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Chap. CXIII.

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We have dwelt at greater length on the trees of New Zealand, than we should otherwise have done with half-hardy species; because, from the climate, and the elevation at which some of them are found, we are inclined to hope that they may prove half-hardy in the climate of London, and nearly, if not quite, hardy in the warmest parts of Devonshire. The singularity of the appearance of phyllocladus, and its obvious alliance to salisburia, would render it a most desirable introduction, either for the green-house or the conservative wall, and possibly it may prove as hardy as salisburia.

CHAP. CXIII.

OF THE HARDY AND HALF-HARDY LIGNEOUS PLANTS OF THE ORDER CONIFERÆ, OR PINACEÆ.

Identification. Lindl. Nat. Syst. of Bot., p. 313.; Richard Mém. Conif., in part.

Synonymes. Coniferæ Rich. Mém. Conif. The Coniferæ, till lately, included the order Taxacææ, already given p. 2065., which has been separated from it by Dr. Lindley. Conacææ Lindl. Key, 232.

Affinities. The Taxacææ have been separated from this order on the one hand, while, on the other, the Cycadacææ are considered as approaching very near it.

General Characters of the Order. All ligneous. Flowers unisexual; those of the two sexes in distinct catkins, that are situated upon one plant in most of the species, and upon two plants in the rest. — Male. Catkin longer than broad. Each flower a scale or body, bearing pollen contained within either 2 cells formed within the scale or body, or 3 or more 1-celled cases; in *Araucária* Juss., in 2-celled cases, exterior to, but united with, the scale or body: a part of the scale or body is free, above the cells or cases containing the pollen. — Female. Catkin more or less conical, cylindrical, or round, in figure; composed of many, several, or few flowers, each, in most species, subtended by a bractea. The catkin, in the state of fruit, is rendered a strobile of much the same figure. Each flower is constituted of 1—3 ovules, borne from an ovary that resembles a scale, and is in some instances connate with the bractea that subtends it. Ovules regarded as receiving impregnation from direct contact of the pollen with the foramen of the ovule. Bracteas imbricated. Carpels, which are the ovaries in an enlarged and ripened state, imbricated. Seed having in many species a membranous wing. Embryo included within a fleshy oily albumen, and having from 2 to many opposite cotyledons, and the radicle being next the tip of the seed, and having an organic connexion with the albumen. Brown has noticed a very general tendency in some species of *Pinus* and *Abies* to produce several embryos in a seed. — Trees, almost all evergreen, the wood abounding in resin. Leaves needle-shaped, scale-like, or lanceolate; in some species disposed in groups, with a membranous sheath about the base of the group, at least in most of these; in some in rows, in some oppositely in pairs, decussate in direction; imbricately in several. (Lindl. Nat. Syst. of Bot.; T. Nees ab Esenbeck Gen. Pl. Fl. Germ. Illustr.; Richard Mém. sur les Conifères; Wats. Dendr. Brit.; and observation.)

The Coniferæ were first studied scientifically by Tournefort. In his *Institutiones*, &c., published in 1717–19, this botanist established the following nine genera; viz., *Abies*, *Pinus*, *Larix*, *Thuja*, *Cupressus*, *Cedrus*, *Juniperus*, *Taxus*, and *Ephedra*. Linnæus, in his *Genera Plantarum*, published in 1737, only admitted seven of Tournefort's genera, uniting *Larix* to *Abies*, and *Cedrus* to *Juniperus*. Adanson, in 1763, in his *Familles des Plantes*, adopted Tournefort's genera, with the exception of *Cedrus*, which, with Linnæus, he united to *Juniperus*; and he added to the Coniferæ the genera *Casuarina* Rumph., and *Equisetum* L. A. L. De Jussieu, in 1789, in his *Genera Plantarum*, formed the family of Coniferæ of the seven genera adopted by Linnæus, placing there the *Casuarina* of Rumphius, and adding the genus *Araucária*. Lamarck (*Encyc. Méth.*, ii. p. 32., published in 1790), under the article Coniferæ, adopted the genera of Linnæus and Jussieu, with the exception of *Araucária*, which he describes, in another part of his work, under the name of *Dombeya*. Gärtner, in 1791 (*De Fruct. et Sem. Plant.*), united in one

group, under the name of *Pinus*, the genera *Pinus*, *Abies*, and *Larix* of Tournefort; and adopted the genera *Thuja*, *Juniperus*, *Cupressus*, and *Taxus* as characterised by Linnæus. Solander, in 1786, in a *Dissertation* published at Berlin by G. Forster, indicated the *Dacrydium cupressinum* as a new genus belonging to *Coniferae*, but did not give its character. Lambert, the vice-president of the Linnæan Society, published, in 1803, the first volume of his magnificent work, *A Description of the Genus Pinus*, the second volume of which was published in 1832, and the third in 1837. L'Héritier founded the genus *Podocarpus* in 1806, and Smith that of *Salisburiæ* in 1796. Persoon added the genus *Altingia* to *Coniferae*, having mistaken a species of *Liquidambar*, the aboriginal name of which is *Altingia*, for one of the *Coniferae*. R. A. Salisbury published, in 1807, in the *Linnæan Transactions*, vol. viii., some curious observations on the stigmas of the *Coniferae*, and endeavoured to establish four new genera; viz., *Bélis* (*Cunninghãmia*), *A'gathis* (*Dãmmara*), *Eutãssa*, and *Colymbãa* (*Araucãria*). Ventenat, in 1808, gave a new character to the *Thuja articulata* of Desfontaines, which he named *Cãllitris*. M. Targioni Tazzetti of Florence published, in the *Annals of the Museum* of that city, *Observations on the Coniferae*, and particularly on the genera *Thuja* and *Cupressus*, which he unites in one genus. MM. Mirbel and Schubert have published, in the *Annales du Muséum de Paris*, tom. xv., and in the *Bulletin des Sciences de la Société Philomatique*, tom. iii., and in various other works, many observations on the *Coniferae*. Both these botanists have proposed a new classification of the genera which compose the order, arranging them into two groups: the one containing the genera in which the flowers are turned up, and the other all those in which they are turned down. M. Mirbel, in 1812, separated the *Cupressus disticha* from the other species of that genus, and described it under the name of *Schubertia*; a name which has not been generally adopted, because it was found that M. Richard, senior, had already described it under the name of *Taxodium* in the *Annales du Muséum*, tom. xvi. M. Tristan, in the same volume of the *Annales*, endeavours to show that *Abies* and *Larix* ought to be united, as Linnæus and Gærtner had previously done. In this volume appeared also a new classification of the genera composing the *Coniferae*, by M. Richard, senior; in which he endeavoured to establish the three groups or sections of *Taxineæ*, *Cupressineæ*, and *Abiétineæ*; and this arrangement is adopted in the same author's justly celebrated work, *Mém. sur les Conifères*, published after his death by his son, M. Achille Richard, in 1826. It is the arrangement of this author, as modified by Dr. Lindley in the edition of his *Introduction to the Natural System* published in 1836, that we have followed in this work; and the characters of the genera have been either drawn up or amended for us by Professor Don; who has also kindly looked over the proof sheets. By Dr. Lindley's arrangement, Richard's section *Taxineæ* is removed from the *Coniferae*, and made a separate order, under the name of *Taxaceæ*, as given in p. 2065.; and, under Richard's two sections *Abiétineæ* and *Cupressineæ*, the true *Coniferae* are arranged as follows:—

Sect. I. *ABIE'TINÆ* Richard.

Sect. Char. All the genera included in the group are evergreen, except *Larix*. Branches in whorls; except, perhaps, in *Dãmmara*. Buds scaly. Catkins of each sex of numerous flowers. Tip of the ovule pointing towards the axis of the catkin, except in *Cunninghãmia*. Leaves scattered, or in groups.

* *Sexes monœcious.*

PINUS L., in part. Male. Catkins grouped. Pollen contained in 2 cells, formed in the scale, that opens lengthwise.—Female. Ovules 2. Strobile ovately conical in most species. Carpels, or outer scales, thickened at the tip, exceeding the bractæas or thin outer scales in length, and concealing them: persistent.—Leaves in groups of 2, 3, or 5; each group arising out of a scaly sheath.

ABIES Link. This differs from *Pinus*, as above defined, in having the cones pendent, and less decidedly grouped; the strobiles cylindrically conical; the carpels not thickened at the tip; and the leaves solitary. They are partially scattered in insertion, and more or less 2-ranked in direction.

PICEA Link. This differs from *Pinus* and *Abies*, as above defined, in having the cones erect. The strobile is cylindrical, and has its carpels not thickened at the tip. Both carpels and bracteas separate from the axis of the strobile; and the leaves are obviously 2-ranked in direction. (*D. Don.*)

LARIX Tourn. This differs from *Abies*, as above defined, in its leaves being annual, and disposed in groups; and in having the cones erect.

CEDRUS Barrelier. This differs from *Larix* in being evergreen, and in the carpels separating from the axis. The leaves, as in *Larix*, are disposed in groups, many in a group; and the cones are erect. Anthers crowned by an elliptical scabrous crest. Strobiles solitary; crest with coriaceous compressed carpels, which are deciduous.

CUNNINGHAMIA R. Br. Male. Catkins grouped. Pollen contained in 3 cases that depend from the scale.—Female. Ovules 3. Strobile ovate.—Leaves solitary, scattered in insertion, more or less 2-ranked in direction, flat, acuminate, and serrulate.

DAMMARA Rumphius. Male. Catkins solitary. Pollen contained in from 5 to 24 cases, pendent from the apex of the scale.—Female. Ovules 2, free. Strobile turbinate.—Leaves ovate-lanceolate, often opposite.

* * *Sexes* [?] *divicuous*.

ARAUCARIA Jussieu. Male. Pollen contained in from 10 to 20 cases, pendent from the apex of the scale. Ovule solitary, connate with the carpel or scale. Leaves imbricate.

Sect. II. *CUPRESSINÆ* Richard.

Sect. Char. All the kinds evergreen, except *Taxodium* Rich. Branches inserted scatteredly in most, if not all. Buds not scaly. Flowers of each sex but few in a catkin. Ovule with its tip pointing from the axis of the catkin.

* *Sexes* *monœcious*.

THUJA Rich. Male. Catkin terminal, solitary. Pollen of each flower included in 4 cases, that are attached to the inner face of the scale, towards its base.—Female. Catkin terminal. Ovary connate with the bractea: the two conjoined may be termed a receptacle. Ovules 2 to each receptacle. Receptacles semipeltate, imbricated, smooth, or, in some, having a recurved beak near the tip. Seeds inconspicuously winged, or not winged. Cotyledons 2.—Branchlets compressed. Leaves scale-like, closely imbricated, compressed.

CALITRIS Vent. Male. Catkins terminal, solitary. Pollen of each flower contained in 2—5 cases, attached to the lower part of the scale, which is peltate.—Female. Catkin terminal, of 4—6 ovaries, or else receptacles, each spreading at the tip, and disposed upon so short an axis as to seem, in the state of fruit, the valves of a regular pericarp, at which time each has a mucro near the tip. Ovules 3 to many to each ovary, or receptacle. Seed winged.—General appearance like that of the kinds of cypress. Branches jointed. Leaves minute, scale-shaped, opposite or whorled, situated under the joints of the branches.

CUPRESSUS L. Male. Catkin terminal, solitary. Pollen of each flower contained in 4 cases, attached to the scale on the inner face at the lower edge. Scales peltate.—Female. Ovaries each connate with the bractea, thus constituting a receptacle. Ovules to each receptacle 8 or more. Strobile globose. Receptacles, as included in the strobile, peltate, having an obscure tubercle at the tip; disposed collaterally, not imbricatedly. Seeds compressed, angular; affixed to the narrow basal part of the receptacle. Cotyledons 2.—Leaves appressedly imbricated.

TAXODIUM Rich. Male. Catkins disposed in a pyramidal compound spike.

Pollen of each flower borne in 5 cases, attached to the scale at its inner face.—Female. Catkins 2—3 together, near the base of the spike of catkins of male flowers, each consisting of a small number of flowers. Ovules 2 to an ovary. Strobile globose. Scales peltate, angled. Seed angled in outline, and having angular projections on the surface; its integument very thick. Cotyledons 6—7.—Leaves linear, disposed in 2 ranks. Annual.

** *Sexes dioecious, or rarely monœcious.*

JUNIPERUS L. Male. Catkins axillary or terminal. Pollen of each flower in 3—6 cases, attached to the basal edge of the scale, and prominent from it.—Female. Catkin axillary, resembling a bud; consisting of 1—3 fleshy ovaries; bracteated at the base. Ovules 1 to an ovary. The ovaries coalesce, and become a fleshy juicy strobile, resembling a berry. Seeds 1—3, each obscurely 3-cornered, and having 5 gland-bearing pits towards the base.—Leaves opposite or ternate, narrow, rigid, and not rarely minute and scale-shaped.

Sect. I. ABIE'TINÆ.



THE *Abietinæ*, or the pine and fir tribe (*arbres verts, Fr.*; *nadelholz, Ger.*) are timber trees, as important in the construction of houses, and in civil architecture generally, as the oak is in the construction of ships, and in all kinds of naval architecture. The trees of this section of the *Coniferae* are so different in their external appearance, not only from the trees of all other orders, but even from the section *Cupressinæ*, that they might well form an order of themselves. The *Abietinæ* are almost all trees of lofty stature, pyramidal in form, and regularly furnished with verticillate frond-like branches, from the base to the summit of the trunk. These branches, unlike those of every other kind of tree, die off as the tree grows old, without ever attaining a timber-like size; so that, in a physiological point of view, they may be considered as rather like immense leaves than branches; and this circumstance, as well as others, seems to connect the pines and firs with the palms. Almost all the species are evergreen, and have linear needle-like leaves; whence the German names of *nadelholz* and *tangelholz*. The number of *Abietinæ* described by Linnæus amounted to no more than 12 species. Smith, in 1819, in Rees's *Cyclopædia*, described 35 species; and in Lambert's *Genus Pinus*, the last volume of which was published in 1837, 66 species are described. Besides these, some others have been introduced, of which little is yet known; so that the number in British collections is considered to amount to upwards of 70 species, exclusive of varieties. They are all natives of temperate regions, and chiefly of the northern hemisphere. On the poorest description of dry soil, a greater bulk of valuable timber will be produced in any given time by a crop of *Abietinæ* adapted to it, than by a crop of any other natural order of trees whatever. According to Delamarre, the proportion between the timber produced by the common pines, and the common broad-leaved trees of Europe, in a poor dry soil, in any given time, is as 10 to 1.

Description. In regard to general form, the *Abietinæ*, when full grown, and beginning to decay, are partly trees with spiry tops, and partly round or flat-headed trees. The genera *Abies*, *Picea*, and *Larix* form conical trees, of the utmost regularity of figure, in every stage of their growth; the different species of *Pinus* and *Cèdrus*, on the other hand, form regular cones when they are young, and until they attain a certain age; but their heads become round or flattened as they grow old; the branches near the bottom of the trunk drop off, and those near the summit increase in thickness, and in lateral extension; and hence the grandeur of the heads of these trees, when favourably situated and of great age. The genus *Cèdrus* is remarkable for the horizontal direction

taken by its branches in every stage of its growth; and the branches of *Abies canadensis* are equally remarkable for their slenderness, and drooping character.

The roots of the *Abietinæ* differ from those of almost all other trees, in not descending perpendicularly; but, both in young and old trees, spreading along the surface of the ground; and, very generally, after the trees have attained some age, swelling and appearing above it. They are numerous, and of less thickness in proportion to that of the trunk, than in the case of any other trees, except the palms; but, being near the surface, and often partially above it, they are of a more tough and woody nature, and are, consequently, better able to resist the action of the wind on the head of the tree, than in the case of trees the roots of which run deep under ground, and which are consequently much less tough and woody. The vitality of the roots of some species is most extraordinary; stumps of the silver fir (*Picea pectinata*) having been found in a growing state, but without leaves, after the trunk had been cut down for upwards of 40 years. The roots of none of the species throw up suckers; nor, when the stems are cut down, do shoots spring from the collar. In some species, as in *P. Tæda* and its varieties, numerous abortive shoots, or tufts of leaves, are produced from the old trunk; and some of the Asiatic and Mexican species also indicate this tendency, though in a much slighter degree.

The trunk, in all the species, grows erect and straight; in some, as in the *Picea pectinata* of Europe, it attains the height of 130 ft. or upwards, with a diameter of from 4 ft. to 8 ft.; and, in the *Picea grandis* of America, it is said to attain the height of 200 ft. The stem is almost always beautifully and regularly tapered, and without those large protuberances common in trees which have their branches of equal durability to the trunk itself, and of like capacity for attaining as large a size. Where the *Abietinæ* have been grown close together, the trunks are almost always straight, and frequently without a single branch to the height of 80 ft. or 100 ft.; the side branches, in such cases, prematurely decaying, from the absence of light and air. Trunks of this kind are common in the spruce fir plantations of Sweden and Norway; and they constitute the fir poles of commerce, so much used throughout Europe as masts for small craft, and as supports for scaffolding. Trunks of the same character are also found in the pine forests of the north of Europe and of North America: and from them are made the masts of the largest American ships; and the beams, rafters, joists, and boards, used in civil architecture, and particularly in the construction of houses in the temperate climates of both hemispheres.

The branches, in the greater number of the species, are verticillate, horizontal in their direction, uniform in their size and shape, and, with the smaller shoots, especially in old trees, generally pendent. In all, the main shoot of the branch is slender, and never attains a great thickness. In some genera (as in *Picea*) the branches are frondose, and quite flat; having a slender main shoot, regularly furnished with smaller side shoots; which are again subdivided into numerous twigs, or spray; and the surface of the whole is flat, like that of the leaf of a fern. In *Abies* and *Larix*, the side branchlets, which proceed from the main shoot of the branch, are for the most part pendent. In *Cedrus*, the branches are more woody than in the case of any other genus; and in *Pinus* least frond-like. As the tree advances in growth, the branches die off, beginning from below; more especially where several trees have been associated together. There are, however, exceptions in the case of single trees in favourable situations, when the branches assume a woody and permanent character; and this is very frequently exemplified in single trees of the cedar, the silver fir, and the Scotch pine, which have had their trunks broken over at a certain stage of their growth. Indeed, pinching out the leading shoot of any species for two or three years in succession, when the tree is young, will generally cause it to produce, instead of a single trunk, a number of trunk-like branches, which form a bushy tree,

of a character anomalous to that of the *Abiétinæ* in general. This anomalous character will be illustrated by the portraits of a silver fir, and some spruce firs, which we shall give in a future page.

The bark of the *Abiétinæ* is thin in young trees; and, in some species of *Abies* and *Picea*, even in old trees, it is never either very thick, or very rough. In many species of *Pinus*, on the contrary, it becomes very thick, rigid, cracked, and deeply furrowed in old trees, from the trunks of which it may be cut in large plates.

The wood is chiefly composed of parallel fibres, arranged in a manner somewhat intermediate between that of dicotyledonous and monocotyledonous trees; and, in consequence of these fibres not being very close, the wood is elastic and resilient. Being resinous, it is also, in general, very durable, and of great combustibility. Michaux remarks that "the branches of resinous trees consist almost wholly of wood of which the organisation is even more perfect than it is in the body of the tree, and that the reverse is the case with trees having deciduous leaves. As soon as vegetation ceases in any part of the tree, the consistence of the wood speedily changes; the sap decays; and the heart, already impregnated with resinous juice, becomes surcharged to such a degree as to double its weight in a year. The accumulation is said to be much greater after 4 or 5 years; the general fact may be proved by comparing the wood of trees recently felled, with that of others long since dead." (*N. Amer. Syl.*, iii. p. 143.)

The leaves are, in almost every case, linear, subulate, acicular, and persistent; though in *Cunninghãmia* they are lanceolate, and in *Dámbara* oblong. In some species they remain on for four or five years, and, in *Araucãria*, for ten or twelve years. In only one genus (*Làrix*) are they deciduous. In *Pinus*, *Làrix*, and *Cèdrus*, they are placed together in bundles of from 2 to 6 in a bundle; but in *Abies* and *Picea* the leaves are single. Where the leaves are in bundles, they are considered by botanists as abortive shoots; because the rudiments of a shoot are found at the base of the leaves: and hence, in pine plants of only one or two years' growth from the seed, the leaves are solitary; and it is only in the third or fourth year that in the axils of these solitary leaves small short shoots appear, each terminating in a fasciculus of from 2 to 6 leaves. The leaves of all the species are without stipules; the numerous scales which are found among them when the shoots are newly developed, being considered as belonging to the buds. In *Pinus*, the leaves are in general more than double the length of those of the other genera; the shortest, as in *P. sylvèstris*, being from 1½ in. to 2 in. long; while those of *P. Pinãster* are from 6 in. to 9 in. in length, and those of *P. austrãlis Michx.* are from 1 ft. to 1½ ft. In all the other genera, the leaves are not much longer than half an inch; and very rarely, as in *Picea Webbiana*, exceed an inch. The long-leaved species belong to warm climates; and these, when grown in cold climates, have their leaves considerably shortened. In texture, the leaves are hard and coriaceous, as in the case of most evergreens; but those of *Làrix* form an exception. The leaves, in all the species, are without lateral nerves; and they are composed of parallel fibres, like those of the *Monocotyledoneæ*.

The buds are enclosed in numerous scales, and are developed in the axils of the leaves, or at the extreme points of the shoots. In all the species they are very few in number, compared with those of broad-leaved trees, in which there is a bud either developed, or in embryo, at the base of every leaf. In the *Abiétinæ* on the other hand, there is not one bud for a million of leaves; and the few that are found in the axils are almost confined to the genera *Abies*, *Picea*, *Làrix*, and *Cèdrus*. The buds are most numerous in *Làrix*, and least so in *Pinus*, in which last genus they are almost entirely confined to the points of the shoots. In general, the bud which terminates the summit of the tree, and is destined to form its leading shoot, and increase its height, is developed the last; and this retardation seems a provision of nature for the safety of the most important shoot which the tree can produce; thus in-

sureing its height rather than its breadth, and the production of timber by the preservation of its permanent trunk, rather than of its temporary and comparatively useless branches.

The flowers are disposed in catkins: they are unisexual, and those of the male are totally different from those of the female. In most species, both male and female catkins are on the same tree; but in *Araucária*, as far as that genus is known, they are supposed to be on different trees. The male flowers consist of a number of stamens without any floral envelope, but simply accompanied by scales; and are much more numerous than the females, as is generally the case in unisexual plants. The pollen from the anthers of most species, when ripe, drops on the lower branches in such abundance as to change their colour from green to yellow; and both in the Highlands of Scotland, according to Lightfoot; and in the Vosges, in the north-east of France, according to Loiseleur Deslongchamps, it has been carried to a distance by wind, and has fallen on the ground like a shower of sulphur, to the great terror of the superstitious. The female flowers consist of a pistil, or stigma, enclosed in a simple perianth, or calyx, and accompanied by an involucre composed of one, two, or of several scales. There are in most genera two scales to each flower; an exterior one, which is large and thick, and forms the outer surface of the pine and fir cones; and an interior one, which springs from the base of the other, and is thin; and which protects two flowers, that afterwards become two seeds.

The fruit of the *Abiétinæ* are all cones, which vary somewhat in form, though they are in general, as the word implies, conical; and they differ in size, from that of *Abies canadensis*, which is about half an inch in length, to that of *Pinus Lambertiana*, which has been found 2 ft. long. The cones which are thickest in proportion to their length are those of *P. Pinea*, *Cèdrus*, and *Araucária*; that of the latter being almost spherical. The largest of all the cones known, is that of *P. macrocarpa*, which is more than 1 ft. in length, and 6 in. in diameter; and which weighs about 4 lbs. In some species of *Làrix*, the axis of the cone is continued in the form of a shoot; and in *Picea bracteata* the scales are prolonged in the shape of leaves. In some, as in *Cèdrus*, *Pinus Pinea*, &c., the scales, or exterior calyxes, of the cones adhere closely together, and, as they ripen, become almost of a woody texture; in others, as in *P. Strobilus*, and in the whole of the species of *Abies*, the scales are loose and open, and of a leathery or soft texture, and may be very easily separated. The seed is readily extracted from the latter description of cones, but with difficulty from the former. The cones in some species, as in *P. sylvèstris*, arrive at maturity in the second year; but in others, as in *P. Pinea* and the genus *Cèdrus*, not till the third year. In some, they remain on the tree only two years: but in others, as in *P. Tæda* and *Cèdrus Libani*, they remain on three or four years; and on *P. púngens* from ten to twenty years.

The largest seeds are those of the *Pinus Pinea*; and the smallest those of some species of *Abies*. The seeds consist of albumen, composed of farinaceous matter, impregnated with resin and oil; in which the embryo is embedded. This oil has an acrid taste; but, as it can be removed by roasting, the farinaceous matter which remains may then be eaten like that of other seeds and roots. Hence all the seeds of the *Abiétinæ* may be considered not only as edible, but as highly nutritive. In some species, as the *P. Pinea* of Europe, and the *Araucária brasiliàna* of South America, the terebinthinate matter in the seeds is so small, that they may be eaten without roasting; while on the other hand, in *Araucária imbricata*, and in *Cèdrus Deodàra*, it is so great that the seeds are kilndried by the collectors of them in the mountains, before being brought down into the plains for sale.

In germinating, the seed first swells and bursts at the upper or narrow end, whence the radicle proceeds and turns downwards into the soil; while, soon after, the lower, or thick, part of the seed opens, and the leaves are developed, and rise above the surface of the ground. The seeds in most of the species are polycotyledonous; but in *Cunninghàmia* there are only two cotyledons,

and seldom more in *Araucària imbricatà*. In *Pinus* inops there are four cotyledons; in *P. sylvéstris* from five to seven; in *Abies excélsa* there are from three to nine; in *Làrix europæa* from five to seven; in *Pinus Stròbus* eight; in *Cèdrus Libàni* from nine to eleven; and in *Pinus Pínea* from ten to twelve.

The general structure of the *Abiétinæ* is remarkable for its unity. The vessels, both in the leaves and wood, are straight and parallel; the trunk is straight, and the branches and all their subdivisions straight and parallel also. Even the leaves, whether inserted in rows as in the firs, or irregularly round the stem as in the spruces and pines, all stand out parallel, and at right angles to the branches. The branches form whorls; and so do the leaves of the cotyledons. The shape of the fruit is conical, and so is that of the entire tree.

The rate of growth of the *Abiétinæ* is, in general, rapid; and the duration of the tree, compared with that of the oak, short. The most rapid-growing species in the climate of London is the *Pinus Larício*, which will attain the height of 20 ft. in 10 years; and the species of this section generally reach maturity, in the climate of Britain, in from 60 to 100 years. Most of the European species bear cones at about 20 years' growth, or before; the spruce fir, on dry chalky soils, in less than half that period. The pinaster arrives at maturity sooner than any other European pine, but seldom lasts longer than from 40 to 50 years. The European species of slowest growth, and greatest duration, is the *P. Cembra*, which seldom attains more than 30 ft. or 40 ft. in height, but which lives for several centuries. The two species which in Europe are most valuable for their timber are the *P. sylvéstris* and the *Làrix europæa*. The grandest and most ornamental species is, unquestionably, the *Cèdrus Libàni*, and the most elegant and graceful the *Abies canadensis*. The species which produce the greatest quantity of timber in the shortest time, in the climate of Britain, are the Scotch pine and the larch; but in favourable situations, both in Germany and Switzerland, these species are exceeded in this respect by the silver fir; in Spain by the pinaster; and in North America by the Weymouth pine.

The greater number of the species of *Abiétinæ* will live in the open air in the climate of London; but some few require to be protected there from the frost.

Geography. The *Abiétinæ* enjoy an extensive range, but chiefly in the temperate parts of the northern hemisphere. Some species are found, both in Europe and America, so far north as to be bordering on the regions of perpetual snow; and others, in Central Europe and in Asia, on the Alpine and Himalayan mountains, in places where, from their great elevation, the climate is equally cold. Wahlenberg and Von Buch describe the genus *Pinus* as occupying the extreme limits of arborescent plants, on Mont Blanc and Mont Perdu, lat. $42^{\circ} 46'$ and on Solitina, in Lapland, lat. 68° . Next to *Pinus*, the genus *Làrix* approaches the nearest to the line of snow. (*Ed. Phil. Journ.*, i. p. 316.) The *Abies* disappears on these mountains about 400 ft. lower than *Pinus*, the species of which extend to within 2800 ft. of the line of perpetual snow. The mean temperature necessary for *Abies* is $37\frac{1}{2}^{\circ}$, while that for *Pinus* is only $36\frac{1}{2}^{\circ}$. On the mountains of Mexico, Humboldt and Bonpland found the genus *Pinus* always attaining the extreme limits of arborescent plants, in the same manner as it does in Europe; *P. australis Michx.* they found occupying a zone at the height of 6000 ft. on Popoc. Lieutenant Glennie, R. N., who ascended the mountain of Popocotapetl, in April, 1827, describes the sides of the mountain as thickly wooded with forests of pines, extending to the height of nearly 12,693 ft., beyond which altitude vegetation ceased entirely. The ground consisted of loose black sand of considerable depth, on which numerous fragments of basalt and pumice stone were dispersed. (*Proc. of the Geol. Soc. of Lond.*, No. vi. p. 76., for 1827-8.) In the southern hemisphere, the *Abiétinæ* have not been found beyond lat. 18° or 20° . The greater number of them are indigenous

to the north and middle of Europe, to Siberia, and to the temperate parts of North America. Some of the South American species, such as the *Araucaria*, differ considerably in general aspect from those of the northern hemisphere; and still more so do those of Australia and Polynesia, such as *Dammara* and *Cunninghãmia*. Very few species of *Abiétinæ* are natives of warm climates; for, though a few, such as the *Pinus occidentális* of St. Domingo, and the *Pinus longifolia* of the East Indies, are found within the tropics, yet they are generally in localities rendered temperate either by their elevation or their proximity to the sea. In Nepal, according to Royle, the *Abiétinæ* are usually associated with the oaks, and "though but small shrubs are found in the vicinity of the highest peaks, no where are more splendid pines to be seen than at 11,000 ft. or 11,500 ft. of elevation. The species most common are, *Picea Webbiãna*, *Cèdrus Deodàra*, *Pinus excèlsa*, and *Abies Morinda*." (*Royle Illust.*, p. 23.) According to Link, the highest limit of the pine, as scattered trees, on the Himalayas, is 12,300 ft., but the pine woods do not extend beyond from 11,000 ft. to 11,800 feet.; though, "at a much higher elevation, poplars 12 ft. in circumference have been observed." (*As. Jour.*, May, 1835, p. 629., as quoted in *Jameson's Journal*, July, 1837, p. 38.) The *Abiétinæ* are almost all social trees, and they are generally found covering extensive tracts of country, while, from their being evergreen, they do this to the exclusion of almost all other trees and shrubs; a pine forest consisting more exclusively of pines, than an oak forest does of oaks, or a forest consisting principally of any other kind of deciduous tree does of that from which it takes its name. The nearest to the *Abiétinæ* in exclusiveness is the beech. (See p. 1956.) The *Abiétinæ*, with very few exceptions, are found in thin soils, on rock, or on a cold but dry subsoil; and but a few species, such as the *Abies excèlsa* and *A. canadensis*, delight in situations where the surface of the ground is saturated with water during a great part of the year. The most common species in Europe, and also the most useful, is *P. sylvéstris*; and the most common in North America is *P. Stròbus*, which produces the white deal of commerce; and these species are found covering immense tracts of arid sand, in both hemispheres where scarcely anything else will grow. The species found in a wild state, in good soil in the south of Europe, are chiefly the *Picea pectinàta*, and some of the varieties of the *Pinus Laricio*.

Very few species of *Abiétinæ* have been found in a fossil state. Nevertheless, some remains of leaves, aments, and seeds of a species of *Pinus*, which Brongniart has named *P. Pseudo-Stròbus*, have been found in some tertiary deposits at Armissau, near the Narbonne, in France, where also have been found the cones of eight other different species of *Pinus*, none of which now exist: the names given to these by Brongniart will be found in his *Histoire des Végétaux Fossiles*, and in the *Dictionnaire des Sciences Naturelles*, tom. lviii. p. 3. In the same tertiary deposits in England, and also in Germany, some of these cones, or some cones nearly resembling them, have also been found in a fossil state.

The distribution of the species and principal varieties of the *Abiétinæ* is as follows:—

In Europe, 14 kinds: viz. *Pinus sylvéstris*, *pumilio*, *Mughus*, *Laricio*, *Pallasiana*, *Pinea*, *maritima*, *brutia*, *halepensis*, *Pinaster*, *Cembra*; *Abies excèlsa*; *Picea pectinàta*; *Larix europæa*.

In Europe and Asia, 5 kinds: viz. *Pinus halepensis*, *Pinaster*, *Cembra*; *Abies excèlsa*; *Larix europæa*.

In Asia, 19 kinds: viz. *Pinus Massoniãna*, *longifolia*, *sinensis*, *excèlsa*, *Gerardiãna*, *halepensis*, *Pinaster*, *Cembra*; *Abies dumosa*, *orientalis*, *Smithiana* (*Morinda*), *excèlsa*; *Picea Webbiãna*, *Pindrow*; *Larix europæa*; *Cèdrus Libani*, *Deodàra*; *Cunninghãmia sinensis*; *Dammara orientalis*.

In Africa, 2 kinds: viz. *P. canariensis*, *Pinea*.

In Europe and Africa, 1 kind: viz. *Pinus Pinea*.

In North America, 40 kinds: viz. *In the United States and Canada*, 18 kinds: *Pinus Banksiana*, *inops*, *resinosa*, *variabilis*, *Tæda*, *rígida*, *pungens*,

serótina, palústris, Stròbus; *A'bies álba, nìgra, rùbra, canadénsis*; *Píceá balsàmea, Fràseri*; *Làrix péndula, microcárpa*. In North-West America and California, 15 kinds: *Pinus Lambertiana*, ponderòsa, Sabiniàna, Coúlteri (macrocárpa), muricàta, tuberculàta, radiàta, monticola, insignis; *A'bies Menzièsii, Douglàsii*; *Píceá nóbilis, grándis, amábilis, bracteàta*. In Mexico, 6 kinds: *Pinus pátula, Teocòte, leiophýlla, Montezumæ, Llavedàna*; *Píceá religiòsa*. In Hispaniola, 1 kind: *Pinus occidentàlis*.

In South America, 2 kinds: viz. *Araucària imbricàta, brasiliàna*.

In Australia, 1 kind: viz. *Araucària Cunninghàmi*.

In Polynesia, 2 kinds: viz. *Araucària excélsa*; *Dàmbara austràlis*.

History. We find the pine and fir mentioned by most of the early Greek and Roman writers. Theophrastus speaks of the pines of Mount Ida, which possessed such a superabundance of resin, that the wood, bark, and even the roots, were completely saturated with it, and the tree was at length killed. In this state, it was used for making torches for sacred ceremonies; and, hence, the word *tæda* (a torch), was frequently applied as an epithet to the pine. Herodotus tells us that, when Miltiades, king of the Dolonei, was taken prisoner by the people of Lampsacus, his friend Cræsus, king of Lydia, procured his release, by threatening his conquerors, that, if they did not release Miltiades, he (Cræsus) would cut them down like pine trees. The people of Lampsacus did not, at first, comprehend the force of this menace; but when they understood that the pine tree, when once cut down, never springs again from the root, they were terrified, and set Miltiades at liberty. The Latins, in allusion to this property of the pine, had a proverb, "*Pini in morem extirpare*," to indicate total destruction. The victors in the Isthmian games (which were instituted 1326 B. C.) were crowned with garlands of pine branches. The fruit of the pine was called by the Greeks *konos*, and *strobilos*; but the Romans called it *nux pinea*, and sometimes the apple of the pine. When Vatinius gave a show of gladiators to conciliate the people, by whom he was much hated, they pelted him with stones. The ediles made an order forbidding the people to throw anything but apples within the arena; and on this the people pelted Vatinius with the apples of the pine tree. The question was, then, whether this was to be considered as a defiance of the law; and the celebrated lawyer Cascellius being consulted, replied, "*Nux pinea, si in Vatinium missurus es, pomum est.*" The wood of the pine tree was employed by the Romans to form the funeral pile for burning the dead. The Romans also used the wood as shingles, to cover the roofs of houses, in the same manner as is done by the peasants of the Jura and the Vosges, and by several others, at the present day.

Pliny mentions several kinds of pine. The pinaster, he says, is quite different from the wild pine, and it grows, both on plains and mountains, to an astonishing height. The silver fir loves mountainous and cold places; and it throws out its branches, which are not very large, from the very root upwards, on every side. The spruce fir grows in the same manner, and is much sought after for building vessels; it is found on the highest mountains. The larch grows in the same situations as the fir, but its wood is better, almost incorruptible, red, and with a strong scent. The resin is abundant and glutinous, but it does not harden. "*Quinto generi situs idem, eadem facies: larix vocatur. Materies præstantior longè, incorrupta vis, mori contumax; rubens præterea, et odore acrior: plusculum huic erumpit liquoris, melleo colore, atque lentiore, nunquam durescentis.*" (*Plin.*, lib. xvi.) Pliny also mentions that the fruit of *Pinus sylvestris*, which he calls *pityida*, was considered by the Romans as an excellent remedy for a cough.

The cones of pines were used by the Romans to flavour their wine, having been thrown by them into the wine vats, where they float on the surface along with the scum that rises up from the bottom, as may be seen in the wine tanks attached to inns and farm-houses, in Tuscany and other parts of Italy, at the present day. Hence, the thyrsus, which is put into the hands of Bacchus, terminates in a pine cone. Pine cones, or pine-apples, were in

consequence much employed in Roman sculpture, and the latter appellation, pine-apple, has been transferred to the fruit of the ananas, from its resemblance in shape to the cone of the pine.

In more modern times, we find accounts of immense forests of pines and firs in different countries, but those of the north of Europe and North America are the most celebrated.

In *Sweden and Norway* are enormous forests, consisting almost entirely of the Scotch pine and the spruce fir; which, in many places, are nearly inaccessible. "If the reader," says Dr. Clarke, "will cast his eyes on the map of Sweden, and imagine the Gulf of Bothnia to be surrounded by one continuous unbroken forest, as ancient as the world, consisting principally of pine trees, with a few mingling specimens of birch and juniper, he will have a general and tolerably correct notion of the real appearance of the country." (*Trav.*) The manner of conveying the trees in these forests, over land, to the banks of a river or the sea, is thus noted by the traveller just mentioned: "At Helsinborg, some fir trees of astonishing height were conducted by wheel-axes to the water side. A separate vehicle was employed for each tree, drawn by horses which were driven by women. These long, white, and taper shafts of deal timber, divested of their bark, afforded the first specimens of the produce of those boundless forests of which we had, till then, formed no conception." The principal river in Sweden by which the pine and fir timber of that country is floated to the sea, is the Götha, by which it is conveyed to Gottenburgh. The timber of Norway is floated down the Glomm to Christiania, whence it is called Christiania deal; down the Drammen to Dram, a seaport about twenty miles west of Christiania, whence it is called Dram deal; and down various other rivers.

In *Prussia, Russia, and Poland*, are also immense pine and fir forests, the timber of which is brought down the rivers, and shipped into the ports on the southern shores of the Baltic, whence it is called Baltic timber. The principal of these ports are Memel, Dantzic, Riga, and Petersburg. The river Memel being the principal channel by which the pine trees grown in the north of Prussia reach the sea at the town of that name, the timber they produce is known by the name of Memel timber. In the hoffs, or lowlands, of this country, amber is found in greater abundance than in any other part of the world; and it is now generally supposed that this substance is the resinous matter of decayed pines, changed by the length of time it has been buried in the earth. (See *Jam. Jour.*, July, 1837, p. 173.) The timber shipped at Memel comes principally from the estates of Prince Radzivil, in Polish Prussia, and it is always much more abundant than that shipped at any other port of the Baltic; that of Dantzic is of better quality, and it is floated down the Bug and the Vistula, from the forests of West Prussia and Poland. The best Baltic timber, however, is that of Riga; and it is the principal kind used for the masts, both of the British and French navies. "The mast trade," says M'Culloch, "is very extensive. The burghers of Riga send persons who are called mast brokers into the provinces, to mark the trees, which are purchased standing. They grow mostly in the districts which border on the Dnieper, and are sent up that river to a landing-place, whence they are transported 30 versts (about 23 English miles) to the Dwina; where being formed into rafts of from 50 to 100 pieces each, they descend the stream to Riga. The tree which produces the longest masts is the Scotch pine. The pieces, which are from 18 in. to 25 in. in diameter, are called masts; and those under these dimensions, spars, or in England Norway masts, because Norway exports no trees of more than 18 in. in diameter. Great skill is required in distinguishing those masts which are sound from those which are in the least degree internally decayed. They are usually from 70 ft. to 80 ft. in length." (*Dict. of Com.*)

The pine timber shipped at Petersburg is at present brought from a great distance in the interior, all the large timber of the comparatively near forests having been long since cut down. A Russian proprietor wishing to

dispose of the timber on his property, having completed a bargain with the Petersburg merchant, sets his peasantry to work in picking out, cutting down, and dragging the trees from the forest to the lakes and rivers. This work generally takes place during the winter months, in order that every thing may be ready for floating the timber to Petersburg as soon as the ice on the rivers and lakes breaks up. As the ground is generally covered several feet deep with snow, and the trees judged to be sufficiently large and sound for the foreign market lie widely apart, the workmen and others employed in picking them out are compelled to wear snow shoes, to prevent them from sinking in the snow. When the trees are found, they are cut down with hatchets, and the head and branches lopped off. The trunk is then stripped of its bark, and a circular notch is cut round the narrow end of it, in which to fix the rope by which the horses are to drag the trunk along; and a hole is made at the other end for a handspike, to steer the log over the many obstacles which lie in its way. Many of these trees are 70 ft. in length, and of proportionate diameter; and they are drawn by from 5 to 9 horses each, "yoked in a straight line one before another, as the intricate narrow paths in the wood will not permit of their going in any other way. One man mounts upon the leading horse, and another upon the middle one, while others support and guide with handspikes the large and distant end of the tree, to raise it over the elevations of the snow, and make it glide smoothly along. The conveyance of these large trees, the long line of the horses, and the number of boors accompanying them through the forests, and across the fields of snow, present an appearance very interesting." (*Howison in Ed. Phil. Jour.*, xii. p. 65.) In many cases, the trees are brought above 1000 versts (nearly 1000 English miles) before they are delivered to the merchant; and they generally remain under his care "another winter, to be shaped and fitted for exportation, in such a manner as to take up as little room as possible on shipboard;" so that the Russian timber does not reach the foreign consumer till two years after it is cut down. When the trees are delivered to the merchant they are carefully examined by him, and the nobleman, or his overseer, to ascertain their soundness; and, for this purpose, a hatchet is struck several times against them, and by the sound arising from the strokes they judge of the soundness of the tree. The trees rejected, which are called *braake*, are in the proportion of 1 in 10. The trunks are formed into rafts, and floated down the rivers by the current; but on the lakes they are propelled by sails or paddles, or, where practicable, by horses; the boors who guide the raft, living in a wooden hut constructed on it. Most of the pine timber sent to Petersburg, lies beyond the Biel Ozer, or White Lake, the waters of which, and of the Onega Lake, it has to traverse, besides passing down several rivers, before it reaches Petersburg. "Across these great lakes, resembling seas in extent, the navigation is at times difficult and dangerous. Storms and sudden gales of wind frequently occur, driving the vessels and timber rafts from the sides into the middle of the lakes, out of sight of land, and often proving destructive to them and to their crews." In order to prevent such accidents, Peter the Great began the Ladoga Canal, along which the rafts are conveyed with perfect safety, to the river Neva, the stream of which carries them down to Petersburg, where they remain in the timber-yard of the merchant till they are ready to be floated down to Cronstadt for foreign exportation." (*Ibid.*, p. 70.)

In Germany there are extensive forests of pine and fir trees; and the following description of the rafts of timber on the Rhine will give an idea of the mode by which these trees are conveyed down that river to the sea:— "A little below Andernach, the village of Narnedey appears on the left bank, under a wooded mountain. The Rhine here forms a little bay, where the pilots are accustomed to unite together the small rafts of timber floated down the tributary rivers into the Rhine, and to construct enormous floats, which are navigated to Dortrecht (Dort), and there sold. These machines have the appearance of floating villages, each composed of twelve or fifteen little wooden huts, on a large platform of oak and deal timber. They

are frequently 800 ft. or 900 ft. long, and 60 ft. or 70 ft. in breadth. The rowers and workmen sometimes amount to 700 or 800, superintended by pilots, and a proprietor, whose habitation is superior in size and elegance to the rest. The raft is composed of several layers of trees, placed one on another, and tied together: a large raft draws not less than 6 ft. or 7 ft. of water. Several smaller rafts are attached to the large one, besides a string of boats, loaded with anchors and cables, and used for the purposes of sounding the river, and going on shore." (*An Autumn near the Rhine.*) Every article of provision for the workmen is carried on board these rafts, together with live pigs, poultry, &c.

In Austria there are immense forests of pines and firs, particularly in the Alpine districts, and in the Tyrol; and the timber is in many instances conveyed several miles before a stream is met with, capable of floating it to a large river or lake, whence it is to be conveyed to the sea. In these cases, semicircular troughs called slides are constructed, formed of six or eight fir trees, placed side by side, and smoothed by stripping off the bark. These slides are made in such a direction, as always to preserve nearly the same slope; and while they require in some places to pass through projecting rocks in tunnels, in others they are carried over ravines on lofty piers, formed of tall trees. The first slide of this kind is supposed to have been that of Alpnach, of which some notice will be found in the succeeding paragraph. These slides are chiefly made use of in winter, at which time they are rendered more slippery, by pouring water down them, which freezes immediately. (See *Handbook for Travellers in Southern Germany.*)

In Switzerland, on the Alps, are extensive pine and fir forests; though but little use can be made of the timber of most of them, except for local purposes, from the great difficulty of transporting the trees to the sea, or to a navigable river. In the year 1810, when the price of Baltic timber had attained its greatest height, a stupendous, and at the same time successful, effort was made by an enterprising engineer to convey the timber of Mount Pilate to the Lake of Lucerne, whence it might be floated down the Rhone to the sea. M. Rupp conceived the idea of making an inclined plane, which should extend the whole distance, from the top of the mountain to the Lake of Lucerne; that is, above eight English miles. This extraordinary contrivance (the construction of which occupied eighteen months, and which was completed in 1812) was called the Slide of Alpnach, and consisted of a trough, formed of 25,000 pine trees, 6 ft. broad, and from 3 ft. to 6 ft. deep. Its length was 4400 English feet; and, of course, to preserve its regular slope, it had to be conducted over the summits of rocks, along their sides, underground, and over deep gorges, where it was sustained by scaffoldings. The slide was kept constantly moist, and the trees descended by it into the lake with extraordinary rapidity. The larger pines, which were about 100 ft. long, ran through the whole space of eight miles and a third, in about six minutes. A gentleman who saw this great work stated, "that such was the velocity with which a tree of the largest size passed any given point, that he could only strike it once with a stick as it rushed by, however quickly he attempted to repeat the blow." The speculation, however, did not answer long; and as soon as the markets of the Baltic were opened by the peace, the Slide of Alpnach was suffered to fall into ruin. (See *Edin. Phil. Journ.*, 1820.)

The north of England and some parts of Scotland and Ireland, appear to have been anciently nearly covered with pine forests. The immense tract of country afterwards called Hatfield Chase was once an almost impenetrable forest; but the trees in it were partly cut down, and partly burnt by the Romans, not only to make a road through the country, but to drive the Britons from their fastnesses. Fallen forests, if the trees be not removed, soon become peat bogs; by the fallen trees stagnating the water, and giving rise to the growth of the *Sphagnum palustre*, and other mosses and aquatic plants. These continue growing on the surface, and decaying at their lower extremities, till the surface of the sphagnum has risen so

high above the natural surface as to throw off the rain, instead of retaining it. The sphagnum and other aquatics then die, and form a surface adapted for mosses, which delight in dry soil; and for other plants, the light seeds of which may be floating in the atmosphere, or carried thither by birds. The Forest of Hatfield, containing 180,000 acres, underwent this process, and remained a complete waste, only inhabited by red deer, till, in the time of Charles I., it was sold to Sir Cornelius Vermuiden, a Dutchman, who drained it, and brought it into use. When this forest was drained, many trees of extraordinary size were found, and, among others, the oak already mentioned, p. 1775. The pine and fir trees were, however, most abundant, and bore marks of having been burnt, some quite through, and others only on one side. Some had been chopped and squared, some bored, and others half split, with large wooden wedges and stones in them, and broken axe-heads, something like the sacrificing axes in shape. (See *Trans. Roy. Soc.* for 1701.) In Scotland, one of the principal pine forests is that of Rothiemurchus, which spreads over the glens and valleys of the Grampian Hills. The timber in this forest is generally floated down the Spey: and when, from a long season of drought or any other cause, there is any difficulty in getting it down to the river, the workmen collect the trees into a suitable dell; and, having built up a temporary dam, wait the coming of a flood, which in a country of such varied surface is no rare occurrence. As soon as the temporary dam is full of water, they break down the boundary; and the liberated waters bursting from their confinement, carry the trees with them, thundering down the Spey. The trees grown in the Forest of Rannoch, in Perthshire, are floated down the Tay, and the remains of this forest may be traced across the country, by stumps and occasional trees, to the woods of Mar in Aberdeenshire, the timber in which is floated down the Dee. In the valley of the Dee is an extensive peat moss, or bog, in which pine is the principal timber found submerged; and such is the durability of this wood, that while the bog timber of the birch is often found reduced to a pulp, and the oak cracks into splinters as it dries, the heart of the pine remains fresh, embalmed in its own turpentine: it is quite elastic, and is used by the country people instead of candles. In the north of Ireland, as late as the sixteenth and seventeenth centuries, an extensive forest of pine and fir appears to have extended through the counties of Donegal and Tyrone; and, according to Mackay (*Fl. Hib.*, p. 259.), trunks of very large dimensions of the Scotch pine are often found in bogs, sufficiently fresh for roofing houses. "The resinous roots," he adds, "are sold in Dublin as fire wood, and are used by the peasantry in the west of Ireland in lieu of candles."

In North America, both in the United States and Canada, are the most extensive pine forests in the world; and the most gigantic specimens of *Abiétina* that are known to exist, some of the firs found by Douglas in California growing to the height of from 150 ft. to 200 ft. In Canada, from the summit of the ridge extending from the shores of Labrador westward across the country to the marshes near Lake Winnipeg, and on the south side of the great estuary of the St. Lawrence, as far as the boundary of the United States, the land, before it began to be cleared by the European settlers, was covered with one immense forest of pines and firs; and on the south of the St. Lawrence, the forest reached down to the water's edge along the whole shore, and even covered the islands. The Canadian timber sent to England is principally from New Brunswick; and in 1824 it amounted in value to half a million sterling. The following account of the mode of cutting the timber in the back woods of Canada is abridged from M^r Gregor's *Sketches of the Maritime Colonies of British America*, published in 1828. Several persons form themselves into what is called "a lumbering party," under the command of a "master lumberer," who manages the whole. The necessary supplies of provisions, clothing, &c., are generally supplied on credit by merchants, who are to receive payment out of the stock of timbersent down the rivers the following summer. The people then proceed into the woods, and select a place for their encampment near a stream of water; here

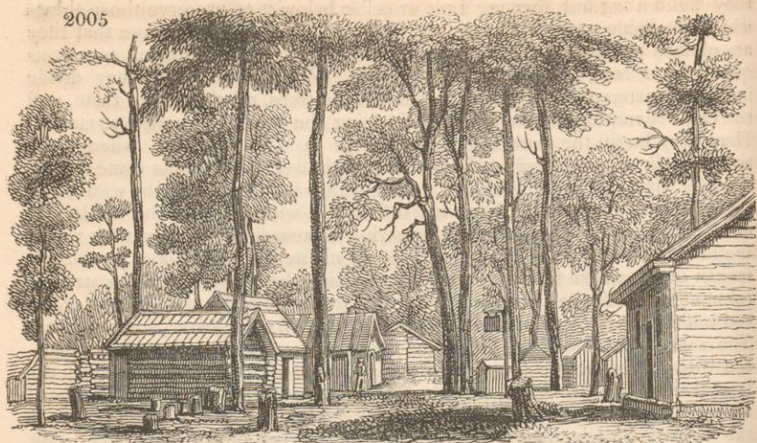
they build a log hut, forming a pit or cellar below it to preserve those things which are liable to be injured by the frost. The cold is so intense that they are obliged to keep up a constant fire night and day, and they drink enormous quantities of rum, generally without water. When they work, they divide into three gangs: one of which cuts down the trees, another hews them, and the third is employed with oxen in dragging the logs to the nearest stream. Here they lie till the snow begins to dissolve in April or May, when "the rivers swell, or, according to the lumberers' phrase, 'the freshets come down.' At this time all the timber cut during winter is thrown into the water, and floated down till the river becomes sufficiently wide to make the whole into one or more rafts. The water at this period is exceedingly cold; yet for weeks the lumberers are in it from morning till night, and it is seldom less than a month or six weeks from the time that floating the timber down the streams commences, until the rafts are delivered to the merchants. No course of life can undermine the constitution more than that of a lumberer and raftsman. The winter snow and frost, although severe, are nothing to endure, in comparison with the extreme coldness of the snow water of the freshets; in which the lumberer is, day after day, wet up to the middle, and often immersed from head to foot." The lumberers of New Brunswick, and those who cut down timber in the United States, take great care to select trees of a proper size. Mr. Mc'Gregor states that not one tree in 10,000, in the woods, is fit for the purposes of commerce. In the United States the forests of pines and firs, when they occur on poor, dry, sandy plains, where broad-leaved trees will not grow, are called pine barrens, and they extend over a very considerable portion of the southern states, as far as North Carolina. "Upwards of 500 miles of our journey," says Captain Hall, "lay through these desolate forests, and I have therefore thought it worth while to give a sketch (fig. 2004.), which is sufficiently characteristic of these singular regions.

2004



Occasional villages (fig. 2005.) gave some relief to the tedium of this part of the journey, and wheresoever a stream occurred, the fertility of the adjacent lands was more grateful to the eye than I can find words to describe. Once or twice, in travelling through the state of Georgia, we came to high knolls, from which we could look over the vast ocean of trees, stretching without a break in every direction as far as the eye could reach; and I remember upon one of these occasions, thinking that I had never before had a just conception of what the word forest meant." (Hall's *Sketches in Canada and the United States*, No. xxiii.) The pines in the United States which furnish timber for exportation are, according to F. A. Michaux, *P. mitis* (the yellow pine,) *P. Ströbus* (the white or Weymouth pine), and *P. australis* (the long-leaved pine.) Of these, the wood of *P. mitis* is called, in the English markets,

2005



the New York pine, and it is sold at a lower price than that of *P. australis*, but higher than that of *P. Ströbus*. The long-leaved pine is the principal tree in the extensive pine barrens of the southern states. The timber of it is sent to England, principally from Savannah in Georgia, in planks called "ranging timbers," which are from 15 ft. to 30 ft. long, and 10 in. or 12 in. broad. At Liverpool it is called Georgia pitch pine, and is sold 25 or 30 per cent higher than any other pine imported from the United States. The timber of *P. Ströbus* is, however, that most generally imported into England from the United States; and the best is brought from the district of Maine, particularly from the banks of the river Kennebeck. The persons engaged in felling this timber are generally emigrants from New Hampshire. "In the summer they unite in small companies, and traverse these vast solitudes in every direction, to ascertain the places in which the pines abound. After cutting the grass and converting it into hay for the nourishment of the cattle to be employed in their labour, they return home. In the beginning of winter they enter the forests again, establish themselves in huts covered with the bark of the canoe birch, or arbor vitæ; and, though the cold is so intense that the mercury sometimes remains for several weeks from 40° to 50° Fahr. below the freezing point, they persevere in their labour." (*Michx North Amer. Syl.* iii. p. 167.) When the trees are felled they cut them into logs of from 14 ft. to 18 ft. long; and, by means of their cattle, drag them to the river, where they stamp them as a mark of property, and then roll them on its frozen surface, to remain till the breaking up of the ice enables them to float down the current. All the logs that come down the Kennebeck are stopped at Winslow, 120 miles from the sea; where each person selects his own, and forms them into rafts with the intention of selling them to the proprietors of the numerous saw mills between that place and the sea; or of having them sawn into planks for his own benefit, at the price of half, or even three quarters of the product in abundant years. The logs that are not sawn the first year, adds Michaux, are attacked by large worms, which form holes about 2 lines in diameter, in every direction; but, if stripped of their bark, they will remain uninjured for thirty years. The district of Maine furnishes three fourths of all the white pine exported from the United States, including what is brought from New Hampshire, by the Merimack, to Boston. That cut on the shores of Lake Champlain is carried to Quebec by the Sorel and the St. Lawrence. "What is furnished by the southern part of the lake is sawn at Skeensborough, transported 70 miles in the winter on sledges to Albany; and, with all the 'lumber' of North River,

brought down in the spring to New York, in sloops of 80 or 100 tons, to be afterwards exported to Europe and the West Indies." (*Michx.*) Timber of the white pine is also floated down the Delaware and Susquehanna to Philadelphia, and down the Ohio and Alleghany to New Orleans. Boston is the principal emporium of pine timber in the northern states; and the timber exported from that city is generally divided into what are called Albany, or common, boards, which are frequently deformed with knots; and the clear, or picked, boards, which are called at Philadelphia white pine panels.

The literary history of the pine and fir tribe, in modern times, may be said to commence about the middle of the sixteenth century, when Belon published his work *De Arboribus Coniferis, Resiniferis, &c.*, already noticed, p. 187. Forests of pines and firs were at that time much more common throughout Europe than they are at the present day; and the attention of planters seems not to have been drawn to the raising of pine and fir plantations, till the comparative scarcity of pine timber of large dimensions, which occurred about the end of the seventeenth century. Evelyn, and afterwards Miller, in England, and Buffon and Du Hamel in France, first directed attention to the subject. About the middle of the last century, the Baron Tschoudy translated into French what Miller had written on the pine; he also made a great many experiments himself; and was the first to introduce the practice of grafting the pine and fir tribe. In the beginning of the present century, the first volume of Lambert's *Genus Pinus*, appeared in England, and it has been since followed by two others; in 1810, Michaux's *Arbres Forêtiers de l'Amérique*, and in 1826, the *Mémoires sur les Conifères*, of M. Richard, were printed in France; and these works, as far as respects botanical science, are by far the best yet published on the subject of which they treat. In Delamarre's *Traité Pratique de la Culture des Pins*, 3d edit., published in 1834, will be found an alphabetical catalogue of 43 authors, who have written, more or less, on the culture of the pine in France; but the works more particularly worth referring to, in addition to those above mentioned, are the *Nouveau Du Hamel*, and the *Flora Americana Septentrionalis* of Pursh.

Several sorts of pines and firs appear to have been known in England in the time of Gerard and Parkinson; and afterwards Ray and Evelyn refer to gardens containing particular species. It had not then been common to form plantations of the pine as a useful tree; for Evelyn mentions as remarkable, that "a northern gentleman" had informed him that the pine was abundantly planted in Northumberland for timber. Evelyn mentions ten several sorts as then in English gardens; including the cedar, and the larch, the pinaster, the *Pinus Tæda*, the silver fir, the spruce, and one or two other species or varieties of doubtful identity. In the London nurserymen's *Catalogue* of 1730, (mentioned p. 60.,) about the same number are enumerated as being then propagated for sale. In Miller's time, collections of pines and firs appear to have been first made by some of the principal landed gentlemen. Among the oldest of these collections was that at Woburn Abbey, where the park, at the beginning of the present century, contained some immense silver firs, that have since been cut down on account of their age. At Whitton, an excellent collection was made, between 1720 and 1730, by Archibald Duke of Argyll; some fine specimens of which, and especially of the cedars, pinasters, Weymouth pines, and hemlock spruces, still remain, and continue to grow vigorously. According to the *Hortus Kewensis*, the *Pinus Cembra* was first planted at Whitton; and the original tree, which still exists, was, in July, 1837, 50 ft. high, with a trunk 1 ft. 6 in. in diameter. Between 1750 and 1760, Peter Collinson made a collection of all the rarest pines and firs that could be procured in his time, in his grounds at Mill Hill; and several of these trees, particularly *P. Cembra*, *P. Pinæa*, and some of the cedars and spruces, still remain. A collection of pines and firs was made at Syon about the same period; and, when Kew Gardens were formed in 1760, as many species were

planted there as could be procured, and the collection has since received several additions from time to time. The best collections of old trees in the immediate neighbourhood of London, now (1837) existing, are those at Kew and Syon; but the most complete collection, where the plants are of a considerable size, in England, and doubtless in the world, is that in the pinetum at Dropmore, near Windsor, commenced by the late Lord Grenville, about 1810, and now (1837) amounting to above 100 kinds. This fine collection is kept up with the greatest care by Lady Grenville, and every new species or variety is added, as soon as it can be procured. All the sorts of *Abiétinæ* that are in the country are in the garden of the London Horticultural Society; but the plants there are, for the most part, of small size.

Pinetums, by which are to be understood collections of the *Abiétinæ* planted by themselves, and without the intermixture of broad-leaved trees, have, since the commencement of that at Dropmore, been formed by several landed proprietors in different parts of the country; stimulated, no doubt, by the extraordinary beauty and interest of the Dropmore pinetum, and by the number of new and beautiful species of pines and firs which have been introduced from California and the Himalayas. Many persons have also made collections of the *Abiétinæ*, and planted them in ornamental grounds along with broad-leaved trees. In England, pinetums, or collections, have been made by J. T. Brooks, Esq., at Flitwick House, in Bedfordshire, where there are 100 sorts; by Sir Charles Monck, at Belsay in Northumberland; by Sir Charles Lemon, at Carclew in Cornwall; by William Harrison, Esq., at Cheshunt; by the Duke of Devonshire, at Chatsworth; by the Duke of Bedford, at Woburn Abbey; by W. A. Baker, Esq., at Bayfordbury, in Hertfordshire; by F. Perkins, Esq., Chipstead Place, Kent; by Lord Arundel, at Wardour Castle; by the Earl of Caernarvon, at Highclere; by William Wells, Esq., at Redleaf; and by several others. In Scotland, the first collection of *Abiétinæ* was formed at Methven Castle, on the estate of Robert Smith, Esq. by the zeal of his able and intelligent land steward, Mr. Thomas Bishop; one has been formed at Posso, in Peebleshire (a place which has long been celebrated for its trees, see page 93.), which it is believed contains a greater number of species than any other in Scotland, though the plants are all young. At Haddo House, in Aberdeenshire, the Earl of Aberdeen has formed a collection, and spares no expense in procuring plants of all the new sorts as they are introduced. At Ballendalloch, Morayshire, George Macpherson Grant, Esq., commenced a pinetum in 1836, to which every new sort is added as soon as it can be procured. The soil and climate of Ballendalloch seem to be particularly adapted for the *Abiétinæ*, as will appear by an account of the growth of some of the trees there, which we shall give in a future page; so that we have no doubt of this pinetum becoming in a few years one of the very first in Scotland. Collections of more or less extent have also been formed at Lowhill, in Fifeshire, the property of C. Craigie Halkett, Esq.; at Hopetoun House, near Edinburgh, the seat of the Earl of Hopetoun, where there is the largest tree of *Abies Smithiana* in Britain; at Oxenford Castle, Edinburghshire, the seat of Sir John Dalrymple McGill; and at Melville House, Fifeshire, the seat of the Earl of Leven. For this account of the pinetums of Scotland, we are indebted to Mr. Lawson, the eminent seedsman of Edinburgh, whose communication on the subject will be found at length in the *Gard. Mag.*, vol. xiii. In Ireland, the first pinetum formed was that of the Glasnevin Garden, which was commenced in 1797; and, about the same time, a number of species were planted at Oriel Temple, in the county of Louth, by the late Lord Oriel. Both collections continue to receive additions, Lord Viscount Ferrard, the son and successor of Lord Oriel, being, like his father, much attached to trees. In Trinity College Botanic Garden, in Dublin, a pinetum was commenced in 1808; which, like that at Glasnevin, has since received the addition of most of the new species. At Tittour, Mount Kennedy, in the county of Wicklow, a collection has been formed, and great attention paid to the culture of the pines in it, by John Nuttall, Esq.; and a collection has been commenced in the Belfast Botanic

Garden. For these notices of pinetums in Ireland, we are indebted to Mr. Nuttall, Mr. Nevin, and Mr. Mackay, whose respective communications on the subject will be found in the *Gardener's Magazine*, vol. xiii.

Among nurserymen, the most complete collection in England is in the arborum of Messrs. Loddiges; and next, as regards the number of rare species, are the collections of young plants grown for sale in the nurseries of Messrs. Brown at Slough, of Messrs. Osborne at Fulham, and of Messrs. Lee at Hammersmith. The best nursery collections in Scotland are, Mr. Lawson's at Edinburgh, and Mr. Roy's at Aberdeen; and the best in Ireland, that of Mr. Hodgkin at Dunganston. Mr. Charlwood is the principal British nurseryman for seeds of rare *Abiétinæ*, which he imports annually from America.

In France, the first collection of *Abiétinæ* worthy of notice appears to have been that of the celebrated Du Hamel, on his estate at Monceau, noticed p. 140. Since that period, several species have been sent from America by Michaux, or collected by the government gardeners, and planted in the grounds of the Trianon, at Versailles, and in the Bois de Boulogne. The Baron Tschoudy had a collection on his estate at Colombey; and M. Delamarre had extensive plantations at Vieil-Harcourt, in the department of the Maine, which he thought of so much importance, that he bequeathed them, together with his treatise on the subject (*Traité Pratique de la Culture des Pins*), to the French government. M. Vilmorin, the joint author with Michaux, of notes to the edition of Delamarre's work, published in 1831, has paid great attention to the subject of pines, and has tried many species on his estate at Barres, where he has collected all the species which he could procure, and planted them singly, or in groups, or masses; the sorts most nearly allied being placed adjoining to each other, with a view to the study of the species and varieties by botanists, when the plants shall be grown up. In this pinetum, M. Vilmorin has been particularly assiduous in procuring and planting all the varieties of the species most esteemed in Europe for their timber: such as *P. sylvestris*, *P. Laricio*, *P. Pinaster*, &c. M. Puvis, who has given an account of M. Vilmorin's plantations, in his work entitled *De l'Agriculture du Gatinais*, &c., states that the pinetum at Barres is at all times open to the inspection and study of botanists and cultivators. Perhaps the most remarkable fact connected with the pine and fir tribe in France, is the circumstance of grafting having been performed on a large scale on the pine trees in the Forest of Fontainebleau, belonging to government. Here M. De Larminat, the conservator of the forest, had grafted many thousands of *P. Laricio* on plants of *Pinus sylvestris*, which have become fine trees; and the practice is annually continued. In the French nurseries, the best collections are those of M. Vilmorin and M. Soulange-Bodin. In Germany, there are collections of pines in the different botanic gardens; and the most complete is that in the Berlin Garden: but even this is surpassed in number of species by the collection of Messrs. Booth, in the Floetbeck Nurseries.

Poetical, mythological, and legendary Allusions. The gloomy grandeur of the pine and fir tribe, their upright growth and great height, the regularity of their forms, and the murmuring of the winds through their stiff leaves and rigid branches, have made them favourites with the poets from the remotest antiquity. The Egyptians considered the pine as an emblem of the soul. Homer describes the residence of the Cyclops as "brown with o'erarching pine;" and other Greek poets tell us that the nymph Pitys, who was beloved by Pan, having slighted the passion of Boreas, was dashed by him against a rock, when the pitying Pan caused a pine tree to spring from her remains. Marsyas, who challenged Apollo to a trial of skill as a musician, and was afterwards flayed alive by that god for his presumption, was fastened to a pine tree, and left there to perish. He is often represented, in ancient sculptures, as tied with his hands behind his back to a lofty pine; while Apollo stands before him holding his lyre. Some authors, however, say that the place of Marsyas's suffering was against a plane tree. (See p. 2038.) The Roman poets frequently mention the pine. Ovid tells us that Polyphemus

carried with him a lofty pine tree, by way of walkingstick; that Ceres bore a flaming pine tree, plucked from Mount Ætna, in each hand, during her search for her daughter Proserpine; and that Cybele, when her favourite Atys was about to destroy himself, changed him into a pine tree, and hence that tree was considered sacred to Cybele. He adds that a grove of sacred pines was among the trees moved by the music of Orpheus. Ovid also gives us the history of Sciron, or Cercyon, the pine-bender, a notorious robber, whose habit was, when he had taken a prisoner, to bend two pine trees, and to tie one of the prisoner's hands to each, and then to let the trees fly back, when the unfortunate traveller was torn asunder. This cruel monster was destroyed by Theseus. Virgil tells us that the ships of Æneas, which were afterwards changed into nymphs, were made of pine trees sacred to Cybele. He also alludes to the mournful sounds produced among the pine branches by the wind, and calls them the singing pines:

"The pines of Mænalus were heard to mourn,
And sounds of woe along the groves were borne."

The cones of the pine were sometimes sacrificed to Bacchus, because they were put into wine to give it a flavour; and sometimes to Esculapius, because their odour, being balsamic, was thought excellent for asthmas.

The pine tree is frequently mentioned by the elder British poets, principally as affording an object of comparison for tall and stately beauty, or for dark and gloomy grandeur. One of the finest allusions to the pine is by Milton, in his splendid description of Satan, in the first book of the *Paradise Lost*:—

"His spear, to equal which the tallest pine,
Hewn on Norwegian hills, to be the mast
Of some great admiral, were but a wand."

Milton also says:—

"His praise, ye winds, that from four quarters blow,
Breathe soft or loud; and wave your tops, ye pines,
With every plant, in sign of worship wave."

Among the more modern poets, perhaps the most beautiful lines relating to the pine are those of Barry Cornwall. Speaking of Polyphemus, he says,—

———"Mighty tears then fill'd
His solitary eye,—and with such noise
As the rough winds of autumn make when they
Pass o'er a forest, and bend down the pines,
The giant sigh'd."

Death of Acis.

———"Here dark trees
Funereal (cypress, yew, and shadowy pine
And spicy cedar) clustered; and at night
Shook from their melancholy branches sounds
And sighs like death."

Ibid.

Leigh Hunt has also some beautiful lines on the pine tree:—

"And then there fled by me a rush of air
That stirred up all the other foliage there,
Filling the solitude with panting tongues;
At which the pines woke up into their songs,
Shaking their choral locks."

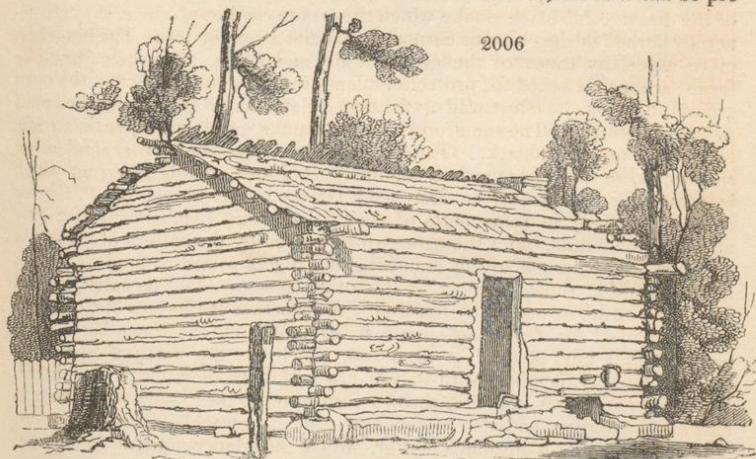
HUNT'S *Foliage*: *Evergreens*, p. 24.

"And 'midst the flowers, turf'd round beneath the shade
Of circling pines, a babbling fountain play'd;
And 'twixt the shafts you saw the water bright,
Which through the darksome tops glimmer'd with showering light."
Story of Rimini, canto iii.

Shelly thus describes one of the conflagrations in the Norway forests:—

"As the Norway woodman quells,
In the depth of piny dells,
One light flame among the brakes,
While the boundless forest shakes,
And its mighty trunks are torn
By the fire thus lowly born;
The spark beneath his feet is dead;
He starts to see the flame it fed,
Howling through the darken'd sky
With myriad tongues, victoriously."

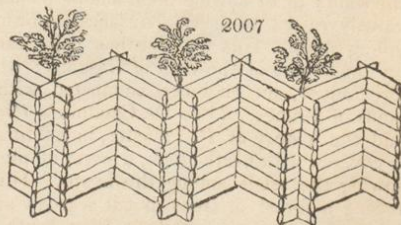
Properties and Uses. The native forests of *Abiétinæ* are observed to be warmer in winter than those of any other evergreen tree in the same climate. They consequently afford excellent shelter for wild animals of every description, and one of the best substitutes for a house for man. In the north of Europe, this is more particularly applicable to the forests of spruce fir, which form so dense a covering as almost to exclude heat in summer, and cold in winter. The pine and fir tribe, in a living state, with the exception of the larch (that tree having tender foliage), afford food to but few insects; but the seeds are greedily devoured by the squirrel and other animals, and by some birds. In civilised society, the wood of the pine and fir tribe is in universal use, and forms one of the most important articles of European and American commerce. No other tree produces timber at once so long and so straight; and so light, and yet so strong and stiff; it is therefore peculiarly fitted for almost all the purposes of civil architecture, and for some peculiar uses in the construction of ships. Masts are every where made of it, where it can be pro-



cured of sufficient size; and the yellow deal of Europe, which is produced by the *Pinus sylvestris*; the white deal of Norway, which is produced by the *Abies excelsa*; and the white pine wood of America, which is the *Pinus Strôbus*, are used throughout the civilised world in building and fitting up houses, in the construction of machinery, in furniture, and for an endless number of purposes. Log-houses (see *fig. 2006.*) are more conveniently made of trunks of the pine and fir tribe than of any other tree, on account of their straightness, and the

slight degree in which they taper. For the same reason, also, the worm fence of America (*fig. 2007.*), and the wooden fence of Sweden and Norway (*fig. 2008.*), are always made of pine or fir wood, when it can be obtained. In Russia, Poland, and other parts of the north of Europe, and also in the interior of North America, roads are formed over

marshy ground by laying down the trunks of pine trees, side by side, and close together, across the line of road. In the latter country, these are called *co durroy* roads. In some parts of the towns of Russia, and particularly in Moscow and Kiow, regularly squared planks are laid down instead of rough trunks; and, both in Moscow and Vienna, the courts of some of the larger



mansions are paved with pieces of the trunk of about 18 in. in length, set side by side, and beaten down till they form a level surface, in the same way as is done when stones are used for a similar purpose. This wood, from the quantity of resinous matter which it contains, is very combustible, and makes excellent fuel; and, in the Highlands of Scotland, splinters of it were formerly used as a substitute for candles; as they still are in some parts of Ireland, and in Sweden, Norway, Russia, and some parts of North America.



2008

In the latter country, according to Michaux, the inhabitants, in some parts of the interior, split the red wood of the pine into pieces about the thickness of a finger, which they call candle wood, and burn instead of candles; but, on account of the disagreeable black smoke which these pine candles produce, they are generally burned in the chimney corner, upon a flat stone or iron. The branches, more especially those of the genera *Abies* and *Picea*, from their frond-like forms, are well adapted for protecting plants during winter, either in the open ground, or trained against walls. In Switzerland and Norway, they are used as food for cattle. The roots, and also the trunks, produce turpentine, resin, tar, pitch, and lampblack. The bark of the larch, and of several other species, is, or may be, used in tanning. *P. Pinea* affords a kernel which is valued for the dessert in Italy and Greece; the kernel of *P. Cembra* is equally prized in some parts of Switzerland. *P. Lambertiana* not only affords eatable nuts, but a substance which is used by the natives of California as sugar. The kernels of the araucarias are highly prized as food in Brazil; and, doubtless, those of most of the other species might be eaten, if freed from their resinous matter by roasting. A decoction of the tops of the spruce fir is employed for flavouring spruce beer; and from the inner bark, dried and ground, a kind of meal is produced, which, in the north of Europe, in times of scarcity, is mixed with that of rye and oats, and made into bread. The cones of pines and firs, thrown into wine or beer, have a tendency to check fermentation, and also to communicate an agreeable resinous flavour. The larch exudes a glutinous matter, which, in some countries, is collected by the natives, and used as a substitute for manna; and the same tree produces a fungus which is used medicinally in Siberia. The more hardy kinds of the pine and fir tribe are much valued in plantations as a shelter to others of a more tender kind; more especially the oak, which, as we have seen p. 1803., is protected in the government plantations, even in the south of England, for a number of years, by the Scotch pine. Few trees are so well adapted as the pine and fir tribe for covering immense tracts of barren, or even drifting, sands, with wood; either by directly sowing the seeds on the sand; or by sowing them among plants of broom or creeping grasses previously raised on drifting surfaces, in order to fix the sand and shelter the young pines. This practice has been carried to a great extent in France, on the shores of the Gulf of Gascony; where it was commenced in 1789, by Bremonnier, an engineer connected with the national forests and waste lands of France. (See De Candolle's *Physiologie Végétale*, tom. iii. p. 1236., and the history of *P. Pinaster*, in a future page.) Wherever waste ground is covered with heath alone, a forest of pines may easily be created by merely sowing the seeds among the heath. This is a remarkably simple mode of raising a forest of trees, but it scarcely applies to ground covered with any other description of herbage than heath, or to any other kinds of timber trees than those of the pine and fir tribe, and the birch. The poplar and the willow might be treated in the same manner, but the seeds of these can seldom be procured in sufficient quantity.

The most useful species of *Abietinæ*, at least in Europe, in the existing state of the pine and fir forests, and of arboriculture, is unquestionably the

Scotch pine: next to it is the larch, and after that the spruce fir. When some of the newly introduced American and Himalayan species are better known, perhaps they may rank as high as, or higher than, these European ones; but at present, with the exception of *Abies Douglâsii*, which promises to be a rapid-growing species, what they are likely ultimately to become in Britain must necessarily be only matter of conjecture.

Resinous substances have been extracted from the pine and fir tribe, since the days of Theophrastus, who has given (book ix. c. 10.) a very good account of the process, which has been copied, with very little variation, by all authors who have written on the subject, up to the time of Du Hamel; and which, as Dr. Clarke observes, corresponds so well with the modern practice in the north of Europe, that there is not the smallest difference between a tar-work in the forests of Westro-Bothnia, and one in those of ancient Greece. Du Hamel's account forms the groundwork of an article on the resinous productions of the pine and fir tribe by Dr. Maton, published in Lambert's *Genus Pinus*, vol. ii.; but the most complete treatise on the subject is in the *Dictionnaire des Eaux et Forêts*, where the German practices are given from Hartig and Burgsdorf; and those of France, Switzerland, and Italy, from modern authors of the respective countries. From these and other sources we shall here give what is general to all the *Abiétinæ*; and under the particular genera and species we shall insert the details for extracting and manufacturing the products peculiar to each. These products are various; but they may be all divided into two classes; viz. those obtained from the tree while it is in a living state, and those procured from the wood and roots after the tree is cut down. The first kinds are extracted from the trunk of the tree by making incisions in the bark or wood, from which a resinous matter flows in greater or less quantity, according to the kind of tree; and from this are procured, turpentine, liquid balsam, the common yellow and black rosins of the shops, oil and spirit of turpentine, and some minor articles. The other kinds are procured from the trunk, branches, and roots, after the tree is cut down, by the application of heat; and they include tar, pitch, lampblack, &c. The common turpentine is generally the produce of the pine; and the process for obtaining and manufacturing it will be given under the head *Pinus*. The Strasburg and Venice turpentines are drawn from the silver fir and the larch (see *Picea* and *Larix*); and the best yellow rosin is that of the spruce fir (see *Abies*). The resinous matter drawn from the trunk of pine trees is put into baskets, and placed over stone or earthenware jars. The fluid part, which runs from it, is the common turpentine; and the solid part left in the basket, when purified by boiling, is the common yellow rosin. Oil, and rectified spirit of turpentine, are distilled from the raw turpentine, and the residuum left after distillation is the black rosin, or colophony, used by players on the violin for their bows. Tar is procured by cutting the wood and roots into small pieces, and burning, or rather charring them, in a close oven, or heap covered by turf, while a tube or trough is left near the bottom of the heap or oven, through which the tar runs, in the form of a thick black fluid. The Swedish tar is the most highly esteemed in commerce; and that of Archangel ranks next to it. In the United States, Michaux informs us, tar is generally made from dead wood collected in the forests, and on this account it is considered very inferior to the tar of Europe. The lampblack is the soot evolved during this process, and is collected from the upper part of the oven, or from the turf which has covered the heap; and pitch is merely tar boiled to dryness. The resinous matter of the spruce, like that of the pine, is collected from incisions made in the bark; but it does not yield its turpentine without the aid of heat and pressure. The resinous juice of the silver fir is obtained by collecting the natural exudations on the surface of its trunk; and that of the larch, from the interior of the trunk, by tapping it with an auger, as is done to obtain the sap of the birch and the sugar maple.

The chemical properties of the resinous juice of the pine and fir tribe have been given at length by Dr. Maton, in Lambert's *Genus Pinus*, from

which the following is abridged :—“ The juice of pine and fir trees, like that of the *Pistacia Terebinthus*, has an austere astringent taste; it is viscid and transparent, readily inflammable, and easily becomes concrete. In distillation with water, it yields a highly penetrating essential oil; and the liquor is found to be impregnated with an acid, a brittle resinous matter remaining behind. Digestion with rectified spirit of wine completely dissolves all the resinous part, along with which some portion of the insipid gum, or mucilage, is also taken up. If this solution be filtered, and diluted largely with water, it becomes turbid, and throws off the greatest part of the oil, the gummy substance being retained. If the solution be subjected to distillation, the spirit brings over with it some of the lighter oil, so as to be sensibly impregnated with its terebinthinate odour; and it leaves behind an extract differing from the rosin separated by water, in having an admixture of mucilage. The native juice becomes miscible in water by the mediation of the yolk or the white of an egg, or by that of vegetable mucilage, and forms a milky liquor. Exposed to the immediate action of fire, the roots, and other hard parts of the tree, produce a thick, black, empyreumatic fluid, which, containing a proportion of saline and other matter mixed with the resinous and the oily, proves soluble in aqueous liquors, and, according to its several modifications, constitutes the varieties of tar and pitch. The resinous residue of the several processes to which the matter extracted from pines may be subjected constitutes the varieties of resin, or rosin, colophony, &c. There are also other products, both natural and artificial, much employed in medicine and the arts.” (vol. ii. p. 148.)

Medicinal Virtues. “ Terebinthine substances, when taken internally, seem to warm the viscera, raise the pulse, and impart additional excitement to the whole vascular system. Applied externally, they increase the tone of the part, counteract the indolence of action, and deterge, as it were, ill-conditioned ulcers.” (*Ib.*) They also act as gentle aperients, and as diuretics; and they possess a styptic property. Formerly, they used to be considered as highly efficacious in pulmonary complaints; and, only a few years since, a gentleman afflicted with asthma is said to have received immediate relief by inhaling the fumes of melted rosin, which he was employing to secure the corks of bottles. The virtues of tar-water were celebrated for curing various diseases, about a century ago; and Dr. Berkeley, Bishop of Cloyne, wrote a long dissertation on the subject, under the title of *Siris; or a Chain of Philosophical Reflections and Enquiries concerning the Virtues of Tar-Water*. Cullen, and other medical writers, appear to have believed in its efficacy, and it was thought to strengthen the tone of the stomach, to excite appetite, and to promote digestion. It was made by pouring a gallon of cold water on a quart of tar, stirring it well together, and then letting it stand for 48 hours, after which the tar-water was strained off for use.

Domestic and Economical Uses of the resinous Products of the Pine and Fir Tribe. The ancients were accustomed to medicate some of their wines with the resinous substances of the pine tree, the astringent flavour of which was also agreeable to their palates. These wines were supposed to assist digestion, restrain ulcerous discharges, and strengthen the bowels; but Dioscorides informs us that they were known to produce vertigo, pain in the head, and many mischiefs not incident to the same quantity of vinous liquor free from such admixtures. In modern times, tar and pitch are extensively used for the purpose of retarding the decomposition of wood, cordage, and other articles, more especially in marine affairs. Tar alone, or mixed with grease, or, as in some parts of the Continent, with clay, is much used for greasing wheels and machinery. Tar is also applied to wounds in horses and cattle, and as a remedy for sheep having the scab. Yellow rosin is employed in the manufacture of common yellow soap, in the proportion of 3 cwt. of rosin to 10 cwt. of tallow, both in Europe and America. Shoemaker's wax is a composition of pitch, oil, and suet; but it is also made of rosin, bees' wax, and tallow, as is the grafting wax used in gardening, sometimes with the addition

of a little sand or chalk. Turpentine, in all its different forms, is extensively used, along with oil, in painting. Tar and pitch, with a mixture of tow, or beaten cables, are used for paying over the seams of the sides and decks of ships after they are caulked, to preserve the oakum from any wet. Oakum is formed of untwisted old ropes, steeped in tar, and is in universal use in ship-building. Lampblack is used by painters, both with water and oil; and also by modellers, and other artists and artisans.

As ornamental objects, most of the species of the *Abiétinæ* are eminently deserving of culture, and they may all be said to be beautiful in every stage of their growth, from the regularity and symmetry of their forms, from their foliage being evergreen, and from the lofty stature attained by most of the species when full grown. The resinous odour of most of the species is also a powerful recommendation to many persons in modern times, as it was anciently to the Greeks and Romans. The fragrance of the common spruce fir is considered, in Sweden and Norway, to be particularly agreeable and refreshing; and, hence, the floors of cottages are generally strewed with it in those countries. In the *Dendrographia* of Johnston, groves of pine are said to be particularly wholesome to walk in; and every one must have felt the refreshing influence of such a walk in the beginning of summer, when the pines are producing their young shoots, and the weather is warm; the resin at that time being in a comparatively volatilised state, and floating in the atmosphere. Among the most ornamental species are, the cedar of Lebanon, the cedar of Deodar, the silver fir, the *Araucária imbricàta*, and the *Picea Webbiana*; but all the species are ornamental in an eminent degree, when full grown, as single objects. No species is more picturesque than even the common Scotch pine, when it has stood detached, has attained a considerable age, and has grown in a suitable soil and situation. Some of the commonest species, in particular localities, and from accidental circumstances, become very singular objects; such as the spruce fir when its branches take root at their extremities, and send up shoots which become trees; or when, from being thrown down on its side, its branches become trees, proceeding from the parent trunk. The same species also affords a curious monstrosity (*A'bies excélsa Clanbrasiliana*), which, when propagated, becomes a bush, seldom seen above 3 ft. or 4 ft. high. The silver fir and the cedar of Lebanon, and also the larch, often form branchy heads, which, from such heads rarely occurring in needle-leaved trees, have a very singular appearance.

Soil and Situation. The debris of granitic rock may be considered as the universal soil of the pine and fir tribe, and a dry subsoil an essential condition for their prosperity; but they will grow on all soils whatever, that are not surcharged with water. The roots of all the *Abiétinæ* run immediately under the surface, and hence do not require a deep soil; and, as their needle-like leaves do not carry off much moisture by evaporation, the soil in which the *Abiétinæ* will grow to a large size may be drier than that required for any other kind of tree. In pine and fir forests, or extensive groves, the leaves and decaying fronds of the trees drop on the surface of the ground, and not only retain moisture in the soil, by forming, from the much longer time which they require to decay, a non-conducting stratum of greater thickness than is ever found in groves of broad-leaved trees, but they supply a layer of vegetable food to the roots. When the trees stand singly, or in scattered groups, their fronds or branches, being fully exposed to the light and air, do not decay so readily as they do when grown in thick masses, from which the air is in a great measure excluded; and, consequently, so much manure is not supplied by them: but, on the other hand, as in this case they cover the ground so as to exclude in a great measure the sun and air, evaporation is prevented, while, from the greater range which the roots have on every side, abundance of nourishment is supplied. Nevertheless, a soil somewhat loamy, and a cool subsoil, are necessary to bring the timber of the pine to its greatest degree of perfection; and various species, particularly those belonging to the genus *Picea*, require a loam rather rich than poor, and a situation low rather than

elevated. *P. sylvéstris*, and some other species, will grow in bleak exposed situations on lofty mountains; and *P. Pináster*, and others belonging to that section of *Pinus*, will endure the sea breeze: but, in general, wherever the *Abiétinæ* are to be exposed, they require to be planted together in masses, so as to shelter one another. None of the species, however, become ornamental when so planted; because they necessarily lose their side branches, on the preservation of which, either wholly or partially, from the ground to the summit of the trees, their characteristic beauty almost entirely depends.

Propagation. The only mode of propagating the pine and fir tribe on a large scale is by seeds; but all the species will succeed by layers, by inarching on closely allied kinds, and by herbaceous grafting; and many, if not all, may also be propagated by cuttings. That the *Abiétinæ* might be propagated by layers and cuttings was known in the time of Evelyn, and was "divulged" by him, "as a considerable secret." Cook, also, mentions these modes of propagating pines and firs in his *Forest Trees*, third edition, p. 117.; but they have never till lately been much in use. At present, in the Horticultural Society's Garden, and in the Fulham and other nurseries, upwards of twenty different species of the *Abiétinæ* are propagated by cuttings with the most perfect success; the plants, in most cases, becoming as handsome trees as if they had been raised from seed. The only exceptions to this result are, where the plant becomes bushy, and does not throw up a very decided leading shoot; but this can always be obtained by pegging the branches down to the ground, and leaving the collar fully exposed; whence one or more vigorous shoots will not fail to be produced, from which a leader may be selected, and all the others kept pegged down for a year or two longer, and afterwards cut away by degrees. We have no doubt that, by this manner of treatment, a plant of the little stunted monstrosity of the spruce fir, called *Abies Clanbrasiliana*, might be restored to the natural form and magnitude of the species.

By Cuttings. The species which strike by cuttings most readily are those belonging to the genera *Picea*, *Abies*, *Larix*, and *Cedrus*. The cuttings may be taken from the lateral branches, when the current year's shoots are beginning to ripen, and prepared like those of Cape heaths; they should then be planted in sand, and covered with a glass. This being generally done in August or September, the cuttings should be kept in a frame, from which frost is excluded, throughout the winter; and the greater part of them will send up shoots the following May or June, and may be transplanted the succeeding autumn. In the London Horticultural Society's Garden, where Mr. Gordon, the superintendant of the arboretum, is singularly successful in this mode of propagating the pine and fir tribe, the cuttings are generally taken off from the points of the lateral shoots in September; and, being planted in shallow pots of sand, they are placed in the shady part of a frame, without being covered by bell-glasses, till the following spring; when they are put into a very gentle moist heat, and begin growing in April. The kinds which Mr. Gordon has found to strike most easily are, *Abies Smithiana*, *A. Douglassii*, *A. Menziesii*, *Picea Webbiana*, and *Cedrus Deodara*. After many trials, and a good deal of experience on the subject, Mr. T. M. Lindsay, gardener to the Earl of Caernarvon, at Highclere, says: "I have found the autumn the best time to put in the cuttings; and, though the early spring will answer the purpose, I have not found success so certain at that season. The sort of cuttings I prefer are the smallest I can select, from 2 in. to 3 in. long: they should be of the current year's growth, and taken off just as the wood is ripened, say about the beginning or end of October. The cuttings should be cut off close at the commencement of the season's growth; or, if stripped off, and then cut, so much the better. I have found silver, or pure white, sand, with a small portion of peat bog or heath mould mixed with it, answer the purpose better than sand alone. With respect to bottom heat, I have been successful both with and without it; and think that a little of it,

at a certain season, is of service, although by no means when the cuttings are first put in. I would recommend the cuttings, for the first five or six weeks, to be covered with a bell-glass, and placed in a shady part of any house or pit where the thermometer generally stands at about 60°; after which they may have a little bottom heat, which may be increased until they are rooted. It is doubted by many, whether plants of Coniferæ, raised from cuttings, will ever form leaders, like seedling plants, unless a leader be selected for the cutting. I can only say that all I have raised have formed good leaders, and many of them have grown 6 in. this season (1837). The following are the species which I have raised from cuttings:—*Pinus sylvestris*, *halepensis*, *Cembra*, *excelsa*, and *monticola*; *Abies excelsa*, *nigra*, *Pichta*, *Smithiana* (*Morinda*), *Menziësi*, *Douglâsi*, and *Clanbrasiliana*; *Picea pectinata*, *nobilis*, *Webbiana*, and *amabilis*; *Larix microcarpa*; *Cedrus Libani* and *Deodara*; *Cunninghãmia sinensis*; *Araucaria imbricata*."

By Grafting. The application of this mode of propagation to the pine and fir tribe was first made by the Baron Tschoudy, probably about the end of the last century; and was practised by him on his estate at Colombey, near Metz, and in the Botanic Garden of that city. It is described at length in various works, of which one of the latest is the *Traité Pratique* of Delamarre, p. 138. 142.; the essence of which is as follows:—The species intended to be united should be as nearly allied as possible; for, though the pinaster, and the *P. Pinea* may be grafted on the *P. sylvestris*, and the cedar on the larch, yet it is preferable (because the grafts succeed better, and the trees produced are likely to last longer) to graft species which are evergreens on evergreen stocks, and those with the leaves in bundles on stocks not only with the leaves also in bundles, but with the same number of leaves in each bundle. *P. Pinea* is found to succeed remarkably well on *P. maritima*, and *P. Cembra* on *P. Stròbus*. The operation of herbaceous grafting is performed in the cleft manner; the slit being made a little deeper than that part of the scion which is to be inserted in it. The time of performing the operation is when the leading shoot of the stock has attained the length of from 8 in. to 12 in., and will break over (without tearing the bark) like a piece of glass, or the most succulent part of a shoot of asparagus fit to gather for the table. The time during which any given species has its leading shoot in a fit state for being broken over in this manner is not more than 15 days; and, as the scions from the species to be grafted are equally tender with the stock, they will not remain longer in a state fit for the operation than about the same period. The graft is always inserted in the leading shoot; the greater number of the side shoots are either removed altogether, or shortened; and the young shoots produced from the stocks during the season are pinched off with the finger and thumb at about half their length. In performing the operation, the first step is to break over the leading shoot with the hand, so as to reduce it to the length of from 4 in. to 6 in.; the leaves are next removed from this remaining portion, with the exception of about an inch at the top, on which they are left for the purpose of drawing up the sap. The scions should have been procured the same day or the evening before, from the extremity of the branches of the kinds to be grafted; and they should be preserved in a vessel of water, and covered with grass or leaves to exclude the sun. The scions need not be above 2 in. in length; the lower half of which should be deprived of its leaves, and cut in the form of a thin wedge, the operator using a very sharp knife. The scion should be rather narrower than the stock, in order that it may be more completely tied into it, which is done by a ligature of matting, or woollen twist. After this is done, the graft is covered with a cornet of paper, slightly tied to the stock, so as to exclude the sun, but yet admit the air. From 10 to 15 days after grafting, the cornet may be taken away; about 15 days later the ligature may be removed; and in six weeks or two months afterwards, the upper part of the stock left with the leaves on may be trimmed off on both sides of the scion, and all the shoots which have been produced on the lower part of the stock removed, so as to throw the

whole of the sap into the scion. A good workman, it is said, will graft 200 or 250 subjects a day, provided he have an assistant to cut the side shoots from the stock, and prepare the scion; leaving him nothing to do but to break off the leading shoot of the stock, make the slit in it, insert the scion, tie the ligature round it, and fix on the paper envelope. The shoot made by the scion is little or nothing for the first year; but the second year it is considerable, and the third a foot or more, and most frequently from 2 ft. to 3 ft. in length. The future shoots, says Delamarre, are truly admirable for their length, their thickness, and their great vigour. The most suitable stocks are plants sown where they are finally to stand; and of 4, 5, or 6 years' growth, the object being to make the graft 3 ft. or 4 ft. from the ground, to avoid the necessity of stooping on the part of the operator. Grafting in this manner has been carried to a great extent by M. De Larminat, in the Forest of Fontainebleau. In the *Bon Jardinier* for 1826, it is stated that about 10,000 scions of *P. Laricio* had been at that time grafted on *P. sylvestris* in that forest; and M. Delamarre informs us, in 1830, that the process had been continued up to that time, at the rate of several thousand trees every year.

The mode of grafting practised by M. De Larminat is described by M. Poiteau in the volume of the *Bon Jardinier* above referred to; and we give it here, because it differs, though in a very slight degree, from that just described. The proper time for grafting pines is when the young shoots have made about three quarters of their length, and are still so herbaceous as to break like a shoot of asparagus. The shoot of the stock is then broken off about 2 in.



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under its terminating bud; the leaves are stripped off from 20 to 24 lines down from the extremity; leaving, however, two pairs of leaves opposite and close to the section of fracture, which leaves are of great importance. The shoot is then split with a very thin knife, between the two pairs of leaves (fig. 2009 a), and to the depth of 2 in.; the scion is then prepared (b); the lower part, being stripped of its leaves to the length of 2 in., is cut, and inserted in the usual

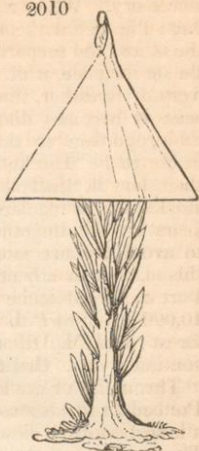
manner of cleft-grafting. They may be grafted, also, in the lateral manner (c). The graft is tied with a slip of woollen; and a cap of paper (fig. 2010.) is put over the whole, to protect it from the sun and rain. At the end of 15 days, this cap is removed, and the ligature at the end of a month; at that time, also, the two pairs of leaves (a), which have served as nurses, are removed. The scions of those

sorts of pines which make two growths in a season, or, as the technical phrase is, have a second sap, produce a shoot of 5 in. or 6 in. the first year; but those of only one sap, as the Corsican pine, Weymouth pine, &c., merely ripen the wood grown before grafting, and form a strong terminating bud, which in the following year produces a shoot of 15 in. or 2 ft. in length. (*Gard. Mag.*, vol. ii. p. 200.) This mode of grafting was practised by the Baron Tschoudy, who gave it the name of herbaceous grafting, not only with the pine and fir tribe, but with every other class of ligneous plants, and also with herbaceous vegetables. It is very generally practised by the Paris nurserymen, and especially by M. Soulange-Bodin, though it is, as yet, but little known in British gardens. One of the first trees, that we are aware of, that was grafted in this way in Britain, was an *Abies Smithiana*, at Hopetoun House, which was grafted on a common spruce in 1826, the same year in which the above account appeared in the *Gardener's Magazine*. This tree is now (1837) 10 ft. high.

By Seed. The number of seeds in a cone varies according to the

species, some containing as many as 300; and the seeds of most species, when allowed to remain in the cone, preserve their vegetative power for several years. The cones are mature, in some species, at the end of the first year, but, in most, not till the end of the second autumn. They ought to be gathered a short time before they are perfectly ripe, in order to prevent the scales from opening, and the seeds from dropping out. In the European *Abiétinæ*, the seeds begin to drop from the cones which remain on the trees generally in March; for which reason February is a good month to collect them. The cones of *Pinus sylvestris*, and of the allied sorts, soon open of themselves, after they have been gathered from the tree, and spread out in the sun; but the cones of *P. Pinaster*, *P. Pinea*, and the allied sorts, though treated in the same manner, will not open their scales for several months, or even a year. The cones of *Cèdrus Libani* will not open till they have been three years or upwards on the trees; and, when they are gathered, it is almost always necessary to steep them in water for 24 hours, and afterwards to expose them before a fire, or to the sun. In Scotland, France, and Germany, the seeds of the *Pinus sylvestris* and of the *Larix europæa*, are very commonly separated from the cones by kilndrying, and afterwards thrashing them; but, as the heat of the kiln is sometimes carried to such excess as to destroy the vital principle, it is considered safer to steep the cones before drying, in which case less fire is requisite; or to split them by inserting an iron triangular-pointed instrument, not unlike a shoemaker's awl, into the axis of the cone, at its broad end. The cones are also sometimes broken by passing them through a bone-mill, or between two cylinders; or by putting them into a bark-mill. The cones of the silver and the balm of Gilead firs, and also of the *Pinus Stròbus*, open of themselves in a dry room, and give out their seeds with less trouble than those of any other species.

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A Kiln for drying the Cones of the Abiétinæ is described by Sang, as being constructed in the manner of a common malt-kiln. The joists or beams which support the floor, or surface on which the cones are to be spread, should be about 9 ft. above the hearth on which the fire is placed, and 2 in. apart. "A haircloth is spread over them from side to side of the kiln, and the cones are laid on it to the thickness of 12 in. or 14 in. A gentle fire is then applied, and regularly kept up till the cones become opened. During the time of drying the cones must be frequently turned upon the kiln; and when the seeds begin to drop out, they must be removed to a dry shed, and sifted till all the seeds which are loose fall out, and be taken from among the cones. The cones are afterwards to be thrashed severely with flails, and sifted as before, and so on till the seeds are taken out as completely as possible." (*Kalendar*, p. 326.) Various modes of constructing drying-kilns will be found given in our *Encyclopædia of Cottage, Farm, and Villa Architecture*.

The most general Time for sowing the Seeds of the *Abiétinæ* is in the end of March, or in April. The ground ought to be in good heart, light, and sandy rather than loamy, and prepared as finely as possible. The seeds may be most conveniently sown in beds; and, after being gently beaten down with the back of a spade or a slight roller, they should be covered with light soil or leaf mould to the depth of a sixteenth, an eighth, or, at most, a quarter, of an inch, according to the size of the seeds, and covered with branches of trees or shrubs, fronds of fern, wickerwork hurdles, or netting, to shade the soil from the sun, and protect the seeds from birds. If, indeed, the seeds are gently patted in with the back of the spade, and the beds kept shaded, and of a uniform gentle moisture, no covering at all is

necessary. When rare kinds are sown in pots, if the surface of the soil is kept 1 in. below the rim of the pot, the pot may be covered with a pane of glass, and the seeds will come up with certainty and vigour. Traps ought to be set for mice, which are great devourers of the seeds of the *Abiétinæ*. In very dry weather the beds should be watered in the evenings; but in this case it becomes doubly necessary to shade them in the day time; because in proportion to the rapidity of the germination of the seeds are they liable to be scorched by the sun. The precaution of shading is much less necessary in Scotland, than in England, or on the Continent; and, though it requires to be regularly practised in the Goldworth Nursery, in Surrey, yet we believe it is altogether neglected in the nurseries in the neighbourhood of Aberdeen, where more plants of the Scotch pine and larch are, we believe, raised, than in any other nurseries in the world. The seeds of the greater part of the *Abiétinæ* come up in from 30 to 50 days. Those of *P. Pinea* have been known to come up in 28 days; though some of this species often do not come up till the second year, and seeds of *P. Pinaster* often not till the third year. Great care must be taken, when the seeds are coming through the ground, to raise sufficiently above them the material employed in shading the beds, and also to remove it by degrees. The young plants, in most of the species, grow slowly the first two or three years; but some few, such as the Scotch pine and the larch, grow with comparative rapidity; and all of them grow most rapidly between their fifth and their tenth years.

Culture. The pine and fir tribe do not, in general, succeed so well when transplanted as the broad-leaved trees; for which reason, most of the sorts planted for ornament, such as the cedar, stone pine, Weymouth pine, Siberian pine, &c., should always be kept by the nurserymen in pots. The Scotch pine, the larch, the spruce, the silver and balm of Gilead firs, the Corsican pine, and the Weymouth pine, may be transplanted into nursery lines, from the seed-bed, in the second year; and, after remaining one year in these lines, they may be removed to where they are finally to remain. Very few species can be kept with advantage for a longer period in the nursery than 3 years; viz. two in the seed-bed, and one transplanted. The species which may be kept longest, and afterwards transplanted with safety, is the common spruce, on account of the concentration of its roots, and its very numerous fibres. The worst species for transplanting is the pinaster; because it has more of a taproot than any other of the *Abiétinæ*. In transplanting all the species to where they are finally to remain, attention should be paid not to plant them too deep; and to have a pit sufficiently large to admit of spreading out the roots in every direction. This spreading out of the roots is more especially necessary in the case of plants that have been kept for years in pots, and that have not naturally taproots; for, when it is neglected, the plants are often many years before they become firmly established and grow vigorously. The reason of this is easily explained. The roots of a tree, when confined in a pot, may be compared to the head of a tree which has been for several years confined and clipped into some regular shape, so as to present an exterior surface of spray and leaves, without any one shoot being stronger than another. Hence, when the head of such a tree is left to itself, a smaller or greater number of years will elapse before a leading shoot, or one or two leading shoots, are produced; and till that is the case, and the sap, in consequence, is diverted into main channels, instead of being equally distributed over the surface of the bush, no vigorous growth can take place. In like manner, the matted roots of a plant which has been a long time kept in a pot, when they are not spread out in transplanting, will be some years before they throw out leading or main roots, without which the part of the tree under ground can no more grow vigorously, than the part above ground can grow vigorously without main branches. The proper time for transplanting the *Abiétinæ* is, as in the case of all other trees, when the sap is in a comparatively dormant state, which is between the end of autumn and the beginning of spring; but, when the plants are of any size, care must be taken to perform the operation

only in mild weather, when there are no drying winds, and, if possible, during gentle rains. In the case of all the more tender species, the plants ought to be surrounded by matting fixed to stakes, at a short distance from the extremities of the branches; or, what is best of all, and serves at once as a shelter from the sun, a protection from the wind, and a guard against cattle, a cylinder of wickerwork ought to be placed round each plant. No pruning ought to be given to the heads, and nothing should be cut from the roots, but such of their extremities as are bruised. When the common *Abiétinæ*, such as the Scotch pine, the spruce, the larch, and the silver fir, are taken up out of the nursery lines for transplanting, their roots should be immediately plunged into a mixture of loam and water, so as to cover them with a coating of mud; and in that state they ought to be carried to the place of planting, and carefully inserted in the soil with as little delay as possible. For want of this precaution, a great proportion of evergreen *Abiétinæ*, of three or four years' growth, perish when they are taken up, and carried to any distance; more especially if the weather, at the time of planting, should happen to be dry. The *Abiétinæ* are, of all trees, the least adapted for being sent to a distance, unless in pots. After the *Abiétinæ* have been transplanted, and become established in the soil, they require very little care for a number of years, and, perhaps, less than trees of any other order. No care is requisite, unless in particular cases, either to provide a leading shoot, or to prevent any of the branches from coming in competition with the main trunk; cares which are always more or less attendant upon the culture and management of every kind of broad-leaved tree.

When plantations of *Abiétinæ* are to be made on a large scale, the best mode, in some cases, is, to sow the seeds where the plants are finally to remain, either in drills, which appears the most scientific mode, as it will admit of regular culture between the rows, or broadcast; and, where the surface is steep and rocky, by sowing in irregular patches. There are many objections to sowing, however, which generally render planting the most profitable mode. A great quantity of seed is required, to provide for the ravages made by birds and other vermin; and the labour of preparing the soil, if this is done properly, is greater in proportion to the number of plants wanted, than in the case of planting. There is also a certain loss of time; since plants three years old, which have been one year transplanted, will be at least three years in advance of seedlings raised where they are to remain. On rocky steeps, however, where there is little or no visible soil, and where the seed can only be deposited in chinks and crevices, or sown on occasional patches of soil, this mode of raising a wood of pines and firs may deservedly have the preference.

Very little *pruning* is necessary for the pine and fir tribe, whether they are grown singly or in scattered groups for ornament, or in masses for useful purposes in plantations. In the former case, to remove any of the branches would destroy the object in view; and in the latter, if the plantation is of suitable thickness, the lower branches begin to die off of themselves, after the trees have acquired a certain age and growth, and all that is necessary is to assist nature, by cutting off the branches close to the trunk, the moment they begin to show indications of decay. Some authors contend that no pruning whatever ought to be given to the pine and fir tribe; and that they ought to be planted so close together, that the branches may rot off when they are quite small, as the trees advance in height. This is, doubtless, the manner in which the clean timber of the pine and fir forests of the north of Europe is produced; but it must be recollected that this timber is obtained at a great expense of time; for, if the trunk is deprived of so many of its side branches, while it is small in diameter, the tree must require to stand many years before the few branches composing its head can elaborate a sufficient portion of sap to thicken the stem to a timber-like size. Some, on the other hand, recommend depriving the trees of branches to two thirds of their height, which must place them nearly in the situation of trees drawn up in their natural forests. To us, there appears no reason for making the *Abiétinæ* an

exception to other orders of trees with respect to culture. They may require culture of a different kind, but, if they are to be subjected to man, they must be pruned, and otherwise treated, so as to fit them for his purposes in the most complete manner, and in the shortest possible time; unless it can be shown that, in an artificial state, they will become fit for these purposes in a sufficiently short time, without pruning, or any other kind of culture. M. Loiseleur Deslongchamps and M. Bosc affirm that the *Abiétinæ* have more need of numerous branches than the broad-leaved trees; because, say they, the pines absorb from the atmosphere as much nourishment by their leaves, as they draw from the soil by their roots. These authors recommend pines and firs to be left wholly without pruning for the first eight or ten years; that at that time the lowest tier of branches may be cut off; and that afterwards a tier may be cut off annually, till the trunk is cleared to the height of 6 ft. or 7 ft.; after which they should be left entirely to nature. We cannot, however, counsel leaving them entirely to nature, even after this period; because, in that case, when the branches began to decay and drop off, the stumps which remain would become buried in the wood, and would greatly diminish its value. M. Hartig is in favour of pruning the *Abiétinæ*; but M. Burgsdorf is of a contrary opinion. According to M. Delamarre, the majority of French authors recommend pruning and thinning; and the practice in the department of the Maine, where his estate lay, is to cut off the branches at 2 in. or 3 in. from the trunk, in order to leave some small shoots and leaves to draw up the sap. In Champagne, he says, 6 in. are left at first; and, in a year or two afterwards, these are cut off close to the trunk. Delamarre adds that 2 in. is the preferable distance; and a stump of this length, he says, will, in three or four years, be buried in the trunk of the tree. In Britain, and also in most parts of Germany, close pruning has the decided preference. The advantage of early and close pruning, in the case of the pine and fir tribe, was pointed out by Mr. Salmon, in the *Transactions of the Society of Arts*, about the beginning of the present century; and afterwards strongly recommended by Mr. Pontey, in his *Forest Pruner*, and practised by him in various places where he had the management of the plantations. It is generally considered, however, that Mr. Salmon and Mr. Pontey carried the practice of close pruning too far. Mr. Main, who has paid great attention to the subject of pruning, states it as his opinion, that all the pine and fir tribe intended for profit should be planted to grow up, and be "all cut down together, like a crop of corn." Mr. Salmon, on the other hand, gives the following directions, founded, as he says, on several years' observation and experience:—The pruning should commence when the trees are six years old, or, in other words, when five distinct tiers of branches appear on the stem. The lowest of these tiers are to be taken off, leaving four remaining. After which, at every succeeding four or five years, the pruning is to be repeated, till the stem of the tree be cleared to the height of 40 ft.; after which the tree may be left to nature. The best practice seems to lie between Mr. Main's opinion and that of Mr. Salmon; and we should think that if small poles and masts were the object, Mr. Main's plan would be the best; but for large beams, planks, and deals, Mr. Salmon's. We shall hereafter have occasion to enlarge on the subject, when treating on the pruning of particular species, and more especially of *Pinus sylvéstris*. In exposed situations, Mr. Nuttall has found that the *Abiétinæ* are much invigorated at the root by pinching out the points of the side shoots, and even of the leading shoot; which causes the plants to increase in diameter at the base, and to become furnished with roots, larger and more vigorous, in proportion to the elevation of the stem, than would otherwise be the case, which consequently enables them the better to withstand the force of high winds. Plants so treated soon recover their leading shoots; or, if they send up more than one, the superfluous ones can be removed. The details of Mr. Nuttall's practice will be found in the *Gardener's Magazine*, vol. xiii. p. 350. The best season for pruning the *Abiétinæ* is in mild weather in early spring, or in the autumn.

Thinning and Felling. Thinning ought to be carried on in connexion with pruning; and, when large timber is to be produced, this is no less necessary in the case of the *Abiétinæ* than in that of the broad-leaved trees; though the former, from their narrow conical shapes and great height, do not require so much room as the latter. The advantages derived from thinning will be shown in a striking manner from actual practice in Britain, when we come to treat of the larch.

The pine and fir tribe, not being trees that stole, are never cultivated as coppice-wood; and when a grove of pines is felled, the roots ought to be taken up, in order to clear the way for the succeeding crop. In the German and French works on the culture of the *Abiétinæ*, there is much difference of opinion as to whether a grove of pines or firs, when full grown, and fit for timber, ought to be wholly cut down at once, "like a crop of corn" (to use Mr. Main's phrase), or cut down by degrees by thinning out. If the latter mode is considered the best, another point arises for discussion; which is, whether the smaller trees are to be taken out, so as to leave room for the large ones to grow larger, which is called *exploitation par éclaircies*; or the larger ones removed to leave room for the small ones to increase in size, which is called *exploitation en jardinant*. In the *Dictionnaire des Eaux et Forêts*, a comparative view is given of these two modes, and the preference is given to the first; but both, it is alleged, are inferior to the mode of cutting down the entire grove or forest at once; and this seems the most rational, because, when the air is once let in to a grove of full-grown pines, they seldom increase much in size afterwards; doubtless, from the influence of the weather on their naked trunks, which have, till then, been shaded and protected by the evergreen branches of the trees that have been removed. Deciduous trees, as they never receive so much protection from one another, never suffer so much from thinning, whether when young, or when mature and fit for felling as timber. The season for felling the *Abiétinæ* is during winter; but in the Alps and the Pyrenees, and also in the north of Sweden and Norway, where the ground is covered with snow for six or seven months in the year, the trees are cut during summer. It is alleged that the wood felled during the latter season, from the greater quantity of sap contained in it, must necessarily be less durable than that felled when the sap is dormant. This, however, must chiefly apply to the sap wood; because the heart wood, which alone is used for important purposes, is not penetrated by the ascending or descending sap. After the trees are felled, the roots are dug up, broken into small pieces, and distilled for tar; or burned in covered heaps for that product jointly with charcoal.

In situations naturally adapted for the progress of pines and firs, the self-sown seeds keep up a perpetual succession of the same species for an unknown period: but when the plantation is cut down before the trees have shed abundance of seeds; or where, from being an artificial plantation of trees all planted at the same time, the ground is so completely shaded, as to prevent the vegetation of the seeds which may have dropped on it; or where the soil is not naturally congenial to the *Abiétinæ*; in any of these cases, this order ought to be succeeded by another totally different from it, but at the same time suitable for the soil. Many authors have observed that native woods, both in England and America, when cut down, are generally succeeded by a different kind of tree (see *Gard. Mag.*, v. p. 421.); and others, that pine forests, when destroyed accidentally by fire, in America, are usually succeeded by oak. M. Le Comte of Riceborough, Georgia, has for upwards of thirty years paid great attention to the subject of the natural succession of woods; and the following are the results of his observations respecting pine forests:—"The pine lands in the southern states have generally old oak grubs, which, by reason of the periodical fires, are prevented from becoming trees, notwithstanding which they still continue alive (see p. 1891.); and when land is turned out (that is, when the cultivation of it is relinquished), the pines, being naturally unproductive of

suckers, are consequently killed *in toto*; while the oak, now sole possessor of the soil, starts up and grows vigorously. On the other hand, land which has been solely occupied by oaks previously to its cultivation, is invariably of a superior quality to what is termed pine land; and is naturally a longer period under cultivation before it is turned out, by which means the roots of the oaks are completely eradicated. The pine seeds, being winged, and thereby easily carried by the wind to a considerable distance, if the ground is free from the roots of other trees, are the first to establish themselves; and, being of a free and rapid growth, they take the lead of all other species of timber, and become the principal occupiers of the land: but when the roots of the oaks are not destroyed, they will take the lead, and resist the pine and other trees. All pine lands, which originally had no oaks, will invariably produce pines again, whether they have been under cultivation for a long time or a short period." (*Gard. Mag.*, vol. viii. p. 287.) In the north of Europe, including the Highlands of Scotland, a pine forest, unless it has been cleared, and the soil brought under the plough, or laid down in pasture, continues such for ever; the seeds of the older trees coming up in the open spaces, as thick as in the nurserymen's seed-beds.

Accidents. With reference to the goodness and value of the timber, the most injurious accident that can befall a pine or fir tree is to have the dead stumps of the side branches left on, whether through neglect in artificial plantations, or from the trees not being sufficiently close together in natural ones. In such cases, the dead stump is buried under the living wood; and, when the tree is sawn up into boards, every point where these stumps intersect the board forms a knot, which, if not glued in, generally drops out, leaving a hole through the board. The pine and fir tribe, from their resinous nature (resin being a powerful non-conductor), are said to be less liable to be struck by lightning than broad-leaved trees; and hence they are considered as particularly suitable for growing on mountains. (See Nuttall in *Gardener's Magazine*, vol. xiii. p. 351.) As, when standing singly, their spiry tops do not oppose so large a surface to the wind as those of round-headed trees, and as their narrow leaves offer very little resistance, they are not so liable to be blown down by high winds as might be imagined from their comparatively small roots; and they are still less so when associated together in dense masses of plantation or forest. As forests of the pine and fir tribe are generally situated on hills or mountains, and for the most part in climates where they are subject to be covered with snow for several months in the year, they are very liable to what may be called geological and meteorological accidents. In Switzerland, those movements of rocks, stones, and soil which take place in the mountainous districts, more or less every spring, and are called *éboulemens*, often destroy several acres of pine forests at a time. In scattered forests, the snow falling on the trees individually is retained by their branches, and, when these are of great length, often weighs them down, and breaks them; while those movements of snow known by the name of *avalanches* are sometimes as injurious as the *éboulemens*. We have seldom been more gratified with winter scenery, than when passing through a spruce fir forest in Sweden. We have seen trees of all ages grouped and distributed in innumerable ways; here weighed down with snow, and there boldly shooting through it their vivid green pyramidal heads. When a sudden thaw takes place in spring, the snow and the branches seem all in motion; some branches, being relieved from their load of snow, are rising up in consequence of their elasticity; and others, from the snow falling on them from branches still higher up the tree, are bending, and perhaps breaking, under the additional weight. In the pine and fir forests of Europe, a number of branches, and also of entire trees, are damaged in this way every year; but this is nothing to the havoc which takes place in America, during what is called an "ice storm." In the *Magazine of Natural History* (vol. vi. p. 100.), a very striking description of one of these storms at Philipsburg, near the Alleghany Mountains, is given by R. C.

Taylor, Esq. A heavy fall of snow had been succeeded by a partial thaw and rain, followed by a severe frost, which enveloped "the trees and earth in a thick coating of transparent ice." The following morning, the accumulation of ice on the branches of the forest trees presented a beautiful and extraordinary spectacle. The noblest timbers were every where to be seen bending beneath the enormous load of ice with which their branches were incrustated, and the heavy icicles which thickly depended from every point; the thickness of the ice, even on the spray, often exceeding an inch. The smaller trees, from 20 ft. to even 50 ft. in height, were bent to the ground by this unwonted burden, and lay pressing on one another, resembling fields of gigantic corn, beaten down by a tempest. Above, the taller trees drooped and swung heavily; their branches glittering, as if formed of solid crystal; and, with the slightest breath of wind, clashing against each other, and sending down showers of ice. The following day, the limbs of the trees began to give way beneath their load. The leafy spray of the hemlock spruce was thickly incased, and hung drooping round the trunks upon the long pliant branches, until the trees appeared like solid masses or monumental pillars of ice. Every where around was heard the crashing of the branches of the loftiest trees of the forest, which fell to the earth with a noise like the breaking of glass, yet so loud as to make the woods resound. As the day advanced, instead of branches, whole trees began to fall; and, during twenty-four hours, the scene which took place was as sublime as can well be conceived. There was no wind perceptible, yet, notwithstanding the calmness of the day, the whole forest seemed in motion, falling, wasting, or crumbling, as it were, piecemeal. Crash succeeded to crash, until at length these became so rapidly continuous as to resemble the incessant discharges of artillery; gradually increasing, as from the irregular firing at intervals of the outposts, to the uninterrupted roar of a heavy cannonade. Pines of 150 ft. and 180 ft. in height came thundering to the ground, carrying others before them. Under every tree was a rapidly accumulating debris of displaced limbs and branches; their weight increased more than tenfold by the ice, and crushing every thing in their fall with sudden and terrific violence. Altogether, this spectacle was one of indescribable grandeur. The roar, the cracking and rending, the thundering fall of the uprooted trees, the startling unusual sounds and sights produced by the descent of such masses of solid ice, and the suddenness of the crash when a neighbouring tree gave way, was awful in the extreme. Yet all this was going on in a dead calm, except, at intervals, a gentle air from the south-east slightly waved the topmost pines. Had the wind freshened, the destruction would have been still more appalling.

Another kind of accident to which pine forests appear particularly liable is their destruction by fire; and, in Siberia and in North America, immense tracts of pine forest are sometimes thus consumed. The fire generally originates with man, either purposely or by accident; but it is supposed sometimes also to be produced by the action of the sun upon the dry decayed wood of fallen trees; and sometimes, no doubt, it is the effect of lightning. In Captain Hall's *Sketches in Canada, &c.*, he gives the following description of an American pine forest on fire:—"Sometimes the monotony of the pine barren was interrupted, in no very pleasant style, by the heat and smoke arising from the forest being on fire on both sides of us; though, as it happened, we were never exposed to any danger, or to serious inconvenience, in consequence of these conflagrations. The sketch (*fig. 2011.*) shows the forest in the predicament we have alluded to. The tree in the foreground had caught fire near the ground; and having, I do not know how, been hollowed out in its centre, the flames had crept up and burst out some feet higher, so that they were roaring like a blast furnace, and rapidly demolishing the tree at the bottom, while the branches at top were waving about in full verdure, as if nothing unusual was going on below." (*Hall's Sketches in Canada, &c.*, No. 24.) McGregor informs us that in New Brunswick the forests are sometimes purposely set on fire by the settlers, to avoid the labour of cutting down the

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trees, and grubbing up their roots; but he adds that the practice is highly injudicious, as, by these indiscriminate conflagrations, the land is not properly cleared, and "a very strong and noxious plant, called the fireweed," springs up every where, and exhausts the fertility of the soil. The appearance of a burning forest is one of the most fearful and sublime objects that can be imagined, and has been powerfully described by Cooper in *The Pioneers*, and also by Galt in *Laurie Todd*. "The flames leap from tree to tree, and winding up to their tops, throw out immense volumes of fire from thick clouds of smoke, that hang over the burning mass, while the falling trees come down with most tremendous crash." The following account of one of these fires, which was more than usually destructive, is extracted from Mr. McGregor's book: — "In October, 1825, upwards of a hundred miles of the country, on the north side of the Miramichi river, became a scene of the most dreadful conflagration that has, perhaps, ever occurred in the history of the world. In Europe we can scarcely form a conception of the fury and rapidity with which the flames extend over a few miles of the forest, the surrounding air becomes highly rarefied, and the wind naturally increases it to a hurricane. It appears that the woods had been, on both sides of the north-west branch, partially on fire for some time, but not to an alarming extent until the 11th of October, when it came to blow furiously from the north-west, and the inhabitants on the banks of the river were suddenly alarmed by

a tremendous roaring in the woods, resembling the incessant rolling of thunder; while, at the same time, the atmosphere became thickly darkened with smoke. They had scarcely time to ascertain the cause of this phenomenon, before all the surrounding woods appeared in one vast blaze, the flames ascending more than 100 feet above the top of the loftiest tree; and the fire, like a gulf in flames, rolling forward with inconceivable celerity. In less than an hour Douglastown and Newcastle were enveloped in one vast blaze, and many of the wretched inhabitants, unable to escape, perished in the midst of this terrible fire." (*Sketches of the Mar. Col. of British America.*) In some parts of Sweden, also, the pines and firs are purposely burnt, to clear the fields for agricultural purposes; but there are also extensive accidental fires. Dr. Clarke, describing his journey from Stockholm northward, says: "As we proceeded to Hamrange, we passed through noble avenues of trees, and saw some fine lakes on either side of the road. Some of the forests had been burned, by which the land was cleared for cultivation. The burning of a forest is a very common event in this country; but it is most frequent towards the north of the Gulf of Bothnia. Sometimes a considerable part of the horizon glares with a fiery redness, owing to the conflagration of a whole district, which, for many leagues in extent, has been rendered a prey to the devouring flames." In Lapland, beyond Tornea, he adds, "some forests were on fire near the river, and had been burning for a considerable time." Mr. Tipping informed us that these fires were owing to the carelessness of the Laplanders and boatmen on the rivers, who, using the *Bolëtus* (*Polýporus*) *igniarius* (German tinder) for kindling their tobacco-pipes (see p. 1834.), suffer it to fall in an ignited state among the dry leaves and moss. They also leave large fires burning in the midst of the woods, which they have kindled to drive away the mosquitoes from their cattle and from themselves; therefore, the conflagration of a forest, however extensively the flames may rage, is easily explained. Yet Linnæus, with all his knowledge of the country, and customs of the inhabitants, attributed the burning of forests in the north of Sweden to the effects of lightning. During these tremendous fires, the bears, wolves, and foxes, are driven from their retreats, and make terrible depredations among the cattle." (*Travels, &c.*)

Diseases. The pine and fir tribe are subject to some diseases, and more particularly to the flow of resin, in consequence of being wounded by pruning when the sap is in active motion in spring. They are also affected by cancerous excrescences; and the wood is liable to become shaly; an evil which, of course, is not observed till the tree is cut down, and sawn into boards, when the annual layers are found to separate from each other. The larch is subject to a very peculiar disease, called pumping, which rots out the heart wood, and which we shall describe when speaking of that tree.

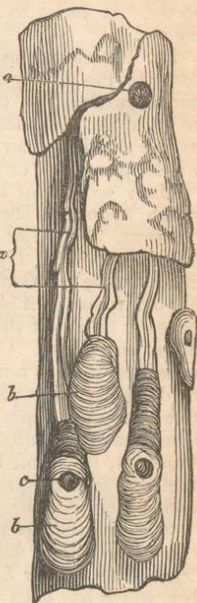
Insects. Mr. Westwood, to whom we are indebted for this article, observes, that the attacks of the insect tribes upon the genus *Pinus* are not, in this country, so prejudicial as in Sweden and some parts of Germany; where, owing to their very great extent, the pine forests are of such vast importance. Hence it is that in these countries the investigation of the habits of the different species of insects which attack the pine and fir tribe has been pursued with much more care than among us. We shall avail ourselves in this article of the most recent labours both of Continental and English authors, adding thereto some original matter, which we have not found noticed in their works.

The insects which attack the different species of *Pinus* may be divided into two classes; viz., internal feeders, and external feeders. The former may again be separated into those which burrow into the wood, and those which merely reside beneath the bark: not, indeed, that the latter are less injurious than the former; because, as in the elm-destroying *Scólýtus*, the presence of great numbers of subcortical species causes the death of a tree as speedily as those which strip it of its leaves, or burrow into its solid substance, and, indeed, often more speedily.

Of the internal Feeders which bore into the solid Wood, the species of the genus *Sirex* of Linnæus (*Urocerus Geoffr.*), belonging to the order Hymenoptera, are amongst the largest. In the winged state, they are comparatively innoxious. They are often as large as hornets; and some of the species are coloured similarly to those insects. They especially abound in cold and mountainous regions, where the pines and other coniferous trees abound; and during flight they make a loud humming noise. The best known species, *Sirex gigas* Linn., attacks *Abies excelsa* (*Rossmüssler, Forstins.*) It is very common in Sweden, and in the Alps and Pyrenees. The females are provided with a very strong horny ovipositor, by means of which they deposit their eggs in the crevices of the trees. The larvæ, when hatched, burrow into the wood in various directions: they are fleshy and cylindrical, with a scaly head, six very minute pectoral feet, and a horny point on the upper side of the extremity of the body. (*Latr. Hist. Génér.*, xiii. p. 149.) "The species of the genus *Sirex*, probably all of them in the larva state, have no appetite but for ligneous food. Linnæus has observed this with respect to *S. spectrum* and *Camelus*; and Mr. Marsham, on the authority of Sir Joseph Banks, relates (*Linn. Trans.*, x. 403.) that several specimens of *S. gigas* were seen to come out of the floor of a nursery in a gentleman's house, to the no small alarm and discomfiture of both nurse and children." (*Introd. to Ent.*, i. p. 231.) In this case, it is evident that the floor of the room must have been recently laid down, the planks containing the sirexes either in the larva or pupa state; and that they made their appearance on attaining the imago form. Linnæus (*Syst. Nat.*, ii. p. 929.) says of *Sirex spectrum*, "Habitat in lignis putridis antiquis Pini et Abietis." Wm. Raddon, Esq., has lately forwarded to the Entomological Society of London specimens of *Sirex juvencus*, another large species, of a fine blue colour in the female; accompanied by specimens of the wood of a fir tree from Bewley Forest, Worcestershire, perforated and destroyed by the larvæ of this insect; some of which still remained in the wood. Of this tree, 20 ft. were so intersected by the burrows, that it was fit for nothing but fire-wood; and, being placed in an outhouse, the perfect insects came out every morning, five, six, or more each day. The females averaged one in twelve for the first six weeks; but afterwards became more plentiful, and continued to make their appearance until the end of November; females being only produced during the last two or three weeks. (*Trans. Ent. Soc. London*, i. p. lxxxv.) At the same meeting of this Society, it was also stated by the Rev. F. W. Hope, that, in his father's grounds at Netley, in Shropshire, the *Sirex* generally attacks those trees which have passed their prime; and that the Weymouth pines are more subject to their attacks than the Scotch pines. These statements will be quite sufficient to disprove the recently published view of the Count de Saint Fargeau (*Hist. Nat. Hymenopt.*, tom. i.), that the Siricidæ are parasitic upon other insects, like the Ichneumonidæ. It is, however, amongst the coleopterous insects that the greatest numbers of pine-boring species are found; and of these a considerable portion belong to the family of the weevils (*Curculionidæ*), one of the largest British species of which is thus injurious: it is the *Hylöbius abietis* of Germar (*Curculio abietis* of Linnæus, *Curculio pini* Marsham, &c.). This insect varies in length from half to three quarters of an inch. It is of a pitchy black colour, varied with yellowish pile. Fortunately, however, in this country it is but of rare occurrence; although in Scotland, and especially in Sweden, it is very abundant and destructive. A memoir upon the habits of this beetle has been published by Mr. W. S. M'Leay, in the *Zoological Journal*. A great failure of the young firs and larches on Lord Carlisle's estates in Scotland had taken place, which was at first thought to be occasioned by mice, so completely was the bark destroyed. The wood warden was, however, subsequently convinced that the mischief was produced by insects, of which specimens were forwarded to Mr. W. S. M'Leay. The destruction was more rapid when the roots of the Scotch fir were in a state of decay; a circumstance strongly supporting the opinion that

the author of the mischief was an insect; for mice would only attack the green and healthy bark: and, indeed, the insects proved to be no other than the *Hyllobius abietis*. According to Rossmässler, it is chiefly young trees of *Pinus sylvestris* and *Abies excelsa* which are attacked by this species. Another species of the same genus is the *Hyllobius pinastri* *Dejean*, which, according to Gyllenhal (*Ins. Suec.*, iii. 168.), "habitat in frondibus et ligno Pini et Abietis."

The species of another genus of weevils (*Pissodes Germar*) are also very destructive to different species of the pine and fir tribe. Gyllenhal describes five species; three only of which have been detected in this country, and all of them are here of great rarity; namely: *P. pini* *Lin.*, *P. notatus* *Fabr.*, and *P. pineti* (*Fabricii* Leach). An interesting memoir has recently been published by Dr. Ratzburg in the last volume of the *Nova Acta Naturæ Curiosorum* (vol. xvii. p. 424.), in which the habits of the two first-named species are given in detail. Fig. 2012. shows the mode in which young trees are attacked; the tree being four years old when the drawing was made. The passage of the larva is here marked with the letter *a*; the abode of the pupa, or cocoon, as it may be termed, with the letter *b*; and *c* indicates the opening through which the perfect insect escapes. Gyllenhal gives *Pinus sylvestris* and *Abies excelsa* as the habitat of *Pissodes pineti*; *Abies excelsa*, as that of *Pissodes Hercyniæ*, *notatus*, and *piniphilus*; but he describes the economy of *Pissodes pini* as being more general: "Habitat in arboribus resinosis, præsertim in abietis frondibus et ligno nuper cæso, frequens." (*Ins. Suec.*, i. pars 3. p. 66.) Dr. Heer has also recently described the metamorphoses of another species of the same genus (*Pissodes piceæ* *Illiger*), of which many larvæ and pupæ were discovered in the trunk of *Picea vulgaris* in the middle of June, 1835. (*Observ. Entomol.*, 1836, p. 27. tab. iv. B.) There is also another tribe of small beetles, very nearly allied to the family *Curculionidæ*, but in which the head is not produced into a muzzle, of which several of the species are very destructive to the trees of this genus. They constitute the genus *Hylurgus* of Latreille, and were included by Fabricius in his genus *Hylésinus*. The species *H. piniperda*, *ligniperda*, *ater*, *palliatus*, and *angustatus*, are recorded as inhabitants of fir plantations. Rossmässler gives the first of these as an enemy to old trees of *Abies excelsa*; but Gyllenhal says of it, "Habitat in Pini sylvestris ramulis, quos perforat et exsiccat etiam in ligno et sub cortice, frequens." The following observations and figures relative to the economy of this species were communicated by Dr. Lindley to Mr. Curtis:—"For the purpose of examining its proceedings more narrowly, I placed a shoot of the Scotch pine under a glass with the insect. In about three hours afterwards, it had just begun to pierce the bark of the base of one of the leaves. Its mandibles seemed chiefly employed, its legs being merely used as a means of fixing itself more firmly. Four hours after, its head and thorax were completely buried in the shoot; and it had thrown out a quantity of wood, which it had reduced to a powder, and which nearly covered the space under the glass. In sixteen hours more, it was entirely concealed, and was beginning to form its perpendicular excavations, and was busily employed in throwing back the wood as it proceeded in destroying it. There were evidently two kinds of this sawdust; part consisting of shapeless lumps, but the greater portion of very thin semitransparent lamellæ, or rather shavings. I now examined it every day, till the fifth; when I found it had emerged through the central buds, at



2012

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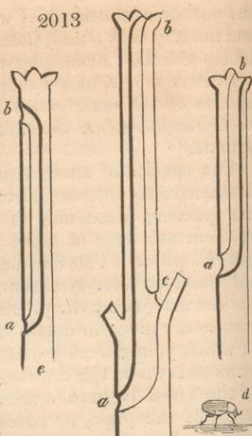
about 1 in. from where it had first entered." (Curtis Brit. Ent., vol. iii. p. 104.) Fig. 2013. shows three longitudinal sections, or shoots, of Scotch pine, with the various perforations of the insects: *a*, where it commences; *b*, the aperture which it makes after it has finished its excavation; and *c*, the end of the first and beginning of a second excavation." (Curtis, loc. cit.) Stephens states that it is extremely detrimental to the leading shoots of the Scotch pine, perforating them longitudinally and transversely, and also injuring the wood and bark of the trunk. This insect (*d.*) is about one sixth of an inch in length, of a cylindrical form, and black colour, with lineate-punctate elytra. It varies to a pitchy red or dull buffish colour.

Dr. Ratzburg has given numerous details relative to the history of this species, and H. Åter and angustatus, in the memoir above referred to; and Dr. Rossmässler recommends that trees infested with them to a great extent should be cut down and burned, as the only means of saving the rest of the plantation or forest.

Many species of longicorn beetles also inhabit the pine forests, amongst which *Spöndylis buprestoides* Fabr. (Gyll. Ins. Succ., iv. p. 117.), *Prionus depçarius* Fab. (Gyll., p. 116.), *Làmia* (Acanthöcinus) *Ædilis* Fabr. (*Ædilis montana* Serville, Gyll., p. 54.), and *Rhågium inquisitor* Fabr., are particularly to be mentioned; the last, according to Rossmässler (p. 77.), attacking old trees of *Abies excélsa*, but committing less damage than the other tribes. Some of the species of the genus *Callidium* are, however, much more obnoxious. *C. bájulus* inhabits the wood of the *Abies excélsa*, in which the larva is nourished; it is also very abundant in old posts and rails of deal, in which the female deposits her eggs by means of her elongated telescope-like ovipositor, and also in the rafters of houses; and Mr. Westwood has been informed by Mr. Stephens, that, at his residence in South Lambeth, it became necessary several times to cover afresh the leaden part of the roof, in consequence of the insects which had been bred in the rafters eating their way through the leaden sheeting by which they were protected.

The proceedings of another species of the same genus (*Callidium violáceum*) have been described by the Rev. W. Kirby in the fifth volume of the *Transactions of the Linnæan Society*. This insect feeds principally on fir timber, which has been long felled, without having had the bark stripped off; a circumstance of considerable importance; as, by taking off the bark as soon as the trees are felled, the attacks of various insects, subsequently to be noticed, might be prevented. The larva, as soon as hatched, proceeds in a serpentine direction, filling the space which it leaves with its excrement, resembling sawdust, and thus stopping all ingress to enemies from without. It is chiefly beneath the bark that it constructs its galleries, which are more tortuous and irregular as it increases in size: but, previously to assuming the pupa state, it burrows into the solid wood to the depth of 2 in. or 3 in., and there becomes an inactive pupa; the perfect insect generally appearing in the months of May and June, gnawing its way out opposite to the hole by which it descended into the wood.

The internal Feeders which are found under the Bark, or the subcortical tribes of beetles, are, however, those by which we find the greatest extent of injury committed upon trees of the pine and fir tribe. The genus *Tömicus* belongs to this tribe, containing numerous species, which, on account of the peculiar habits and mode of burrowing, have been fancifully termed printer, or typographer, beetles. The type of this genus is the *Derméstes typógraphus* of Linnæus; a small cylindrical beetle, one fourth of an inch



long, and of a pitchy black or reddish colour, with long yellow hairs; the elytra being obliquely truncate, with six teeth on each side, behind the margins of the truncation. This beetle is, fortunately, very rare in England; but in Germany it has, at various times, abounded to so great an extent, that the great pine forests have suffered very severely. "The insect, in its preparatory state, feeds upon the soft inner bark only; but it attacks this important part in such vast numbers (80,000 being sometimes found in a single tree), that it is infinitely more noxious than any of those that bore into the wood; and such is its vitality, that, though the bark be battered, and the tree plunged into water, or laid upon the ice or snow, it remains alive and unhurt. The leaves of the trees infested by these insects first become yellow; the trees themselves then die at the tops, and soon entirely perish. Their ravages have long been known, in Germany, under the name of wurm-trökniss (decay caused by worms); and, in the old liturgies of that country, the animal itself is formally mentioned under its vulgar appellation, the 'Turk.' This pest was particularly prevalent, and caused incalculable mischief, about the year 1665. In the beginning of the last century, it again showed itself in the Hartz forests. It reappeared in 1757, redoubled its injuries in 1769, and arrived at its height in 1783; when the number of trees destroyed by it, in the above forests alone, was calculated to amount to a million and a half; and the inhabitants were threatened with a total suspension of the working of their mines, and, consequently, with ruin. At this period, these insects, when arrived at the perfect state, migrated in swarms, like bees, into Suabia and Franconia. At length, between the years 1784 and 1789, in consequence of a succession of cold and moist seasons, the numbers of this scourge were sensibly diminished. It appeared again in 1790; and, so late as 1796, there was great reason to fear for the few fir trees that were left." (*Wilhelm's Recreations in Nat. Hist.*, quoted by *Latreille* and by *Kirby and Spence*.)

Rossmässler gives the old trees of *Abies excelsa* as the habitat of this species; but Gyllenhal adds *Pinus sylvestris*; justly calling the insect "pinetorum pestis." (*Ins. Suec.*, i. p. 111. pag. 351.) Its passages are so similar to those of *Scolytus destructor* (figured in p. 1388.), that we have not thought it necessary to give a representation of them. Its proceedings are also very similar to those of the *Scolytus* (to which genus, indeed, it is very nearly allied); so that it would be as erroneous to attribute the destruction of the German forests to other primary causes, and to consider the *Tomicus typographus* as a secondary cause, as it is to deny that the *Scolyti* are the cause of the destruction of the elms around London. Wilhelm, indeed, expressly states that the misplaced confidence which many persons entertained that the insects attack only trees already injured, and that their ravages are suspended by the insects themselves, has lost many hundreds of trees. The remedies suggested in a preceding page (1390.), for the destruction of *Scolyti*, may also, to a great extent, be advantageously adopted for the extermination of the *Tomici*.

Rossmässler, Bechstein, and Ratzeburg detail the natural history of several other species of this genus of beetles. *T. chalcographus* attacks old trees of *Abies excelsa*; *T. pinastri*, those of *Pinus sylvestris*; *T. abietipërda*, *Pinus Picea*; *T. Lâricis* inhabits *Lârix communis*. *T. 8-dentatus* and *T. saturalis* are also pine feeders; as is also *T. bidens*. *Fig. 2014.* represents the workings of the last-named species beneath the bark of a four-years-old fir tree.

Tomicus chalcographus Gyll. (6-dentatus *Oliv.*) has not hitherto been recorded as a native of this country: it must, however, have been long since introduced from the north, in the fir trees so constantly imported. Mr. Spence has recently communicated specimens



to the Entomological Society of London, discovered in a living state, at the end of the month of March, beneath the bark of a foreign fir tree, which was being prepared at Southampton for a mast; several of the insects being at the time just emerging from the pupæ, and others still larvæ. The perfect insect is small (about 1 line long), pitchy black, with castaneous elytra, retusely truncate behind, with three teeth on each side. The galleries made by the female are horizontal, like those of the genus *Hylésinus* (not vertical, like those made by the *Scólyti*), though very often more or less curved or oblique. (See fig. 2015.; in which *a* represents the insect of the natural size.)



a 2015

Dr. Heer has described another species belonging to the same genus, under the name of *Bóstrichus cémbra*, which is found beneath the bark of *Pinus Cémbra*. In the month of July, 1835, this species, in all its states, was discovered in the above-mentioned situation, at an elevation of 5700 ft. above the level of the sea, "in valle Beversiana." (*Oberv. Entomol.*, p. 28.)

Ips ferruginea is another coleopterous insect, of small size and depressed body, which is found beneath the bark of the fir.

The external Feeders consist, for the most part, of the caterpillars of various species of lepidopterous insects, together with those of a few of the saw-flies. Amongst the *Sphingidæ* is to be noticed the *Sphina pinástri* of Linnæus, a fine, but in this country very rare, species, the caterpillar of which feeds upon *Abies excelsa*, and on *Pinus sylvéstris*, *P. Stróbus*, &c. This caterpillar is smooth, and at first entirely yellow; but it finally becomes of a fine green, with a brown dorsal line. The upper side of the body is terminated by a curved, black, and horny tail. The perfect insect is of an ashy colour; the fore wings being marked with three short, longitudinal, black lines. It is nearly $3\frac{1}{2}$ in. in expansion of the wings. Bouché (*Garten Ins.*, p. 63.) states that it is sometimes very destructive, when it abounds to a considerable extent, occasionally entirely stripping the Weymouth pine of its leaves.

Amongst the Linnæan *Bómbycæ*, *Eùtricha pini* is often, on the Continent, a perfect land scourge, entirely stripping many of the pines, especially the Weymouth, of their leaves. This large moth is of a greyish colour, with an irregular reddish bar across the fore wings, and a small white discoidal spot. The caterpillar is hairy, and varied with white, brown, and grey; with the anterior segments ornamented with two blue transverse stripes, and some red spots on the sides. The moth and caterpillar are beautifully figured by Curtis (*Brit. Ent.*, pl. 7.), who observes, in his new edition, that the hairs with which the latter are clothed cause excessive irritation when handled. The caterpillars were found at the end of June; and the moths appeared at the end of the following month. Rossmässler gives old trees of *Pinus sylvéstris* as the habitat of this species. The irritating powers of this insect are, however, far surpassed by the celebrated ptyocampa of the ancients, which is regarded as the caterpillar of the *Bómbyx Ptyocampa Fabr.* (genus *Cnethocampa Stephens*), which resides upon the fir, the hairs of which are said to occasion a very intense degree of pain, heat, fever, itching, and restlessness. By the Cornelian law, "De Sicariis," the punishment of death was inflicted upon those who should, with malice prepense, administer either the ptyocampa or the buprestis:—"Qui buprestem vel ptyocampem, tanti facinoris conscii, aut mortiferi quid veneni ad necem accelerandam dederit, judicio capitali et pœna legis Corneliæ afficiator." This moth belongs to the same modern genus as the processionary moth, before described. (See p. 1820.) The moth is of a greyish colour, with three darker transverse bars; and the caterpillars are dark or dusky grey, with a white lateral line. They are processionary in their movements, but not so regularly so as the *Cnethocampa processionæa*.

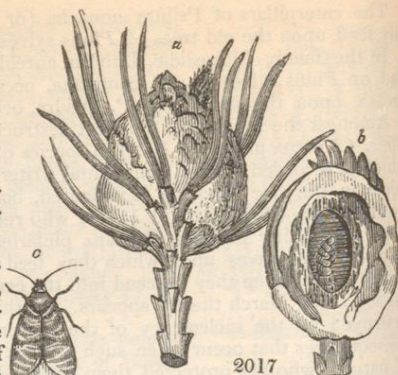
The caterpillars of *Psilura monacha* (or the black arches moth) occasionally feed upon the old trees of *Pinus sylvestris*, according to Rossmässler.

In the family Lithosiidæ, *Lithosia aureola* feeds upon the *Abies excelsa* and on *Pinus sylvestris*; *P. complana*, occasionally upon the latter; *P. depressa*, upon the same; and *P. quadrata*, occasionally on the fir.

Amongst the Noctuidæ, the most destructive species is the *Achætea spræta* *Fabr.* (*Noctua piniperda* *Kob.*), a species of considerable rarity in England, which is recorded by the Continental writers as occasionally doing very great injury in the pine forests. It is figured, both in the winged and larva state, by Mr. Curtis (*Brit. Ent.*, pl. 117.); who remarks that the caterpillars, "like those of *Sphinx pinastri*, *Bupalus piniarius*, &c., are striped in a way to resemble the leaves upon which they feed: they are full grown about the end of June, when they descend into the earth, and become chrysalides; and the following March the fly appears. At this time multitudes, no doubt, are destroyed by the inclemency of the season, thereby preventing the serious consequences that occur when such a check is withheld by the great Author of nature, who has protected them with a clothing that has a greater resemblance to hair than scales, and, no doubt, is better adapted to their wants, since we find the same in many other moths which make their appearance at an early period of the year." Rossmässler gives the old trees of *Pinus sylvestris* as the habitat of this species. *Noctua* (*Dypterigia* *Steph.*) *pinastri* *Linn.* feeds on several species of *Rumex*. In the family Geometridæ, the *Geometra* (*Bupalus* *Leach*) *pinaria* *Linn.* is a great pest; and it is fortunate that it is of considerable rarity in this country. The following report, addressed by the inspector of forests at Strasburg to the bureau of the administration of woods and forests at Paris, and published in Silbermann's *Revue Entomologique*, will show the extent of damage which this insect is capable of committing:—"At the end of 1822, a malady occurred amongst the fir trees in the Forest of Hagenau, one of very considerable extent, near Strasburg, extending over 7000 hectares. The firs, covering a space of about 40 hectares, were at first observed to have their leaves of a yellow colour, and to be dried in their appearance. The cause of this malady was sought for in vain; but, during the following year, it was so much increased, that more minute researches were made; and it was at length discovered that it was owing to the attacks of the larva of the moth, which commenced its ravages at the beginning of the month of May, passing from tree to tree, until the month of October, when it descends into the ground to undergo its transformations. The trees attacked in 1832 are now entirely destroyed, without hope of future vegetation." Stephens gives *Abies excelsa* and *Pinus sylvestris* as its habitats. (*Illustr. Brit. Ent.*, iii. p. 147.) Bouché states that the most advantageous means of preventing its attacks is, to hunt for and destroy the chrysalides in the winter, under the moss at the roots of the attacked trees. The caterpillars of *Ellöpia fasciaria* (*Geometra* *Linn.*) and *Thera variata* also feed upon different species of *Pinus*; the latter preferring *Picea vulgaris* and *Abies excelsa*. De Geer (*Mémoires*, tom. ii. t. 9. f. 10—12, has figured the transformations of several small moths, the caterpillars of which feed within the cone of the fir. *Phalæna Tinea pini* *Retz.*, *ibid.*, fig. 14. (fig. 2016. is a cone enclosing two caterpillars; *a a* representing the excrement ejected from the cone); *Phalæna strobilorum pini major* *Retz.*, *ibid.*, fig. 15.; *Phalæna strobilorum pini minor* *Retz.*, tom. i. pl. 22. fig. 27.; *Phalæna gemmarum pini* *Retz.* There are several other small moths which are also destructive to the young cones and buds of the fir; namely: *Tortrix Buoliæna* (*Ratzeburg* and *Rossmässler*) and *T. Turionæna* (genus *Orthotænia* *Stephens*). Mr. Curtis bred the latter from caterpillars which feed on the shoots of the Scotch pine. *Ortho-*



tæ'nia comitana is also common amongst fir trees. *Eudorea resinea* Haw. frequents the trunks of firs and pines. De Geer has figured the natural history of *Orthotæ'nia resinella* Linn. The caterpillars of this beautiful little moth reside in resinous galls, which they produce at the tips of the young shoots of the fir. Fig. 2017. exhibits one of these galls; in which *a* represents the withered bud at its extremity; *b*, one of these galls opened, showing the internal cavity enclosing the caterpillar; and *c*, the moth. The pseudo-caterpillars of several of the species of the genus



2017

Lophyrus (belonging to the family of the saw-flies, *Tenthredinidæ*) also feed upon the leaves of the pine. De Geer has given full details of their history. (*Mémoires*, tom. ii. pl. 36.) The males of this interesting genus are distinguished by having the antennæ very deeply bipectinated. *L. pini*, according to Rossmässler, is attached to old trees of *Pinus sylvestris*. The singular hymenopterous genus *Xyela* of Dalman, was named *Pinicola* by Brebison, in consequence of the species being found exclusively upon the pine.

In addition to the preceding, there are numerous other small insects, belonging to different orders, which inhabit trees of the genus *Pinus*; namely, *Aphis pini* and *pineti*, *Eriosoma abietis*, *Coccus abietis*, *Psylla abietis* and *pini*, and *Mantinea* (*Pachymerus*) *abietis*, belonging to the Linnæan order Hemiptera; a small midge (*Cecidomyia pini*), which produces small galls on the young stems in which its larva resides (*De Geer, Mém.*, tom vi. t. 26.): and belonging to the Coleoptera are, *Cryptocéphalus pini*, *Brachyonyx indigena*, *Brachyderes incanus*, and *Mágdalis violaceus* (all of whose histories are detailed by Ratzeburg); as well as *Cyphon pini* and *Malthinus Pinicola*.

Parasites and Epiphytes. Among the plants which live on the pine and fir tribe, may be included the mistletoe in Europe, and the *Arceuthobium* Hook. (*Viscum Oxycedri* Dec.) in North America: the former, we believe, has been chiefly found on *P. sylvestris* and on the silver fir, and the latter on *P. Banksiana* and *P. ponderosa*. For the following enumeration of Fungi that live on the bark, or on the decaying wood, of the pine and fir tribe, we are indebted to the Rev. M. J. Berkeley:—

Fungi. The natural order *Coniferæ* is very rich in Fungi, and produces many that are peculiar to it, though it has likewise a few species which are found on trees of other orders. We shall first notice those which grow upon species belonging to the genera *Pinus*, *Abies*, and *Larix*, treating of those which belong to other *Coniferæ* under their respective genera. It is probable that many pines and firs have species peculiar to them; but, though this is well known with regard to a few Fungi, authors have, in general, so loosely indicated the kinds which produce particular Fungi; and the terms *pinicola* and *abietina* are so often applied inaccurately, that it is not always possible to speak decidedly on the subject.



2018

Upon the wood of different firs and pines, the following are among the more interesting or most general species observed in this country:—*Agaricus rutilans* Schaff., syn. *Xerampelinus* Sow., t. 31., and our fig. 2018., is remarkable for its rich crimson red downy pileus, tinged occasionally with olive brown, and its yellow floccoserrated gills. This species occasionally



2019

occurs on trees of other natural orders. *A. Tris* Berk. Eng. *Fl.*, v. p. 56.

with a downy sky-blue pileus; *A. campanella* Batsch., syn. *A. caulinæ* Sow., t. 163., and our fig. 2019.; *A. lepideus* Fr., syn. *A. squamosus* Schaff., t. 29., and our fig. 2020. Monstrous forms of this fungus occur in dark situations, with or without a pileus, exactly analogous to certain states of *Polyporus squamosus*. Such are figured by Schæffer at t. 248. and 249., and by Sowerby at t. 382., under the name of *A. tubæformis*. *A. porrigens* Pers. Syn., p. 480., found by Herr Klotzsch near Inverary; *A. flavidus* Schaff., t. 35., and our fig. 2021. *Merulius pulverulentus* Fr. El., v. i. p. 60., syn. *Auricularia pulverulenta* Sow.; one of the species known under the name of dry rot; first found at Ash Hill, in Norfolk, on fir beams in a wall. *Dædalea sepiaria* Wulf., syn. *Agaricus boletiformis* Sow., t. 418.; found upon unsquared deals in a Thames dock. *Dædalea abiétina* Fr. Syst. Myc., i. p. 334., *Agaricus abiétinus* Bull., t. 442.; a nearly allied species, found in a similar locality at Glasgow. Possibly both these have been imported into our dockyards. *Polyporus cæsius* Fr. Syst. Myc., v. i. p. 360., syn. *Bolëus albidus* Sow., t. 226.; remarkable for turning blue when bruised; a property which exists in an eminent degree in several *Bolëti*, and appears to arise from a chemical change taking place in the juice of the plant when exposed to air. *Pol. irregularis* Klotzsch; syn. *Bol. irregularis* Sow., t. 423., *Pol. amorphus* Fr. Syst., i. p. 364., *Pol. abiétinus* Pers. Syn., p. 541., *Grev. Sc. Cr. Fl.*, t. 226.; a very beautiful species, elegantly tinged with violet. *Pol. pinicola* Fr. Syst. Myc., v. i. p. 372.; found on pine trunks in Scotland, by Mr. Arnott. *Pol. undatus* Pers. Myc. Eur., v. ii. p. 90. t. 16. f. 3; *Pol. incarnatus* Fr. Syst. Myc., v. i. p. 379.; *Pol. armeniacus* Berk. Eng. Fl., v. v. p. 147., a beautiful buff and white species, found amongst the treasures of the collection of Capt. Carmichael. *Irpex pëndulus* Fr. El., v. i. p. 143.; syn. *Hýdnum pëndulum* Alb. et Schw., t. 6. f. 7.; *Thelëphora sanguinolenta* Alb. et Schw., p. 274., *Grev.*, t. 225., and our fig. 2022.; *Thel. amórpha* Fr. El., v. i. p. 183. *Thel. lactescens* Berk. Eng. Fl., p. 167., and *Brit. Fungi*, No. 21.; remarkable for distilling drops of milk when wounded, which, in taste and smell, resembles that of *Ag. quietus*. This species occurs also on the elm. *Thel. gigantëa* Pers. Myc. Eur., v. i. p. 150.; *Thel. lívida* Fr. Syst. Myc., v. i. p. 447. *Thel. puteana* Schum., Fr. Syst. Myc., v. i. p. 448.; a peculiarly hygrometric fungus, which occurs in houses. When placed, after being gummed on paper and preserved in the herbarium for several weeks, in the cupboard where the fungus was first found, and where it had been entirely destroyed by a solution of corrosive sublimate; though the woodwork, which, in consequence, in an unusually damp season, had before been constantly dripping, was quite dry; it, in 12 hours, recovered its original fleshy appearance, and was studded with drops of coffee-coloured moisture. (*Berk. in Mag. of Bot. and Zool.*, v. i. p. 44.) *Calócera viscòsa* Fr. Syst. Myc., v. i. p. 486.; syn. *Clavaria viscòsa* Pers. Comm., t. 1. f. 1. *Peziza calycina* Schum., syn. *P. pulchélla* Grev. Fl. Ed., p. 421.; extremely common on fallen branches of the larch. *Pez. búccina* Pers. Syn., p. 659.; *Pez. sanguínea* Pers. Syn., p. 657.; *Pez. xanthostigma* Fr. Obs., i. p. 166.; *Pez. flexélla* Fr. Syst. Myc., v. ii. p. 152.; *Ditiola radicàta* Fr. Syst. Myc., v. ii. p. 170., and our fig. 2023. *Helòtium radicatum* Alb. et Schw., t. 8. f. 6.; a very beautiful, but destructive, fungus, growing on boards of *Pinus sylvéstris*. The mucedinous roots insinuate themselves between the fibres of the wood, and, creeping far and wide, separate, and at length render the substance soft and rotten, by exhausting its nutritive particles. Besides which, from the erumpent mode of growth of this fungus, the wood is rendered pervious to the rain, and, in a few years, becomes brittle and perishes. The roots are perennial, and put forth fresh



2020



2021



2022



2023

individuals every year, which are in perfection after the spring rains. *Stictis parallela* Fr. *Syst. Myc.*, v. ii. p. 197. A curious undescribed species (*Stictis nivea*) is found in great abundance near Paris, in the Bois de Boulogne, on the fallen leaves of *Pinus maritimus*, and is most probably to be found in some of the



2024

London nurseries. *Nematelia encéphala* Fr. *Syst. Myc.*, v. ii. p. 227.; *Dacrymyces stillatus* Nees, *Grev.*, t. 159., and our fig. 2024.; *Agýrium rufum* Fr. *Syst. Myc.*, v. ii. p. 232.; *Nidularia crucibulum* Fr. *Syst. Myc.*, v. ii. p. 299., *Grev.*, t. 34., and our fig. 2025. *Sphæ'ria gelatinosa*

2024



Tode Fung. Meck., ii. p. 48. f. 123, 124. a very rare species. *Sp. abietis* Fr. *Syst. Myc.*, v. ii. p. 398.; *Sp. strigosa* Alb. et Schw., t. 5. f. 7.; *Sp. sordaria* Fr. *Syst. Myc.*, v. ii. p. 458.; appearing like a black scurfy stain on moist pine wood. *Sp. pilifera* Fr. *Syst. Myc.*, v. ii. p. 472.; remarkable for its hair-like orifice. *Lophium mytilinum* Fr. *Syst. Myc.*, v. ii. p. 533., *Grev.*, t. 177. f. 1., and our fig. 2026.; and *Lophium elatum* *Grev.*, t. 177. f. 2., and our fig. 2027.; are most curious and elegant



2026



2027

Fungi, resembling minute bivalve shells, placed with their frontal margin upwards. *Phacidium Pini* Schmidt, *Myc. Hest.*, ii. t. 2. f. 11.; on the bark of *Pinus sylvestris*. *Reticularia atra* Alb. et Schw., t. 3. f. 3.; *Lycopér-*



2028

don fuliginosum Sow., t. 257.; *Ret. olivacea* Fr. *Syst. Myc.*, v. iii. p. 89.; remarkable for its beautiful olive-green sporidia. *Perichæ'na abietina* Fr. *Syst. Myc.*, v. iii. p. 191.; *Sphaerocarpus sessilis* Sow., f. 258.; and *Pachnocybe ferruginea* Berk. *Eng. Fl.*, v. v. p. 334., syn. *Mucor ferrugineus* Sow., t. 378. f. 10.

Several species occur on the fallen cones; amongst which are: *Agaricus tenacellus* Pers. *Ic. Pict.*, t. 1. f. 3, 4., syn. *Ag. spinipes* Sow., t. 206., and our fig. 2028.; *Ag. conigenus* Pers. *Syn.*, p. 388. *Ag. sanguinolentus* Alb. et Schw., p. 196.; a small but elegant species, distilling a claret-coloured fluid when broken, which often occurs on cones of the Scotch pine, though found also on the twigs of various trees. *Ag. strobilinus* Pers. *Syn.*, p. 393., and our fig. 2029., syn. *A. coccineus* Sow., t. 197.; which occurs, also, occasionally on twigs, as in our figure. *Hydnum auriscalpium* L., Sow., t. 267., *Grev.*, t. 196., and our fig. 2030.; on cones of *Pinus sylvestris*. *Peziza pineti* Batsch. *Cont.*, i. f. 140.; *P. confingena* Pers. *Syn.*, p. 634., *Grev. Fl. Ed.*, p. 425.; *Sphæ'ria strobilina* Holl. et Schm., Fr. *Syst. Myc.*, v. ii. p. 495.; *Hystèrium conigenum* Moug. et Nest., No. 475.; on cones of the Scotch fir,

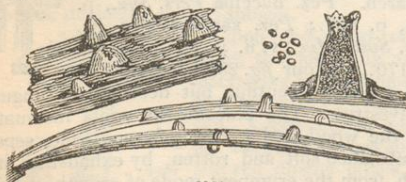


2029

confined to the upper and exposed portion of the scales. *Perichæ'na strobilina* Fr. *Syst. Myc.*, v. iii. p. 190., *Grev.*, t. 275.; between the scales of old cones of the spruce fir.



2030



2031

Peziza subtilis Fr. *Syst. Myc.*, v. ii. p. 157.; *Sphæ'ria Pinastri* Dec. *Fl. Fr.*, v. vi. p. 133.; *Hystèrium Pinastri* Schrad., *Pers. Syn.*, p. 28., *Grev.*, t. 60.

On the leaves are produced:

Æcidium Pini Pers. Syn., p. 213., *Grev.*, t. 7., and our *fig.* 2031.; on *Pinus sylvestris*, occurring sometimes on twigs, and being then much larger. An allied species, *Æ. abiétinum*, is found, in Germany, on the spruce fir; and two on *Pinus Picea*, *Æ. columnare* and *Æ. elatinum*. All are figured by Albertini and Schweinitz, in their fifth plate. The latter infests trees to such an extent, that they are known by the name of hexenbäume.

Many *Fungi* grow beneath the shade of *Coniferæ*; as *Agáricus hypothëjus Fr.*, syn. *A. limacinus Sow.*, t. 8., and our *fig.* 2032.; *A. multifórmis Schaff.*, syn. *A. terreus Sow.*, t. 76., and our *fig.* 2033.; *A. deliciosus L.*, *Sow.*, t. 202., and our *fig.* 2034.; the reitzkers of the Germans, is, as its name implies, a most delicious agaric, but not always to be eaten with impunity. It abounds in mucilaginous matter, and has, therefore, been recommended for pulmonary affections by M. Dufresnoy. *A. rufus Scop.*; *A. bellus Pers.*; *A. maculatus Alb. et Schw.*, syn. *A. carnosus Sow.*, t. 246., and our *fig.* 2036.; *A. vulgáris Pers.*; and *A. limónius Fr.*, *Cantharëllus aurantiacus Wulf.*; a poisonous species, which must be carefully distinguished from the edible one, *C. cibarius Fr.*, our *fig.* 2037. *Bolëtus granulatus L.*, syn. *B. lactifluus With.*, *Sow.*, t. 420.

an esculent species, according to Persoon. *B. bovinus L.*; and *B. variegatus Swartz.* *Hýdnum imbricatum L.*, *Grev.*, t. 71., and our *fig.* 2035.; and *H. compactum Pers.* *Theléphora terrëstris Fr.*; *T. laciniata Fr.*, syn. *Helvélla caryophyllæa Bolt.*, t. 173., and our *fig.* 2038.; and *T. byssoides Fr.* *Clavária abiétina Pers.*; *Geoglossum cucullatum Fr.*, syn. *Leotia mítrula Grev.*, t. 81., and our *fig.* 2039. *Spathulária flavida Pers.*, *Grev.*, t. 165., and our *fig.* 2040. *Sphæria capitata Holmsk.*, syn. *Sphæria agaricifórmis Sow.*, t. 354., and our *fig.* 2042., parasitic upon *Elaphomyces granulatus Fr.*; and *S. alutæca Pers.*, syn. *S. clavata Sow.*, t. 159., and our *fig.* 2044.; are both among the most curious and rare of British *Fungi*: and to these may



2032



2033



2034



2035



2036



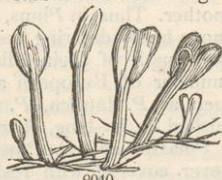
2037



2038



2039



2040



2041



2042

be added the interesting *S. lateritia Fr.*, developed upon agarics, which are so strangely altered by the parasite as to assume the form of a *Helvélla* or *Leotia*.

The branches of the larch, which are cut off for the purpose of thinning plantations, are frequently covered with *Agáricus mítis Pers.*; and under the shade abounds *Bolëtus laricinus Berk.*

The Study of the Species. The mode which we have followed in the study of the *Abiétinæ*, as in all the other orders and genera treated of in this work,

has been, first, to study the subject historically, that is, to ascertain what has been said of it in books; and, next, to study it practically, that is to compare the information and the plates given in books, with living plants. After perusing all the works we could procure on the subject, including Lambert's *Genus Pinus*, 2d edit., 2 vols, 8vo, and the third volume of that work (which, though only three or four copies have yet, August, 1837, been published, we have been very kindly favoured with the loan of by His Grace the Duke of Bedford), we took the first two volumes of Lambert's work, and that volume of Michaux's *North American Sylva* which contains the *Abiétinæ* of North America, in our hands, and visited Loddiges's arboretum, the Horticultural Society's Garden, Kew, Syon House, Dropmore, Whitton, Pains Hill, Mill Hill, White Knights, and the principal nurseries; and, from the study of the plants in these places, in connexion with the descriptions and plates in the books we have mentioned, we have arrived at the general conclusions which we shall now shortly lay before the reader, as preliminary to giving each genus, and its species and varieties, in detail.

In every arrangement of species and varieties, it appears to us that there ought to be two objects in view. First, to throw all the kinds into groups capable of being more or less distinctly defined; or, at all events, of being represented by one species as a type; such, for example, as the group *Sylvestres*, of the section *Binæ*, which consists of species all more or less resembling the Scotch pine in foliage and in cones. The use of these groups is, to render the whole mass easily comprehended by any person who knows only a few of the species; and, secondly, when separating these groups into species and varieties, to give as prominent a place to all varieties and subvarieties that are truly distinct, as if they were species. Besides the argument which we have advanced in favour of throwing the kinds into groups, there are the important ones mentioned in Part II. of this work (p. 216.); viz. those of assisting a collector of trees to make a judicious selection, and of preventing a beginner in botanical studies from puzzling himself in finding out specific distinctions where none really exist. The reason why we wish to keep every variety and subvariety as distinct as possible is, that, in the practice of arboriculture, whether for useful or ornamental purposes, a variety is often of as much importance as a species, and sometimes, indeed, more so: for example, in *P. sylvestris*, the Highland variety is known and acknowledged to produce timber of a superior quality to the common kind; and, in point of ornament, for situations where the common kind of Scotch pine is too large, the species may be represented by *P. (s.) p. Mughus nana*, which forms a beautiful little bush.

In studying the *Abiétinæ* from living trees, the terminal buds, the number of leaves in a bundle or sheath, and their position on the branch, the sheaths being persistent or deciduous, and the form of the cones, and the character of their scales, are the principal points by which, we think, one species or group of kinds can be distinguished from another. Thus, in *Pinus*, all the varieties of *P. sylvestris* have short-pointed resinous buds, differing less in this respect than they do in their cones, or in the length of their foliage. *P. Laricio* (which we consider as including a number of European and some Asiatic kinds, generally ranked as species, such as *P. taúrica*, *P. romana*, *P. calábrica*, *P. caramánica*, &c.) is distinguished by its long, sharply pointed, concave-sided, resinous buds; and *P. Pinaster* and *P. Pinea*, by their short, blunt, imbricated buds, which are never covered with resin. The buds of *P. Tæ'da* (which we consider to be the centre of a group of varieties generally treated as species, under the names of *P. rígida*, *P. variabilis*, *P. serótina*, &c.) are very small and resinous, and they are more numerous on the shoots than in any other species, either European or American. All the kinds belonging to *P. Tæ'da* have also the peculiar property of sending out numerous small abortive shoots from the dormant or adventitious buds in their trunks and larger branches, by which the trees may be known at a glance, even at a distance. All the tender kinds (such as *P. longifolia*, and its allied sorts, *P. leiophylla*, *P. canariensis*, &c.) have small obscure buds; and so on. The scales of

the cones of all the varieties of *P. sylvestris* terminate in surfaces having more or less the appearance of a depressed pyramid; those of all the varieties of *P. Laricio* have a smooth lip, more or less protruding, and terminating in a depressed point; those of all the varieties of *P. Pinaster* terminate in a strong woody pyramidal point; and those of all the varieties of *P. Tæ'da* in a slender sharp prickle, turned upwards or downwards. The cones of different varieties of what we consider as the same species vary much in size; and, as these variously sized cones are generally reproduced from seed, the plants bearing them have been usually treated as distinct species. We do not, however, consider the fact of the seed of large-coned varieties producing plants bearing large cones, any more a proof that the kind is a species, than we do that of seedlings from the seeds of a large apple producing trees bearing large apples, a proof that the particular kind of apple is a species distinct from apple trees bearing small apples. The cones of *P. (s.) p. Mughus* are twice the size of those of *P. (s.) p. pumilio*; but in other respects the plants are hardly distinguishable. Perhaps we shall be told that the comparison between pine trees and apple trees is not a fair ground of argument; because the apple tree is in a state of culture, and far removed from its natural habits; but to this we answer, that the same effects as those produced by culture in the apple tree, are produced by a variety of geographical and physical circumstances in the pine tree; and of this the two above-named varieties of *P. sylvestris* may be cited as a proof.

The leaves of all the species of pines may be classed according to the number in a sheath; and this is a most convenient mode of determining the groups and even the species, in the case both of young plants, and of trees without cones. All the European species, with the exception of *P. Cembra*, have only 2 leaves in a sheath, and most of the Asiatic, Mexican, and Californian kinds have 3, 4, or 5 leaves; while those of the United States and Canada have, for the most part, 3. The leaves vary in length in different species; but much less so in the varieties of the same species than might be imagined. Thus, in all the varieties of *P. Laricio* the leaves are nearly double the length of those of *P. sylvestris*.

Pinus. In studying this genus, and arranging the kinds according to their buds, cones, and leaves, we consider *P. sylvestris*, *P. Laricio*, *P. Pinaster*, *P. Pinea*, *P. halepensis*, and *P. Cembra*, as the principle European species, and the other European kinds as only varieties of them. *P. australis*, *P. Tæ'da*, *P. Banksiana*, *P. inops*, *P. pungens*, and *P. Stròbus*, we consider as the principal species of North America. *P. Sabiniàna*, *P. ponderosa*, and *P. insignis* are the principal species of California. *P. Lambertiana* and *P. monticola* also from California, and *P. excelsa* from Nepal, appear to be only varieties of *P. Stròbus*. The most remarkable species from Nepal is *P. Gerardiana*, which has straight stiff leaves like those of *P. Pinea*, but with caducous sheaths.

Abies is a genus of which there are so few species, that it is attended with no great difficulty. *A. rubra*, *A. nigra*, and *A. alba* are probably only different forms of one and the same species. *A. Smithiana* may possibly be a variety of *A. excelsa*, and *A. dumosa* of *A. canadensis*. *A. Douglasi* and *A. Menziesii* appear specifically distinct, but there are only very small plants of the latter in this country. One of the most remarkable species of *Abies*, from Cephalonia, which has lanceolate and sharp-pointed leaves, like those of an *araucaria*, has just (1837) been introduced.

Picea is a very easy genus; *P. balsamea*, *Fraseri*, and *Pichta* are probably only varieties of one species; and, though *P. Webbiàna* has purple cones, we doubt whether it can be considered more distinct from *P. pectinata* than *Tilia grandifolia* is from *T. parvifolia*. The colour of the cones in the *Abietinæ* has no claim to be considered a specific distinction; because in all extensive woods of one species, such as of *P. sylvestris* and *Larix europæa* in Scotland, they will be found to vary considerably.

Larix. It appears very doubtful to us, whether there are more than one

species of this genus; but the varieties we admit to be distinct; and these might be increased in number, if the colour of the flowers and of the cones were taken into consideration.

To observe the different forms assumed by the same species, they should be studied in all their native habitats; and, to mark how all these different forms return to that of the species which may be considered the central or normal form, it is necessary to study them under cultivation in the same soil, situation, and climate. Many species of *Abiétinæ* that are very distinct in the forests of America, come very near to each other in the pinetums of Britain; and species which appear very distinct in the pure air and elevated situation of Dropmore, are hardly recognisable as different in the smoky atmosphere of the Hackney arboretum. It is very remarkable, that, in this last situation, the only species which thrive are *P. Laricio* and its varieties, and *P. Pinaster* and *P. Pinæa*. These, therefore, may be considered the best pines for planting in cities.

Whatever we may think on the subject of species, we have treated all the kinds in such a manner, and given so many synonyms, that those who differ from us in opinion will find no difficulty in recognising in our pages the species of other authors. The great objects that we have had in view, in this work, in reducing the number of species, have been to simplify and to generalise, in order to render the subject of technical distinctions less perplexing to general readers, and to young students in arboriculture.

As the dried specimens of the *Abiétinæ*, from the large size of the cones, cannot, in general, be kept in paper, like the specimens of broad-leaved trees, we may mention, for the benefit of gardeners, that we have found slight paste-board boxes, like those in which hats are kept, which cost, in London, about 6d. each, a very convenient receptacle for enclosing them. Each box will contain, at an average, half a dozen species. The specimens, as soon as possible after being gathered, should be dipped in boiling water, in consequence of which they will retain their leaves; and as the cones generally open by drying, when it is wished to see their correct shape, they ought to be put into cold water for a quarter of an hour, till the scales close up, and the cone resumes its original form.

GENUS I.



PTNUS L. THE PINE. *Lin. Syst. Monœ'cia Monadélphia.*

Identification. *Lin. Gen.*, 499; *Juss.*, 414; *Fl. Br.*, 1031; *Tourn.*, t. 355, 356; *Gaertn.*, t. 81; *N. Du Ham.*, 5. p. 229; *Lamb. Pin.*, 2d ed., 1. t. 1.

Synonymes. Le pin, *Fr.*; Fichte, Pynbaum, or Kiefer, *Ger.*; Pynboom, *Dutch*; Pino, *Ital.* and *Span.*; Pinu, *Anglo-Saxon*; Pinnua, *Welsh*; Peigne, *Erse*.

Derivation. The word *Pinus* comes from the Greek *pinos*, used by Theophrastus to designate the pine tree. *Pinos* has for its root *pion*, which signifies fat; because the trees of this genus furnish pitch and tar. Others derive the word *Pinus* from *pin*, or *pyn*, a mountain or rock, *Celtic*; in allusion to the habitat of the tree; the British towns Pen-ryn, Pen-rith, and Pen-maen; and the Spanish ones, Penna-flor, Penna-fiel, &c., being so call from being built on hills, or rocks.

Description. Evergreen trees, generally of large size, natives of Europe, Asia, and America, and in an eminent degree both useful and ornamental. They flower, in Britain, in May and June, and generally ripen their cones in the autumn of the following year. The species may be arranged either according to their cones, or their leaves; and we have adopted the latter feature as the foundation of our sections, because it is applicable to trees in every stage of their growth; and because many of the species in London gardens have not yet borne cones.

Sect. i. *Binae*.—Leaves generally 2 in a Sheath.

§ i. *Sylvéstres*.

Sect. Char. Leaves short, more or less glaucous; cones short, generally small,

on short footstalks. Buds ovate, blunt-pointed, and more or less covered with resin.

A. Cones having the Scales without Prickles.

† 1. *P. SYLVESTRIS* L. The wood, or Scotch, Pine, or Scotch Fir.

Identification. Lin. Sp. Pl. 1418.; Willd. 4. 494.; Ger. Emac., 1356.; Hook. Scot., 275.; Dum. Bot. Cult., 6. p. 456.; Woodv. Med. Bot., 570. t. 207.; Smith Fl. Br., t. 1031.; Huds. Angl., 423.; With. Arr., ed. 3. 615.; Pall. Ross., 1. p. 1. 5.; Vill. Dauph., 3. p. 804.; Mill. Illust., t. 82.; Du Roi Harbk., ed. Patt., 2. p. 16.; Hunt. Evel. Syl., 1. p. 274.; Eng. Fl., 4. p. 159.; Willd. Baum., p. 265.; Hayne Dend., p. 172.; Jaume St. Hilaire, t. 55.; Rich. sur les Conif., p. 55.; Höss Anleit., p. 3.; Smith in Rees's Cycl., No. 1.; Hook. Br., p. 406.; N. Du Ham., 5. p. 230.; Lamb. Pin., ed. fol. 1. t. 1., and ed. 8vo. 1. t. 1.; Michx. N. Amer. Syl., 3. p. 125.; Mackay Fl. Hibern., p. 258.; Lindl. Synop., p. 241.; Pouchet Bot. appliquée, 2. p. 666.; Laws. Man., p. 328.

Synonymes. *P. foliis blinis*, &c., *Hall. Helv.*, No. 1660.; *P. rubra* Mill. *Dict.*, No. 3.; *P. sylvestris communis* *Ait. Hort. Kew.*, 3. p. 366.; *P.*, No. 29. *Gmel. Sib.*, 1. p. 178.; Pin Sauvage, Pin d'Ecosse, Fr.; gemeine Föhre, gemeine Fichte, Kiefer, Taune, and 55 other names, which are given in Hayne's *Abbildung.*, Ger.; Pynboom, Dutch; Pino sylvatico, Ital.; Pino sylvestre, Span.; Fyrre, Dan. and Swed.; Sosna, Pol., Boh., and Russ.

Emergings. Woodv. Med. Bot., t. 207.; Pall. Ross., t. 2. f. 1.; Mill. Illust., t. 82.; Hunt. Evel. Syl., p. 274.; Black., t. 190.; Eng. Bot., 35. t. 2460.; Lamb. Pin., 2d ed., 1. t. 1.; N. Du Ham., 5. t. 66.; Michx. N. Amer. Syl., 3. t. 138.; Hayne *Abbild.*, t. 153.

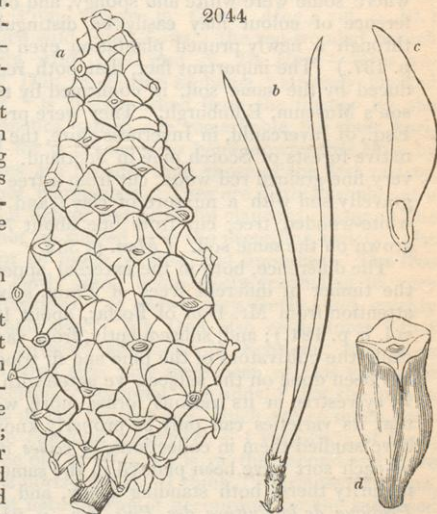
Spec. Char., &c. Leaves rigid, in pairs. Young cones stalked, recurved. Crest of the anthers very small. (*Smith.*) Buds (*fig.* 2043.) ovate, blunt-pointed, from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. long, and $\frac{1}{4}$ in. wide in the broadest part; white, with a reddish tip, the white produced by resinous exudation. The central bud generally with 5 or 6 smaller ones round it. Leaves (*fig.* 2044. *b.*) from $1\frac{1}{2}$ in. to $2\frac{3}{4}$ in. long, somewhat waved and twisted, slightly concave on the upper, and convex on the under surface; light bluish green, finely serrulated on the edges; the sheath lacerated and slightly ringed. Cones (*fig.* 2044. *a.*) from 2 in. to 3 in. long, and from 1 in. to $1\frac{1}{4}$ in. broad. Scales (*fig.* 2044. *d.*) from 1 in. to $1\frac{1}{4}$ in. long, terminating in an irregular four-sided projecting point, often recurved. Seeds, with the wing (*c.*), from 1 in. to $1\frac{1}{4}$ in. long; without the wing, from $\frac{2}{18}$ in. to $\frac{3}{18}$ in. long; dark-coloured. Cotyledons (*fig.* 2045.) 5 to 7. —



2043

A tall, straight, hardy, long-lived tree, from 60 ft. to 100 ft. high; a native of most parts of Europe, flowering in May and June, and ripening its cones about 18 months afterwards; the most valuable, for its timber, of all the European species of *Pinus*.

Varieties. Like all trees which have an extensive geographical range, and grow on almost every kind of soil, and at great elevations as well as in plains, the varieties and variations of the Scotch pine are exceedingly numerous; both as respects the exterior appearance of the tree, and the quality of its timber and resinous products. On poor soils, at great elevations, it becomes a diminutive shrub: and in low situations, where it is a lofty timber tree, the wood on some light sandy soils, is white, almost without resin, and of little duration; while on other soils, of a colder and more substantial nature, it is red, heavy, and of great durability. It appears, also, that the same soil will produce both white-wooded, and red-

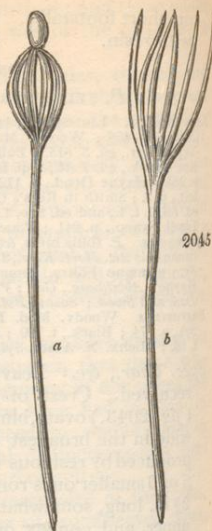


2044

wooded trees; and that seeds from red-wooded trees will, at least in many instances, produce others the wood of which is red. The first recorded notice which we have of varieties or variations in the quality of the timber of the Scotch pine is in the *Treatise on Forest Trees*, published by the Earl of Haddington in 1760. His Lordship says: "Though I have heard it asserted that there is but one kind of Scots fir, and what difference is seen in the wood when wrought is only owing to the age of the tree, and the soil where it grew, yet I am convinced it is otherwise; for this reason: When I cut firs that were too near the house, there were people alive here who remembered when my father bought the seed. It was all sown together in the seed bed, removed to a nursery, and afterwards planted out the same day. These trees I cut down, and saw some of them very white and spongy, others of them red and hard, though standing within a few yards of one another. This makes me gather my cones from the trees that have the reddest wood, as I have said before." (*Treatise, &c.*) Boutcher, in 1775, says that it has been an old dispute, which still

subsists, whether there are more sorts than one of the Scotch pine or fir. It is commonly objected, he adds, that the difference which we see in the wood is owing to the age of the tree, or the quality of the soil in which it grows; but that this opinion is founded on insufficient observation, for he has seen many pine trees cut down of equal age, in the same spot, where some were white and spongy, and others red and hard. "The difference of colour may easily be distinguished by any one who walks through a newly pruned plantation even of young trees." (*Treatise, &c.*, p. 137.) The important fact, that both red and white wood may be produced by the same soil, is confirmed by two specimens of wood in Lawson's Museum, Edinburgh. They were presented by James Farquharson, Esq., of Invercauld, in Inverness-shire, the proprietor of some of the finest native forests of Scotch pine in Scotland. One of the specimens was of very fine-grained red wood, cut from a tree 200 years old, and grown on a gravelly soil with a mixture of clay; and the other was a specimen of a white-wooded tree, cut from one about 70 years of age, which had been grown on the same soil. (*Man.* p. 332.)

The difference, both in the external appearance and in the qualities of the timber of different trees of *Pinus sylvestris*, received a good deal of attention from Mr. Don of Forfar, about 1810 (see *Mem. Cal. Hort. Soc.*, vol. i. p. 121.); and, subsequently, from various other authors, more especially the cultivators of the pine and fir tribe in France: but, after all that has been done on the subject, we agree with M. Vilmorin, who has studied *P. sylvestris*, in its various forms, more, we believe, than any other man, that its varieties can only be properly known and described by those who have studied them in collections, or *écoles d'étude*, in which several plants of each sort have been planted in the same ground, and allowed to attain maturity there, both standing singly, and in masses. (Delamarre's *Traité Pratique de la Culture des Pins*, &c., p. 24.: note by M. Vilmorin.) M. Vilmorin, as we have already mentioned (p. 2121.), has made a collection, for this purpose, of all the varieties of the Scotch pine that he could procure in Europe, on his estate at Barres, near Montargis; with the view, after a suitable period, of determining the distinct sorts. In the present state of uncertainty on this subject, we shall confine ourselves to giving the names of a few of the more marked varieties, of which we have seen plants in the environs of London.



a. *Timber Trees.*

† *P. s. 1 vulgàris*, the common wild Pine (fig. 2046., to our usual scale), is thus described by Don of Forfar. Branches forming a pyramidal head; leaves marginated, of a dark green colour, and but little glaucous underneath; cones considerably elongated, and tapering to a point, and the bark of the trunk very rugged. "This variety seems to be but short-lived, becoming soon stunted in its appearance, and it is altogether a very inferior tree to either variety 2, or variety 3." (*Cal. Mem.*, i. p. 123.) The common wild pine of the French is, by Loiseleur Deslongchamps and some other authors, called simply *P. sylvestris*, while others again name it *P. s. genevènsis*: but, whether the *P. sylvestris* of Loiseleur Deslongchamps (in the *Nouveau Du Hamel*) and of Bosc, and the *P. s. genevènsis* of Delamarre (*Traité Prat.*, &c., p. 23.) and of several other French authors, apply to one and the same variety; and whether this variety be identical with the *P. s. genevènsis* of the Horticultural Society's Garden, received from Noisette of Paris, and of which a plate is given in our last Volume; we are unable to decide. If they are the same, which we think very likely to be the case, then the *P. sylvestris* of the French is of little value as a timber tree, and very inferior to even the *P. s. vulgàris*, or commonest variety of the Scotch pine found in Britain.



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† *P. s. 2 horizontalis*; *P. horizontalis* Don of Forfar; *P. sylvestris* var. *montana* Sang, *Plant. Cal.*, p. 65.; the Speyside Pine, *Hort. Soc.*; the Highland Pine, *Grigor* in *Gard. Mag.*, viii. p. 10.; the horizontal-branched wild Pine, *Laws.*; the red-wooded Scotch Pine, *Sang*; ? *P. rubra* *Mill. Dict.* and *N. Du Ham.*—This variety is described by Don of Forfar as being "strongly marked and permanent." It "is distinguished from the former by the disposition of its branches, which are remarkable for their horizontal direction, and for a tendency to bend downwards close by the trunk. The leaves are broader than those of the first variety, and serrulated, and not marginated. They are distinguishable at a distance by their much lighter and beautiful glaucous colour. The bark of the trunk is not so rugged as in the preceding variety. Its cones are thicker, not so much pointed, and smoother. The tree seems to be a more hardy plant, being easily reconciled to very various soils and situations. It grows very freely, and quickly arrives at a considerable size." Mr. Don also conjectures "that the fir woods which formerly abounded in Scotland, the trees of which arrived at a large size, may have been of this variety or species." "I have certainly observed," he adds, "that the greater part of the fir woods of the present day, which are so much complained of, are of the common variety [*P. s. 1 vulgàris*]; at least, not more than one tree out of 10 or 12 is of the second and more desirable kind [*P. s. 2 horizontalis*]. I think," continues Mr. Don, "that this is the most natural way of accounting for the supposed decline of the Scotch fir in this country, for two reasons: 1st, because var. 2 [*P. s. 2 horizontalis*] retains all the good qualities formerly attributed to the Scotch fir; and, 2dly, because, as var. 1 [*P. s. 1 vulgàris*] produces its cones much more freely than the other, the seed-gatherers, who are paid by the quantity, and not by the quality, would seize upon the former, and neglect the latter."

(*Cal. Mem.*, i. p. 125.) This variety abounds in the counties of Aberdeen, Moray, and Inverness, more especially in the Highland districts of Abernethy and Strathspey; and in the forests of Mar, Invercauld, and Glentanner, along with the white-wooded pine, and always on a light hazelly loam. The first individuals who collected seeds and raised plants for sale of this variety were Messrs. A. and J. Grigor, nurserymen at Elgin and Torres; for whose exertions the Highland Society awarded them a premium in 1830. This variety appears to be that alluded to by Sir Walter Scott in the *Quarterly Review* for October 1828, in which he recommends procuring the seeds of red pine from the Highlands of Scotland, alleging that the ordinary, or white-wooded, "Scotch fir" is "an inferior variety, brought from Canada not more than half a century since." This Canadian variety he describes "as a mean-looking tree, but very prolific of seed; on which account the nursery gardeners are enabled to raise it in vast quantities." (See *Gard. Mag.*, vol. iii. p. 351.) Every botanist knows that the Scotch pine is not indigenous to America; and every nurseryman, that seeds of pines of any kind are received from that country only in very small quantities. It is certain, however, that the commonest description of Scotch pine is much more prolific of seed than the *P. s. horizontalis*; and this circumstance may have led Sir Walter Scott into the above-mentioned error. We may also add that at Stratton Strawles, in the neighbourhood of Norwich, there are two kinds of pines in the woods of Robert Marsham, Esq., of both of which that gentleman has sent us specimens. One of them is called the Scotch pine, and the other the American pine; but both are obviously *P. sylvestris*: the so called American variety has longer leaves and a redder bark than the other; and, when cut down, the wood is found white throughout, while the heart wood of the other is red. There are young plants of *P. s. horizontalis* in the Horticultural Society's Garden; and both plants and seeds of it may be obtained in large quantities from Messrs. Grigor of Elgin and Forbes, Mr. Lawson of Edinburgh, Mr. Charlwood of London, and M. Vilmorin of Paris. There is a tree at Syon, which, in 1837, was named *P. rubra*, and which answers to the description of Don's variety. It is 25 ft. high, and was planted about 1825. The branches are depressed towards the stem; and the leaves are short, and of a beautiful glaucous hue.

- † *P. s. 3 uncinata*, the hooked-coned wild Pine; Mar Forest wild Pine, *Hort. Soc. Garden*; is another of Don of Forfar's varieties, which is described by him, in the article before quoted, as a remarkable variety, quite distinct both from *P. s. vulgaris* and *P. s. horizontalis*. Its leaves are of a still lighter colour than those of the last, insomuch that they appear of a truly light glaucous hue, approaching to a silvery tint. Its branches form, like *P. s. vulgaris*, a pyramidal head; but it differs remarkably in its cones from both the former varieties; the cones in this variety having the appearance of being beset with blunt prickles bent backwards. The leaves are serrulated; a character which at once distinguishes it from *P. s. vulgaris*, with which the tree agrees in having a pyramidal head. This variety is more common than *P. s. horizontalis*, and it also produces good timber. There are young plants of this variety in the Horticultural Society's Garden, and it may be obtained, also, of M. Vilmorin, taken from a cone received from that gentleman, and which we conclude to be the same variety as, or at all events nearly related to, that described by Don of Forfar. It will be observed that this hooked cone is quite different, both in its general form, and the

form of its scales, from the cone of *P. (s.) p. Mughus*, which is also often called *P. uncinata*.

- ‡ *P. s. 4 hagenensis*; Pin de Hagenau, *Fr.*; Rothentanne of Schöttel, seedsman, Rastadt. — This variety was introduced from the forests of Hagenau (whence its name) and Rastadt, on both sides of the Rhine. It is thus described in Lawson's *Manual*:—"The old trees are remarkably tall, straight, free from branches, except near the summit, with remarkably smooth reddish-coloured bark. The leaves of the young plants are longer than those of any of the preceding varieties; they are much waved or twisted, of a light green slightly glaucous colour, and minutely serrulated; the young terminal buds are of a peculiar reddish colour, and generally more or less covered with whitish resin. The young plants are, besides their difference in shade of colour, readily distinguished by their stronger and more rapid growth." (*Agricult. Manual*, p. 230.)



On December 2. 1828, we inspected the trees of this variety growing in the neighbourhood of Rastadt, and purchased some seeds; and on the next day we went through the Forest of Hagenau, in company with M. Nebel, of the firm of Nebel and Neunreutter, dealers in madder and in seeds of the Hagenau pine. The young trees on both sides of the Rhine were of remarkably vigorous growth, and answer well to the description of the variety given by Mr. Lawson. The soil in which they were growing on the German side of the Rhine was gravelly or sandy on the surface, and somewhat loamy below; that at Hagenau seemed to be all a deep sand; but, the surfaces of both forests being quite flat, and very little above the level of the Rhine, there can be no doubt of the subsoil, at a certain depth, being moist in both cases. The Forest of Hagenau, M. Nebel informed us, extended over upwards of 30,000 acres; but the greater part of the pine trees were cut down during the war. There were still, however, a number remaining, with trunks remarkable for the red colour and scaly (not furrowed) appearance of the bark, from 2 ft. to 3 ft. in diameter, and from 60 ft. to 80 ft. or 90 ft. high. The seed is taken out of the cones by drying on the same kiln which is used for drying madder; and was sold, in 1828, at 1 franc 15 sous a pound. We brought over some and distributed it; and there are young trees in Perthshire, in two places, to which the planters have given the names of Loudon's Howe and Loudon's Brae. (See *Gard. Mag.*, vol. v. p. 663.) Seeds of this variety may be obtained from Vilmorin, Charlwood, and Lawson; and from the latter, we believe, also young plants.

- ‡ *P. s. 5 rigensis*; Pin de Riga *Desf. Hist.*, t. ii. p. 61.; Pin de Russie, Pin de Mâtre, *Fr.* — This variety is said to constitute the forests of Lithuania and Livonia; to which, according to Desfontaines, the minister of marine of the French government, in 1785, sent a master mast-maker, named Barbé, from Brest, who brought back with him a great quantity of seeds. These were sown at Koual, near Brest; at Couatilloux, near Annion; at Mency, in the vicinity of Odierne; and on the grounds of Du Hamel at Monceau. According to M. Fougereux, the plants which came up did not differ from the *P. sylvestris*; and he adds that Miller, in a letter to Du Hamel, thanking him for the seeds of the pin de Riga which he had sent, states that he had previously received 50 lb. of the seed of the Riga

pine from the Duke of Northumberland, and that the trees produced were exactly similar to the Scotch pine. Pallas assures us that the pine of Livonia and Lithuania differs not from the *P. sylvestris*: masts, he says, are not made of any peculiar species, as foreigners, and more especially the French, think; but they are all of the *P. sylvestris*. Those trees are chosen that have a yellow bark, and a tall straight trunk, free from branches. (*Desf. Hist. des Arb.*, ii. p. 619.) In 1814, this variety was again brought into notice by the late Professor Thouin, who published a tract on the subject, recommending its culture, on account of the superiority of its wood to that of the common French variety of *P. sylvestris*. M. Puvis (*De l'Agric. du Gatinais, &c.*) describes the pin de Riga as growing beside the pin de Hagenau, on M. Vilmorin's estate at Barres, and rivalling that variety in dimensions. The following are Mr. Lawson's remarks on this variety:—"From the superior quality of the timber of *P. sylvestris* imported from Riga under the name of red pine, to distinguish it from that of *Abies communis*, or white deal, it has been considered advisable to procure seeds from the natural forests in the neighbourhood of that place, and to the plants produced from such seeds the above name is applied. They may at least be considered as possessed of equal merits with such as are derived from the best native forests in the Highlands of Scotland." (*Agric. Manual*, p. 331.) Seeds and plants of this variety may be obtained of Mr. Lawson and M. Vilmorin; and there are specimen plants of it in the Horticultural Society's Garden, in the arboretum at Kew, and at Messrs. Loddiges.

Other Timber Tree Varieties. The names of several might be given from books; but, as we could neither accompany them by descriptions or synonymes, nor refer to any place where living plants may be seen, we consider that it would be of very little use. *P. s. altissima*, in the Horticultural Society's Garden, is a strong-growing variety, resembling the pin de Hagenau, and is probably identical with it, though raised from Caucasian seeds; but *P. altissima* is a name more generally applied to *P. Laricio* than to *P. sylvestris*.

b. *Varieties curious or ornamental.*

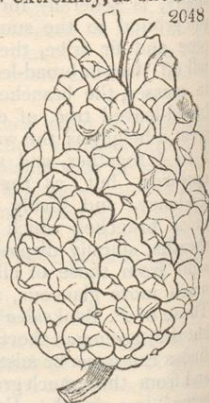
- ‡ *P. s. 6 genevensis.* *The Geneva wild Pine.*—There is a plant of this variety in the Horticultural Society's Garden, a portrait of which is given in our last Volume, by which it appears to be a low crooked tree, with numerous twisted branches, extending considerably at the base. There is a good specimen at Dropmore. We have already suggested that this may possibly be the commonest and most worthless variety of *P. sylvestris* which attains a timber-like size in France. (See p. 2155.)
- ‡ *P. s. 7 monophylla* Hodgins. — The leaves are long and glaucous, and those of each sheath are generally attached to each other throughout their length; though when the points are taken between the finger and thumb, and the apparently single leaf twisted, it generally separates into two, and sometimes into three leaves. We have only seen one plant in the Horticultural Society's Garden, to which it was sent by Mr. Hodgins, nurseryman, Dunganstown, near Wicklow, about 1830.
- ‡ *P. s. 8 scariosa*; *P. scariosa* Lodd. *Cat.*, ed. 1836. — A French variety, introduced about 1820; but the plant at Messrs. Loddiges's is small, and scarcely appears different from the species.
- ‡ *P. s. 9 intermedia.* — This is a Russian variety, of which there is a plant in the Horticultural Society's Garden, having slender young shoots depressed towards the stem, and leaves shorter and less glaucous than those of the species.

- † *P. s. 10 altdica* Ledebour.—A plant in the Horticultural Society's Garden, raised from seeds received from Dr. Ledebour in 1836, and which is only between 3 in. and 4 in. high.
- † *P. s. 11 tortuosa* Don of Forfar.—This variety Mr. Don describes as having the leaves shorter than *P. s. vulgaris*, and somewhat curled, or, rather, twisted. He only saw three or four trees of it, and thinks it nearly approaches the *P. Banksiana* of Lambert.

Other Varieties of curious or botanical Interest. Several names might be added from books; but, as we have not seen the plants, or seen them only in a very young state, we do not think them worth notice. We might have included in the list, *P. (s.) pumilio*, and its subvariety *P. (s.) p. Mughus*; but though we have no doubt of their being only varieties of *P. sylvestris*, yet they are so very different both in appearance and magnitude, that we think them well worth keeping distinct.

Description. The wild, or Scotch, pine, in favourable situations, attains the height of from 80 ft. to 100 ft., with a trunk from 2 ft. to 4 ft. in diameter, and a head somewhat conical or rounded, but, as compared with the heads of broad-leaved trees, generally narrow in proportion to its height. The bark is of a reddish tinge, comparatively smooth, scaling off in some varieties, and rough and furrowed in others. The trunk, when the tree stands singly, is generally furnished with branches from within a short distance of the ground to the summit; nevertheless, in this, as in all the species of the pine and fir tribe, the lower branches have a greater tendency to decay and fall off than in broad-leaved trees. In like manner, when the trees are grown in masses, the branches die off sooner, and so much so, that no European broad-leaved tree, of equal girth of trunk, is found clear of branches to so great a height as the wild pine. The branches are disposed in whorls from 2 to 4 together, and sometimes 5 or 6: they are at first slightly turned upwards, but, as the tree advances, in growth they take a horizontal tendency, and finally become somewhat pendent, with the exception of those branches which form the summit of the tree. The leaves are in sheaths, spirally disposed on the branches; they are distinguishable at first from those of all other pines in which the leaves are in pairs, by being much more glaucous, more especially when in a young state, and straighter. Those of *P. Banksiana* and *P. inops* are also rather glaucous when young, but they are much shorter and more twisted. Those of *P. Laricio* and *P. resinosa* can never be mistaken for those of *P. sylvestris*, from not being glaucous, and from their much greater length; nor those of the section *Tæda* from their being 3 in a sheath. Examined more minutely, the leaves of *P. sylvestris* will be found to have their two interior surfaces (which, while they are in the sheath, face each other) quite flat, or nearly concave, so as to form before they expand, or when they are pressed together, a cylinder of about half a line in diameter. The general length of the leaves, in vigorous-growing trees under 20 or 25 years' growth, is from 2 in. to 3 in.; but in old trees they are much shorter: they are smooth on both surfaces, stiff, obtuse at the extremities, with a small point, and minutely serrated; dark green on the upper (that is, the flat or concave) side, and glaucous and striated on the under side, which is convex. They remain green on the tree during four years, and generally drop off at the commencement of the fifth year. Long before this time, and generally at the beginning of the second year, they have entirely lost their light glaucous hue, and have become of the dark sombre appearance which is characteristic of this tree at every season except that of summer, when the young glaucous shoots of the year give it a lighter hue. The flowers appear commonly from the middle of May till the middle of June. The male catkins are from $\frac{1}{2}$ in. to 1 in. or more in length; and they are placed in a whorl or whorls at the extremities of the branches of the preceding year, and round the base of the young shoots of the current year. The flowers are composed of two or more stamens; each stamen being surmounted by two anthers of a sulphur colour. The anthers contain a considerable quantity of yellow powder, which,

when they burst, is sometimes dispersed in such immense quantities as to fill the air, and give rise, as we have already observed (p. 2109.), to the idea of a shower of sulphur. The female flowers, or embryo cones, appear on the summits of the shoots of the current year, generally 2 on the point of a shoot, but sometimes 4, 5, or 6. The colour of these embryo cones is generally purple and green; but they are sometimes yellowish and sometimes red. After impregnation, the young fruit becomes lateral, stalked, and reflexed; green, and of a more ovate figure. The first year, it ceases to grow about the middle of July, when it has attained the size of a good bean; and in the second year it begins to grow in the month of April, attains its full size by the end of June, and ripens into an ovate, pointed, hard, tessellated, but unarmed, woody cone, about the middle of October. If left on the tree, it is not till the following March or April that the scales open, and allow the seeds to drop out. It thus requires 18 months to mature the cones; and in a state of nature it is two years before the seeds are in a condition to germinate. After the seeds have dropped out, the cones generally remain on a year, or at least till the following winter; so that full-grown trees generally exhibit cones in three or four different states; viz. young cones in their first stage; cones of full size, but green; cones brown and opening; and cones with their scales fully expanded, after the seeds have dropped. The cone, which is stalked, and when mature begins to open at the narrow extremity, as shown in *fig. 2048.*, is, while closed, perfectly conical, rounded at the base, from $1\frac{1}{2}$ in. to 2 in. in length, and about an inch across in the broadest part; as it ripens, the colour changes from green to a reddish brown. The scales are oblong, swelled on the back part of their upper extremity into a sort of pyramid, which appears pressed down upon itself, and is truncate at the summit. The form of this swelled part of the scales is very variable. Sometimes it does not project at all, and the surface of the cone is quite smooth; and, in general, it projects much less on the side of the cones which is next the branches, than on that which is exposed to the air. Sometimes the pyramid in which the scale terminates is raised so as to form a protuberance of more than two lines in height. Sometimes the summit of the pyramid is sunk; and sometimes it is pointed, and turned to one side; while at others, as in *P. (s.) p. Mughus*, it is turned downwards towards the base of the cone, and terminates in a prickle. This variation in the form of the scales of the cone of *P. sylvestris* has given rise to different varieties; though hooked cones and smooth cones may frequently be found on trees having very different habits, such as *P. (s.) p. Mughus* and *P. s. uncinata*. At the base of each scale, on the inner side, close to the axis of the cone, are lodged 2 oval winged seeds, somewhat flattened. Each seed is a little monospermous nut, to which, as in all the other *Abiétinæ*, the wing is not attached, otherwise than by enclosing it with its membranaceous texture. Hence, the wings of the seeds of this pine, like those of every other species of *Abiétinæ*, may be separated from them without doing them the slightest injury. Sometimes the cones are sterile; but in this case the winged membrane is as fully developed as if it were fertile, which clearly proves that it does not form a part of the seed. In germination, the first appearance of the seed exhibits 5 or 6 linear leaves escaping from their envelope, as shown in *fig. 2045. a*; and in a few days afterwards, when the envelope has dropped, they assume the appearance of *b*. It is remarkable, that this species, which has the leaves of trees of 3 ft. or 4 ft. in height glaucous when young, has the seminal leaves, and the leaves of young plants in the first or second year, and sometimes even for 3 or 4 years, not glaucous; whereas in *P. Pináster*, *P. Pínea*, and some others, the leaves of which, in



plants of 4 or 5 years' growth, are not glaucous, the seminal leaves, and the leaves of young plants of 2 or 3 years' growth, are entirely so. The seeds of the Scotch pine come up in about 3 or 4 weeks after they are sown : the growth is not above 3 in. or 4 in. the first year; the second, if on a good soil, they will grow from 4 in. to 6 in.; and the third year the plants begin to branch, and attain the height of from 14 in. to 2 ft., according to soil and situation. In the fourth and fifth years, if not transplanted, or if they have been transplanted carefully in the second year, they begin to push strongly, making a leading shoot from 1 ft. to 3 ft. in length, according to soil and situation; and they continue growing vigorously for half a century, or even a century, according to circumstances. In 10 years, in the climate of London, plants will attain the height of 20 ft. or 25 ft.; and in 20 years, from 40 ft. to 50 ft. Evelyn mentions a Scotch pine which grew 60 ft. in height in little more than 20 years. Like almost all the other species of the *Abiétinæ*, the Scotch pine is a social tree, and is always found in masses of considerable extent. The tree is considered full grown, and fit to be cut down for timber, at 50 or 60 years' growth; but where it grows slowly, as in its native habitats in the north of Scotland and other cold climates, it will continue increasing for three or four centuries. Mr. Farquharson of Marlee, in the Highlands of Scotland, Mr. Strutt informs us, cut over close to the root a tree of 2½ ft. in diameter, which is nearly the size which a Scotch pine, reared in a nursery, and then planted out, would attain in about 50 years; and he counted exactly 214 circles, which made this self-sown tree about four times the age of the cultivated one. In Sweden, Dr. Walker informs us, 360 circles have been numbered in a tree that was composed entirely of sound wood. The largest Scotch pine that was ever cut down in Scotland is supposed to be one which stood in the Forest of Glenmore, which was called the Lady of the Glen, and of which there is a plank in the entrance hall of Gordon Castle, 6 ft. 2 in. long, and 5 ft. 5 in. broad. The annual layers of wood, as reckoned by Mr. Grigor (see *Highland Soc. Trans.*, xii. p. 128.), are about 235. The plank bears the following inscription on a brass plate:—

“ In the year 1783,

WILLIAM OSBOURNE, Esquire,

Merchant of Hull, purchased of the Duke of Gordon the Forest of Glenmore, the whole of which he cut down in the space of twenty-two years, and built, during that time, at the mouth of the river Spey, where never vessel was built before, forty-seven sail of ships of upwards of 19,000 tons burthen. The largest of them of 1050 tons, and three others, little inferior in size, are now in the service of His Majesty and the Honourable East India Company. This undertaking was completed at the expense (of labour only) of above 70,000*l.* To His Grace the Duke of Gordon this plank is offered, as a specimen of the growth of one of the trees in the above forest, by His Grace's most obedient Servant,

Hull, September 26, 1836.

WILLIAM OSBOURNE.”

The Scotch pine which is supposed now to contain the most timber of any tree of the species about Gordon Castle is one of which the skeleton portrait, *fig.* 2049., was kindly sent to us by the Duke of Richmond. It is about 100 ft. high, and contains 260 cubic feet of timber, exclusive of the branches. Some of the finest single specimens of Scotch pine in the neighbourhood of London are at Whitton and Pain's Hill, where some of them are between 80 ft. and 90 ft. high, and, standing singly, are very picturesque in their general forms. A portrait of one of the handsomest of those at Pain's Hill, by H. Le Jeune, Esq., is given in our last Volume. There are also a few very fine specimens at Muswell Hill, a portrait of one of the most picturesque of which, by W. A. Nesfield, Esq., is given in our last Volume. There are others at Studley, in Yorkshire, of one of which, 82 ft. high, *fig.* 2050., to a scale of 24 ft. to 1 in., is a portrait by H. W. Jukes, Esq.; and there is a very

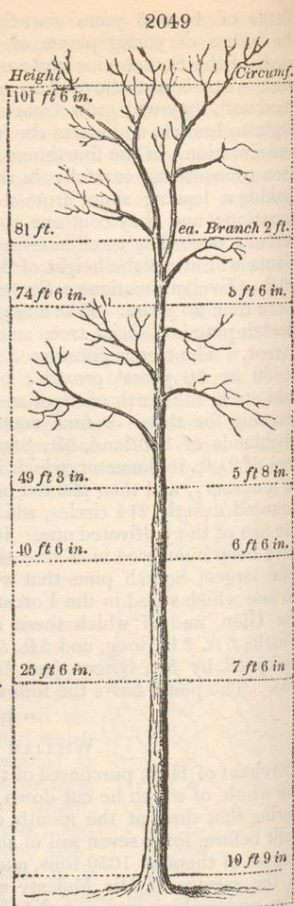
noble specimen at Dunmore, which is considered to be the most picturesque tree in the Lowlands of Scotland, and of which *fig.* 2051. is a portrait after Strutt, to a scale of 24 ft. to 1 in. The height of this tree was, in 1836, 67 ft.; and the diameter of the trunk, at 1 ft. from the ground, 3 ft. 9 in.; and it was estimated to contain nearly 300 ft. of timber. Among the finest specimens in the Highlands of Scotland are those in Strathspey, of a group of which *fig.* 2052., to a scale of 24 ft. to 1 in., is a portrait by W. A. Nesfield, Esq. The tallest of these trees is 75 ft. high.

The quality of the timber of the Scotch pine, according to some, is altogether dependent on soil, climate, and slowness of growth; but, according to others, it depends jointly on these circumstances, and on the kind of variety cultivated; and this is our opinion. It is acknowledged, that the timber of the Scotch pine, grown on rocky surfaces, or where the soil is dry, sandy, or hazelly, is, in general, more resinous, and redder in colour, than that of such as is grown on soils of a clayey nature, boggy, or on chalk: but this is not always the case; for an instance is given, in Lawson's *Manual*, of "a plantation, recently cut down, which stood on the north side of the Perth and Dundee road, nearly 10 miles from the former, the seed of which was, 70 or 80 years since, received from the Forest of Mar; and the timber, although grown on a poor, damp, tenacious clay, besides attaining to a great size, was found equal in quality to that for which the above natural forest is esteemed." (*Ag. Man.* p. 320., note.) Scotch "pine timber," Sir T. D. Lauder observes, "is best in the colder situations. In the warmer regions, it contains a great deal of white, or sap,

wood. At what time the sap wood is transformed into durable, or red, wood, has not yet been determined by vegetable physiologists; and, though most writers believe that the ligneous matter is deposited in the second year, we are disposed to doubt the fact. More than a dozen layers of sap wood may be counted on some trees; and, what is a very interesting observation, where trees have been much exposed to the mid-day sun, the whole southern half of the tree is sometimes found to be little better than sap wood, whilst the northern half may contain only a layer or two of it at the circumference." (*Laud. Gülp.*, i. p. 174.)

The durability of the red timber of the Scotch pine was supposed, by the celebrated engineer, Brindley, to be as great as that of the oak; and Dr. Smith, in his *Essay on the Production of Timber*, in the *Transactions of the Highland Society of Scotland*, vol. i. p. 165., says that he has seen some Scotch pine grown in the North Highlands, which, when taken down after it had been 300 years in the roof of an old castle, was as fresh and full of resin as newly imported timber from Memel; and that part of it was actually wrought up into new furniture.

Geography. *P. sylvestris* and its varieties are indigenous throughout the greater part of Europe, from the Mediterranean on the south, to 70° N. lat.



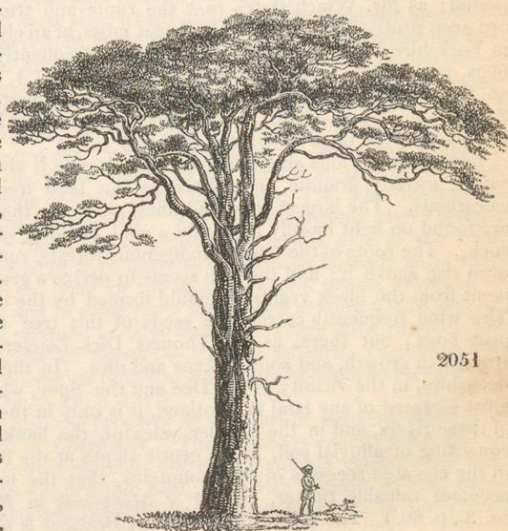
in Norway on the north; and from Spain and Britain on the west, to the confines of Siberia and Kamtschatka on the east. It extends into the north, east, and west of Asia; and, according to some, it is found at Nootka Sound, in North America. In the south of Europe, it grows at the elevation of 1000 ft. to 1500 ft.; in the Highlands of Scotland, at 1400 ft.; and in Norway and Lapland, at 700 ft. In the extreme elevations, as in the extreme limits of its northern range, it assumes the character of a stunted tree, or bush. Mirbel indicates the range of the Scotch pine to be, "Caucasus, Peloponnesus, Calabria, Valencia, Pyrenees, Lapland to 70° N. lat., Bucharia; Western Siberia, on the Oby, under 64°, perhaps beyond; Eastern Siberia, at the Stananoi Mountains, in 62° or 63°; Kamtschatka, between 55° and 57°; Dahuria, Japan." The elevation to which it attains on the mountains, according to the same author, is, in Lapland, under 70°, to 125 toises (of about 6 ft. 6 in. each);

on the Carpathians, to 500; on the Alps of Switzerland and Dauphiné, to 870; on the Pyrenees, from 600 to 1250; and on the Caucasus, to 900 toises (or 3850 ft.) Von Buch considers the space between *P. sylvestris* and perpetual snow in Norway to be 2771 ft.; and that the mean temperature where it ceases is 31° of Fahrenheit.

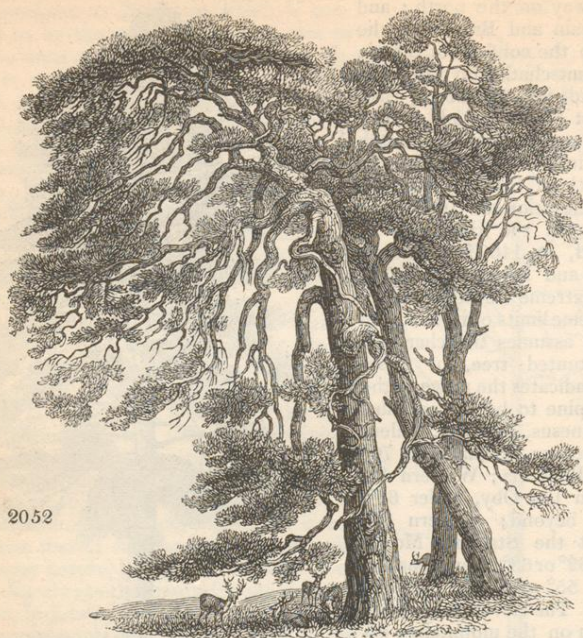
Wahlenberg makes the mean temperature of the earth 1° 8' Cel. (ab ou 35° Fahrenheit), and the elevation 1278 ft., where it ceases in Swedish Lapland." (*Watson's Outlines, &c.*, p. 269.) The Scotch pine is most abundant in the north of Europe, between latitude 52° and 65°. There are immense forests of it, on even ground, in Poland and Russia, and on hills and mountains in Sweden, Norway, Germany, the Alps, the Pyrenees,



2050



2051



and the Vosges. In Spain it is found, but not in great abundance; except in the form of the *P. uncinata* of Captain S. E. Cook, which we believe to be only a mountain variety of this tree. In Britain, *P. sylvestris* is indigenous to the mountainous districts of Scotland; but it appears not to be so to England, though this may probably have been the case at some distant period; as Mr. Winch states that the roots and trunks of very large pines are seen protruding from the black peat moss, at an elevation of nearly 3000 ft. in Yorkshire and Lancashire; cones are also frequently dug up out of the peat bogs, particularly in the latter county. (See p. 21.) In Scotland, it grows at the height of 2700 ft. on the Grampian Mountains; at the height of 2300 ft. on Ben-na-Buir, in Aberdeenshire; and as high, or higher, on the mountains near Loch-na-Garr. (*Watson.*)

In all these various situations, the Scotch pine is always found on soils dry, sandy, gravelly, granitic, or argillaceous, but least frequently on such as are calcareous. The largest trees and finest timber in the Highlands of Scotland are found on light hazelly loam; on a cold, but dry, subsoil, generally granitic rock. The roots of the tree, in indigenous forests, run along the surface, and even rise above it; and the tree seems to derive a great part of its nourishment from the black vegetable mould formed by the decay of its own leaves. The wind frequently carries the seeds of this tree to marshy surfaces and peat bogs; but there, as Sir Thomas Dick Lauder observes, it is always stunted in growth, and soon sickens and dies. In the higher parts of Aberdeenshire, in the vicinity of the Dee and the Spey, where the surface is the most elevated of any land in Scotland, it is only in the valleys, on the borders of these rivers, and in the smaller vales on the banks of tributary torrents, consisting of alluvial soil, in the gentle slopes at the bottoms of the hills, or in the elevated recesses of the mountains, that the native pine thrives, and becomes valuable timber. (*Grant of Monymusk in Pontey's Forest Pruner*, ed. 3., p. 60.) The soil of the Forest of Braemar is a light gravel, formed of

the debris of granitic rock ; there is a considerable extent of surface, in which rocks of granite, porphyry, and gneiss rise in the most precipitous manner ; and some other parts entirely covered with peat bog ; but, on the rocks, the trees, where they occur, have dwindled to mere bushes ; and great part both of the rocky surface and of the bog is entirely destitute of vegetation. A Report on the native Pine Forests of Scotland, by Mr. John Grigor, nurseryman and seedsman of Forres, and for which he received the Highland Society's silver medal, will be found in the *Transactions* of that body, vol. xii. p. 122. The following is a brief abstract of this Report :—

Abernethy Pine Forest, the property of the Earl of Seafield, stands on the southern extremity of Morayshire, on the south side of the Spey, and is one of the most ancient forests in Scotland. The surface is partly hilly and partly level. The soil is principally composed of thin sandy peat, with a subsoil of hard, hazelly-coloured gravel ; and, in some parts, it is a black mould mixed with sand, and very stony. The timber produced is very resinous. Great part of it was burnt down by accident in 1746 ; but a new crop of trees has risen from the ashes, and the forest now produces excellent timber. Mr. Grigor saw trunks barked, and prepared for floating, 10 ft. 7 in. in length, 6 ft. in girth at the root end, and 5 ft. 2 in. at the other end. The number of annual layers indicated 73 years of age. The finest specimens are understood to be at Reynloit, one of the largest of which Mr. Grigor found from 10 ft. to upwards of 13 ft. in circumference, at 1 ft. from the ground ; and at 8 ft. from the ground from 9 ft. to 12 ft. ; tapering with a clean trunk to the height of from 20 ft. to 35 ft., and shooting up to the entire height of from 40 ft. to 65 ft. These very old trees stand on low and level ground, on the side of the Nethy ; but perhaps the finest tree in this forest stands on a steep hill side adjoining, though not highly situated, which measures in circumference, at the height of 1 ft. from the surface, 13 ft. 3 in., and at 8 ft. high, 12 ft. It tapers to 32 ft. of trunk, its whole height being about 50 ft., with a top branching like an oak ; to which all the large trees, in point of form, bear a strong resemblance. A few yards distant from this tree, one of similar dimensions had lately been felled, the stump and roots remaining to indicate its size. The annual rings of this root indicate the age of 242 years, and that of the top, 224. The top lay at the distance of 27 ft. from the root, and Mr. Grigor imagines that the tree had grown about that length in 18 years ; that being the number of years intervening between the ages of the root and top. Several others had been felled of nearly the same size, which had almost attained the age of 200 years. Mr. Grigor observed, from the size of the interior layers, that the trees had rapidly advanced in growth between the ages of 8 and 70, the growth having afterwards diminished ; and, eventually, the outside layers, although distinct enough to be numbered, are very minute, and the whole timber is equally strong, hard, and red, to within less than an inch of the bark. Many of them had been thrown down by the great flood of 1829 ; the stumps of which still remain, and show that the roots had derived all their nourishment from the surface soil, none of them being more than 1 ft. from the surface, where the subsoil is hard and gravelly. They are discernible above ground ; and each forms a rib, to the height of several feet, on the side of the trunk. The soil on which these large trees have been produced is sandy moss, to the depth of from 4 in. to 8 in., lying for the most part on a brown gravel of several yards in depth ; and in some parts the subsoil is more fertile, and of a blackish colour, with a mixture of large stones. These soils produce only the following small variety of plants :— *Calluna vulgaris*, *Vaccinium Vitis idæa*, *V. Myrtillus*, *Hypochaeris radicata*, *Bléchnum boreale*, and a species of *Scirpus*. (*High. Soc. Trans.*, xii. p. 124.)

Duthel Pine Forests, also the property of the Earl of Seafield, stand north of the Spey, to the west of Abernethy. The surface is mountainous, and the best trees grow in the lowest grounds, and on the sloping sides of the bases of the mountains. The soil is a thin peat, on a rich subsoil of thin brown mould. Mr. Grigor examined several trees, varying from 112 to 126 years of

age, and girting from 6 ft. to 12 ft. at 1 ft. from the ground, consisting of excellent timber, with the sap wood varying from 1 in. to $2\frac{3}{4}$ in. in thickness. The river Dulnain ornaments these glens, floats the timber, and impels saw machinery.

Rothiemurchus Forest is the property of Sir John Peter Grant. The surface is irregular, the hollows for the most part marshy, and the soil and subsoil of the elevated portions dry and sandy. The old trees are chiefly cut down, but many patches still remain. The pines are not so remarkable for their girt, as for their extraordinarily tall and smooth trunks. Mr. Grigor found trees measuring, at 6 ft. high, 4 ft. 6 in. in circumference, with a trunk continuing nearly of the same girt to the height of about 35 ft. The average height of the trees he found about 70 ft., and their age from 120 to 125 years. The trees stand so closely, that the surface of the ground, within the masses, is almost destitute of herbage; and the largest trees are uniformly found on the outskirts. The progress of young trees in this forest appears to be at the rate of 9 ft. 6 in. in 15 years.

Glenmore Forest, the property of His Grace the Duke of Richmond, is situated in a glen surrounding a lake. The surface soil is a thin sandy peat; and the subsoil a rich brown clay, which feels quite soft to the touch. The trees grow slowly till they are at the age of 12 years, which Mr. Grigor conjectures to be owing to their roots not penetrating earlier into the rich subsoil. The average rate of growth of young trees, in 10 years, is 5 ft. 6 in. There are few old trees remaining; the greater part having been felled and carried away by Mr. Osbourne (see p. 2161.), who completed his contract in 1804. Some scattered trees are yet standing at great distances, which are very picturesque in appearance, with trunks measuring from 9 ft. to 10 ft. in circumference; but knotty, with bushy heads, and of no value as timber, having evidently been left on that account.

Plantations at Castle Grant. In addition to the natural forests, Mr. Grigor notices the plantations on the estate of Castle Grant, where the Scotch pine has made extraordinary progress; trees, apparently still young, having trunks 9 ft. 6 in. in circumference, and being from 60 ft. to 70 ft. high. These trees stand on a surface of rich black earth, on a subsoil of gravelly sand; but, unfortunately, Mr. Grigor had not an opportunity of ascertaining their age, so as to calculate their rate of growth.

"*The Soil in the Highland Forests,*" Mr. Grigor observes, "is found of very different qualities, which, in some measure, regulates the quality of the timber. The richest ground produces the largest trees, consequently, the timber is not so fine in the grain as that grown on sand or poor gravel; but the quick-grown trees appear as full of resin, as healthy, stand to as great an age, and are as red when cut up, as those which grow on poor soil. In general, the soil of the native Highland forests is superior to that on which firs are commonly planted throughout the low country. Neither poor soil nor bad climate can account for the superiority of the Highland pine, as the forests are generally situated in glens, or in the most sheltered slopes of the hills. Natural birch and alder are frequently met with in these forests, but none are large or valuable; the latter not being confined, as might be supposed, to the lowest grounds, but frequently found at considerable heights on the hills. It is very rare to see any other trees in the vicinity of these forests; but I observed an ash standing alone, and much exposed, on the western extremity of the parish of Inverallen, and on the north of the Spey, opposite Abernethy. Perhaps another hardwood tree is not to be found within a mile of this one. At 1 ft. from the surface, it measures 20 ft. 9 in. in circumference; at the height of 8 ft., it measures 14 ft. 10 in.; at the height of 13 ft., it is divided into five limbs; and its whole height is about 60 ft., several of its large branches having been blown down. The trunk is hollow in the centre, but its leaves have a healthy appearance. The surface of the ground where it stands is rendered fertile from its decayed foliage, and by the tree affording a shelter for sheep, which pasture on the surrounding heath. The subsoil is of a sandy

clay, inferior to the generality of the subsoil in Duthel and Glenmore. The quality of soil in the Highlands seems, in no degree, to alter the external appearance and figure of the pines. Under every circumstance, they assume a rough and shaggy form. In general, they are older than most plantations throughout Scotland, and are of greater size, even in proportion to their age. Notwithstanding this, it is very uncommon to see a single tree in a decaying state. We observed several trunks that had a few feet of timber scooped out from the side of each, to be used as *candles* by the cotters, yet the trees continue quite green and healthy, with the hollows overhung with turpentine icicles several inches in length. The pines grown in these districts appear to be of one species, and differ from the great bulk of those produced in the low counties of Scotland in the following respects:—The Highland Pine is of a more robust and shaggy appearance. In early life it grows, although crowded together, to a greater girth; it is found to attain a greater size on very wet ground; its wood is redder and harder, consequently more durable, and is found to be more inflammable. It produces very few fertile flowers or cones, and what it does produce are uniformly found to be rounder, smaller, and whiter; and it outlives many generations of the common cultivated fir, and ultimately attains a larger size. It may be difficult to ascertain the differences in plants necessary to constitute a distinct species, but, if the superiority of the Highland pine to the common tree of the low countries should not be attributed to a difference in kind, the great proportion of the trees in Scotland, by repeated cultivation, must have lamentably degenerated; since it is known, that thousands of the common fir have arrived at maturity, and thousands have died of old age, without ever producing timber in any respect comparable to that of the districts now attempted to be described; and they who aim not to propagate these magnificent objects of nature, overlook that analogy which is every where observable in the works of creation." (*Ibid.*)

The influence of these various climates and soils on the Scotch pine is so great as almost to change its character. In Spain, and in the south of France, it flowers in March; in the climate of Paris, about the end of April; in that of London, about May; and in the Highlands of Scotland, and in Norway, it flowers from the beginning till the middle of June. On the north side of the Highland and Norwegian mountains, where it is crowded together, and on the plains of the north of Germany and Russia, where the trees also stand in close woods, they are drawn up to a great height, and produce clean straight timber. On elevated irregular surfaces, and in very poor soil, the trees, when crowded, are often stunted; and, when scattered, become tortuous bushes, or low branchy trees. The leaves and cones vary, in these situations, as much as the entire tree; and the quality of the timber as much as the exterior appearance.

History. The *Pinus sylvestris* was doubtless known to the Greeks and Romans. (See p. 19.) Pliny, as we have seen (p. 2112.), expressly mentions the wild pine, which was called *pityda*, from the name of the nymph *Pitys* (see p. 2121.); and that the fruit of it was considered an excellent remedy for a cough. (lib. xv. c. 10.) The first modern record of the tree is by Matthioli, who calls it *Pinus sylvestris montana*; and the first of these epithets, *sylvestris*, was adopted as a specific name by Linnæus. Miller, in the earlier editions of his *Dictionary*, made four species, *P. sylvestris*, *P. rubra*, *P. tatarica*, and *P. montana*; but these are now (as we have seen, p. 2150.) considered by most botanists as only varieties; viz. *P. s. vulgaris*, *P. s. horizontalis* or *P. s. rigensis*, *P. (s.) pumilio*, and *P. (s.) p. Mughus*. The different qualities of the timber of this tree, according to the soil and situation in which it was first grown, seem to have been ascertained in England in the time of Evelyn; but it was not till long after his time that it was generally known that the red wood and yellow deals and planks of the Baltic, so generally esteemed throughout Europe, were produced by the Scotch pine. This point seems to have been determined by Pallas and Cox, and made generally known by the latter in his *Travels*, which were published in 1784. The tree only began to be planted

in Britain about the end of the 17th century; and about the middle of that following, some planted trees, more especially in Scotland, having been cut down, and employed as timber, were found to be of inferior quality to imported timber, or to that grown in natural forests. Dr. Walker, writing near the end of the last century, observes that the Scotch pine had been planted every where in abundance, but had not yet had time for its timber to arrive at perfection. The timber of this tree, he adds, is depreciated, because it is white, soft, and perishable; though he argues that this is merely from want of age in the tree. In the course of years, he says, this white wood will become red; and the planted fir will become more and more valuable in quality, and be held in greater estimation. The prejudice against the wood of the Scotch pine seems to have been at its greatest height between 1790 and 1810; for Marshal, writing in 1796, says, the Scotch pine "should be invariably excluded from every soil and situation in which any other timber tree can be made to flourish. The north aspect of bleak and barren heights is the only situation in which it ought to be tolerated; and even there the larch is seen to outbrave it. In better soils, and milder situations, the wood of the Scotch fir is worth little; and its growth is so licentious, as to overrun every thing which grows in its immediate neighbourhood; and this renders it wholly unfit to be associated with other timber trees; we therefore now discard it entirely from all useful plantations." (*Plant. and Rur. Orn.*, i. p. 146.) Soon afterwards (in 1798), Mr. Thomas Davis, a planter and manager of timber of great experience, and high and deserved repute, who had then had the care of the Marquess of Bath's plantations, near Warminster, for 35 years, and who had planted upwards of 25,000 trees a year on poor heathy land, at the foot of the Wiltshire Downs, published a paper in the *Transactions of the Society of Arts*, vol. xvi., in which he refutes the generally received opinion, that the English-grown Scotch pine was of no use as timber, by facts that had come within his own knowledge. "I can assert from experience," he says, "that, for strength and durability, English-grown fir is equal to any foreign deal whatever. I allow that the Scotch fir (although it is, undoubtedly, the real yellow deal) is seldom of so fine a grain as the foreign yellow deal; but this is certainly occasioned by the rapidity of its growth, and its having too much room to throw out large side branches. Lord Bath's Scotch firs, which are known to have been planted in 1696, are from 2 ft. to 3 ft. in diameter; whereas the best Christiania deal, although evidently 100 years old, is seldom above 1 ft. in diameter; and its knots, which denote the size of its side branches, are small and inconsiderable, therefore evidently appearing to have grown slow and close together. We have a cart-house on Lord Bath's estate, which was built above 80 years ago, out of small firs, which is now perfectly sound and upright; and, for the last 20 years, all the carpenters of the country have used small firs for rafters, &c., with success; and no timber is more ready of sale." (p. 125.) In Lambert's *Pinus*, ed. 2., vol. ii. p. 177., is published a letter to nearly the same effect, from the same writer; and the same facts have been lately (1837) confirmed to us by Mr. Davies's son and successor, the present Thomas Davies, Esq., of Portway House, near Warminster. Pontey, in his *Forest Pruner*, published in 1805, also defends the Scotch pine against the "almost universally prevalent" prejudices against it. "At first sight," he says, "it seems natural to suppose such prejudices must be well founded; though, in fact, they rest upon no better foundation than the prejudice that prevailed, less than a century ago, against foreign fir timber; namely, a prejudice, the effect of inexperience. At that time, no workman could be found credulous enough to suppose that a roof made of it would answer the purpose as well as one made of oak; and yet now the tide of opinion is completely turned. An article which, apparently, has but little of either strength or durability is found, by experience, to possess a very extraordinary degree of both." (*Forest Pruner*, p. 52.) Mr. Pontey traces the prejudice to the use of young trees as timber; the absurdity of which, he says, where strength and durability are required, every one will admit.

The history of the indigenous pine forests in Scotland is thus given by Sir T. D. Lauder. Commencing with the Western Highlands, he notices the remains of the Rannoch Forest, on the confines of the great counties of Perth, Inverness, and Argyll, which, he says, has been "unmercifully slaughtered," in consequence of the high price of Baltic timber during the late wars. "The roots that exist, and the occasional single trees and groups which may still be seen here and there, in situations not easily accessible, show that this forest stretched far and wide across the country, meeting with those which now remain on the Dee, the Spey, the Findhorn, the Ness, and the Beauley; as well as those connected with the Glen-mor-na-albin, or Great Caledonian Glen, and with the Glengarry, Lochiel, Glen Nevis, and more western sylvan districts. Of these remnants, none were more extensive, or more esteemed for their timber, than the forests of the Spey and the Dee. The Abernethy forests still continue to furnish a great quantity of very fine timber. In 1730, a branch of the York Building Company purchased 7000*l.* worth of timber; and, by their improved mode of working it up, by saw-mills, &c., and their new methods of transporting it on floats to the sea, they introduced the rapid manufacture and removal of it which afterwards took place throughout the whole of the sylvan districts. About the year 1786, the Duke of Gordon sold his Glenmore Forest to an English company for 10,000*l.* [It will be perceived, that there is a discrepancy between this account and that of Mr. Grigor, p. 2161., which, however, is of no great consequence.] This was supposed to be the finest fir wood in Scotland. Numerous trading vessels, some of them of above 500 tons burthen, were built from the timber of this forest; and one frigate, which was called the Glenmore. Many of the trees felled measured 18 ft. and 20 ft. in girth; and there is still preserved at Gordon Castle a plank nearly 6 ft. in breadth, which was presented to the duke by the company. But the Rothiemurchus Forest was the most extensive of any in that part of the country: it contained above 16 square miles. Alas! we must now, indeed, say that it was; for the high price of timber hastened its destruction. It went on for many years, however, to make large returns to the proprietor, the profits being sometimes above 20,000*l.* in one year. The Forests of Glenmore and Rothiemurchus, though belonging to different estates, were so united as to form, in reality, one continuous forest; and they are now equally denuded of all their finest timber. The Braemar and Invercauld Forests, on the Dee, are as yet most entire. They are very extensive, and some very magnificent pines are to be found among them; but the destructive axe has been let loose on that of Mar; and we fear that nothing but a reduction in the price of timber will save it from the ruin which has befallen those we have mentioned. It is curious to observe, in the Rothiemurchus Forest, and in all the others, how the work of renovation goes on. The young seedlings come up as thick as they do in the nurseryman's seedbeds; and in the same relative degree of thickness do they continue to grow, till they are old enough to be cut down. The competition which takes place between the adjacent individual plants, creates a rivalry that increases their upward growth; whilst the exclusion of the air prevents the formation of lateral branches, or destroys them soon after they are formed. Thus, Nature produces by far the most valuable timber; for it is tall, straight, of uniform diameter throughout its whole length, and free from knots: all which qualities combine to render it fit for spars, which fetch double or triple the sum per foot that the other trees do. The large and spreading trees are on the outskirts of the masses, and straggle here and there in groups or single trees." (*Lauder's Gilp.*, vol. i. p. 177.) These last are the trees which are described by tourists, and drawn by artists, as the Highland pine. (See fig. 2052. in p. 2164.)

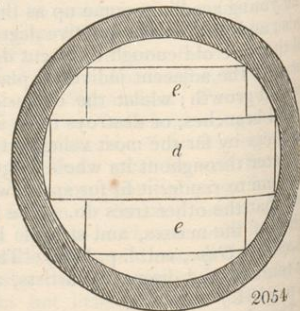
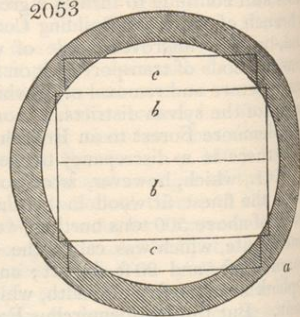
The pine forests on the Continent, and especially in the north of Europe, have suffered like those of the Highlands of Scotland, and from the same causes; but, on the Continent, the work of reproduction goes on with rapidity, while this is the case in only a few of the Highland forests. The reason is, that

the Scotch forests are for the most part pastured with cattle and sheep, which, as well as the deer that are found wild in these forests, browse upon the seedling trees, and prevent them from attaining the size of timber. The forests of Sweden, Norway, and Russia are also pastured by cattle, but in a very slight degree; the proportion of cattle to the range of country open to them being incomparably smaller than in the Highlands. In France and Germany, the native forests are, for the most part, carefully enclosed, and placed under the care of woodmen, who are under the general direction of scientific men; and, consequently, for whatever trees are cut down, a succession of young ones, either supplied by nature or art, are protected.

In Norway, according to James White, Esq., an extensive proprietor of pine and fir forests in that country, the only tall straight trees, fit for exportation, as timber, either of *P. sylvestris* or *Abies excelsa*, are found in sheltered situations on the plains, and on the sides of the mountains; and always in a good soil, that would bring oak, or any other kind of timber tree, to perfection. On the sea shore, and in all elevated exposed places in the interior, and also where the trees stand singly, or in small groups on plains, they are stunted, short, or with branchy heads, so as to be fit only for fuel. In an estate belonging to Mr. White, of 5600 acres, there are 250 acres of naked rock and bogs; of the remaining 5350 acres, one tenth part consists of the stunted trees already alluded to, or of trees only half grown. There remain 4118 acres

of thriving wood, all situated on the sides of hills, in narrow valleys, or on plains; and all the trees are growing close together and sheltered, on good soil, the basis of which is the debris of granitic rock. On each acre of this good soil there are from 320 to 500 trees, of which above 30 in each acre are considered full grown, and fit for timber; that is, from 130 to 200 years of age. The diameter of the trunks of these trees, at about 1 ft. from the ground, is from 16 in. to 20 in.; and at from 52 ft. to 63 ft. in height, from 4 in. to 6 in. Thus the average dimensions of the Scotch pine and spruce fir timber produced by such an estate are as follows:—Length of the log, or tree, 57 ft. 6 in.; diameter, at the lower end, 18 in.; and, at the upper end, 5 in. Each log, or tree, may be sawn up into two deals, 9 in. wide, and 3 in. thick, fit for the English market; and two other deals 8½ in. wide, and ½ in. thick, fit for the French market. The manner in which these deals are cut, so as to include only a small portion of the sap wood, is shown in the cross section, *fig. 2053.*, in which the shaded part, *a*, represents the sap wood; *bb*, the two English deals; and *cc*, the two French deals. Another mode of cutting these trees into planks is shown in *fig. 2054.*, in which *d* is an English deal, 9 in. by 3 in., and *ee* are two battens, each 7 in. by 2½ in. When the timber is intended for masts, the tree is simply barked, and a portion of the sap wood is cut off, after which it is sent down to the sea port, and shipped. (*Reports, &c.*, for 1821 and 1835; and MSS. communicated by Mr. White.)

By far the greater quantity of pine timber employed both in civil and naval construction in Britain is imported from the Baltic, and from the coast of Norway. One London builder alone (the Mr. White mentioned above), who



imports his own timber, is the owner of pine and fir forests, in Norway, of 20,000 acres in extent.

Artificial plantations of the Scotch pine have been made to a great extent, not only in Britain, but in France and Germany, during the present century. From 1780 or 1790, to 1815, many thousands of seedlings of Scotch pines were sent by the nurserymen of Aberdeen and Edinburgh to the English nurserymen and proprietors, and more particularly to the proprietors of estates in Wales. These trees were planted, not always with a view of producing timber, but rather for the purpose of sheltering other trees which were considered of greater value, such as the oak, &c. Both in Scotland and in England, also, plantations of Scotch pine were formed solely for the purpose of being cut down as a crop at the end of 25 or 30 years; when the produce was disposed of for local purposes, and the ground afterwards either planted with broad-leaved trees, subjected to the plough, or laid down in pasture. At the present time, the Scotch pine is still in general use as a tree for sheltering others, especially the oak (see p. 1800.), and also for the sake of its timber; and, for the latter purpose, the red-wooded or Highland variety is generally planted, at least in Scotland.

Poetical Allusions. The pine mentioned by the Roman poets was probably *P. Pinea*; but that of Milton is, no doubt, the *P. sylvestris*:— Speaking of the fallen angels, he says, —

——“ Faithful how they stood,
Their glory wither'd; as when Heaven's fire
Hath scathed the forest oaks, or mountain pines,
With singed top, their stately growth, though bare,
Stands on the blasted heath.”

Sir Walter Scott, also, mentions the Scotch pine in the following lines:—

“ And higher yet the pine tree hung
His shatter'd trunk, and frequent flung
Where seem'd the cliffs to meet on high
His boughs athwart the narrow'd sky.”

Churchill, with reference to the growth of the Scotch pine in various soils and situations, says, —

——“ That pine of mountain race,
The fir, the Scotch fir, never out of place.”

Wordsworth has frequent allusions to this tree:—

“ Unheeded night has overcome the vales:
On the dark earth the baffled vision fails:
The latest lingerer of the forest train,
The lone black fir forsakes the faded plain.”

Vol. i. p. 67.

“ And there I sit at evening, when the steep
Of Silver-how, and Grasmere's placid lake,
And one green island, gleam between the stems
Of the dark firs — a visionary scene.”

Vol. ii. p. 279.

——“ While o'er my head,
At every impulse of the moving breeze,
The fir grove murmurs with a sea-like sound,
Alone I tread this path.”

Vol. ii. p. 280.

Keats, also, appears to allude to this tree, when he says:—

——“ Fir trees grow around,
Aye dropping their hard fruit upon the ground.”

Properties and Uses. So much has been said on the uses of the pine and fir tribe generally, in our introduction to the *Abiétinæ* (p. 2123.), that we have only here to notice such uses as are peculiar to the species before us. It is universally allowed, that the timber of the Scotch pine makes the best masts for ships; and, indeed, we are not aware of any use to which the timber of the genus *Pinus* is applicable, that that of the Scotch pine will not fulfil. All the resinous products common to the pine and fir tribe may be obtained from it, and this is the case in the north of Europe; but, in Britain, the tree is seldom used for any other purpose than for timber. The timber of this species, when grown in a suitable soil and situation, is fit for being employed in construction, when from 80 to 100 years of age, at which age the trunk will

be found from 2 ft. to 3 ft. in diameter, according to the circumstances under which it has grown; but it will continue growing for a much longer period, and the timber will increase in value as well as in bulk. The wood varies in colour from a yellowish white to a brownish red, the latter being produced by the presence of resin. That wood which grows slowest, and in the coldest climate, is considered the best, and it is generally of the darkest colour. That which grows with the greatest rapidity is commonly white, soft, and spongy in texture, and without resin. A slow-growing tree will not produce layers more than the tenth of an inch thickness, while one of rapid growth may have the layers from a sixth to a fourth of an inch in thickness. The red, or resinous, wood is almost exclusively of very slow growth: it is hard, dry, and does not adhere to the saw; while the more rapidly grown wood, when it is resinous, chokes the saw, and has a clammy unctuous feel. When rapid-grown wood is without resin, it is white and spongy; and the surface, after the saw, has a woolly appearance. It is evident that such wood can neither be strong nor durable. English-grown Scotch pine, when cut down at 40 or 50 years' growth, has commonly this appearance; but, as we have seen, p. 2161., there are many exceptions. Some of the Russian and Baltic pine timber is often clammy, the saw raising up and pushing before it what the carpenters call strings; while the pine timber of Norway and Riga is generally red and firm.

Masts of Scotch pine are procured from different ports on the Baltic (see p. 2113.), and also from Norway; and not only masts have been obtained, but entire ships have been built, from the Scotch pine forests in Aberdeenshire (see p. 2161). The most celebrated masts in Europe, however, are those of Riga.

The weight of the wood varies according to its age and other circumstances. A cubic foot, in a green state, weighs from 54 lb. to 74 lb.; and, in a dry state, from 31 lb. to 41 lb. According to the *Dictionnaire des Eaux et Forêts*, the average weight of the timber produced by a full-grown tree, in a green state, will be about 68 lb., and in a dry state, about 40 lb. 5 oz. or 6 oz.; losing about a twelfth part of its bulk in drying: while, according to Varennes de Fenille, it weighs, green, 74 lb. 10 oz.; and dry, 38 lb. 12 oz.; losing only a tenth part of its bulk by drying.

The wood is valued, like that of every other pine, in proportion to its freedom from knots; and it is found that the knots of this species are much more easily worked, and much less liable to drop out of flooring boards, than is the case with knotty boards of the spruce or silver fir. The facility with which the wood of the Scotch pine is worked occasions its employment in joinery and house carpentry, almost to the exclusion of every other kind of timber, wherever it can be procured. It is at once straight, light, and stiff, and, consequently, peculiarly fitted for rafters, girders, joists, &c., which may be made of smaller dimensions of this timber than of any other. In point of durability, if it is kept dry, it equals the oak; more especially if it has been of slow growth, and is resinous.

The timber of the Scotch pine, when it has grown rapidly, on a good soil, and in a favourable climate, such as in most parts of the low country both of England and Scotland, is found, when not of more than 20 or 30 years' growth, to consist chiefly of sap wood, and, hence, to be of very short duration when employed in buildings, or for any other rural purpose. To render it more durable, Mr. Menteth, of Closeburn, in Dumfriesshire, has been in the practice, for upwards of 40 years, of steeping all his Scotch pine timber in lime water, after it has been cut out, and fitted for the different purposes required. It would appear, either that the alkali of the lime neutralises, in some degree, the albuminous matter of the soft wood; or that the water acts as a solvent, and extracts a part of it; for, while Scotch pine of 20 or 30 years' growth seldom lasts 30 years before it is destroyed by worms, timber of the same age, which Mr. Menteth has steeped, has already lasted 40 years, and is as sound as when first put up. The solution of lime water is formed by a very small

quantity of quicklime being dissolved in it, and the time of steeping is ten days or a fortnight. The deeper the tank, and the lower the wood is sunk in it, the more effectually will the lime water penetrate into the wood. Probably alum water would be still more effective than lime water, and the corrosive sublimate used in Kyanising would, doubtless, be the most effective of all.

As fuel, the wood of the Scotch pine lights easily, and burns with great rapidity; but it produces a black and very disagreeable smoke. Its value as a combustible, compared with that of the beech, is as 1536 to 1540. Its charcoal is excellent, and is to that of the beech as 1724 is to 1600. The faggot wood of the Scotch pine is valued by the chalk and lime burners of England more than any other, on account of its rapid burning and intense heat, and consequent saving of time in attending on the kilns. The resinous juice, whether exuding naturally, or procured by incision and distillation, produces tar, pitch, rosin, turpentine, and the essential oil of turpentine employed in house-painting. Lampblack of an inferior quality is made from the smoke of the wood; and the leaves and branches are burned for potash, though of this salt the tree yields only a small quantity. In the north of Russia, and in Lapland, the outer bark is used, like that of the birch, for covering huts, for lining them inside, and as a substitute for cork for floating the nets of fishermen; and the inner bark is woven into mats, like those made from the lime tree. Ropes are also made from the bark, which are said to be very strong and elastic, and are generally used by the fishermen. The Laplanders, and other people of the extreme north, are said to grind the inner bark of the pine into a coarse flour, for the purpose of making bread. This, though not true in the sense in which it is generally taken, is still founded on fact. Mr. Laing, in his *Journal of a Residence in Norway*, states that he had been disposed to doubt the use of fir bark for bread; but he found it more extensive than is generally supposed. In Norway, it is the custom to kilndry oats to such a degree, that both, the grain and the husks are made into a meal almost as fine as wheaten flour. In bad seasons, the inner bark of young Scotch pines is kilndried in a similar manner to the oats, and ground along with them, so as to add to the quantity of the meal. The present dilapidated state of the forests, in districts which formerly supplied wood for exportation, is ascribed to the great destruction of young trees for this purpose in the year 1812. The bread baked of the oat and pine meal is said to be very good. It is made in the form of "flat cakes, covering the bottom of a girdle or frying-pan, and as thin as a sheet of paper, being put on the girdle in nearly a fluid state." When used at table, these cakes are made crisp by being warmed a little. (*Laing's Journal of a Residence in Norway*.) According to Pallas, the young shoots, as well as the inner bark, are ground and used as bread in some parts of Siberia. The leaves and branches are eaten by cattle and sheep in severe weather; and they are said, by Delamarre and other French authors, to preserve sheep from the rot. Evelyn tells us that pine chips are used as a substitute for hops; and other writers inform us that the young shoots, stripped of their leaves just when they are beginning to appear, are sought for with avidity by the children of the peasantry, who eat them. The milky juice found on the liber of the young trees is also said to be very sweet. The log houses of Russia, Poland, and Sweden are almost entirely made of the trunks of Scotch pine, notched and let into each other, as already described, p. 2123.

In Russia, roads are formed of the trunks of the Scotch pine. The trees selected are such as have trunks from 6 in. to 1 ft. in diameter at their thickest end. The branches of these are lopped off, to the length of 12 ft. or 15 ft., according to the width which the road is intended to be, and the rest are left on. The ground being marked off for the road, and made somewhat even on the surface, the trees are laid down across it side by side, the thick end of one trunk alternating with the narrow part of another, and the branches at the ends of the trunks forming a sort of hedge on each side of the road. The interstices of the trunks are next filled up with soil, and the road is completed. The hedges formed by the branches on the extre-

mities of the trunks are found extremely useful after snow has fallen, and before it has become hard with the frost, and also on the commencement of a thaw, in indicating to the traveller when his horses are getting too near the edge of the road. Roads of this rude description are peculiarly suitable for marshy ground, and are very common in the interior of Russia, and also in some parts of Poland. Recourse is also had to them in the commencement of back settlements in North America. In 1814, the greater part of the road from Petersburg to Moscow was of this kind; but it has since, we understand, been Macadamised. The practice of paving streets and courtyards with blocks, cut from the trunks of Scotch pines, and set up endwise, has been already mentioned, p. 2123.

Mode of procuring the resinous Products of the Scotch Pine in the North of Europe. The turpentine obtained from the Scotch pine is so inferior to that of the silver fir, that very little is made use of in the way of commerce, except for the coarsest kinds of work. To procure it, a narrow piece of bark is stripped off the trunk of the tree in spring, when the sap is in motion, and a notch is cut in the tree, at the bottom of the channel formed by removing the bark, to receive the resinous juice, which will run freely down to it. As it runs down it leaves a white matter like cream, but a little thicker, which is very different from all the kinds of resin and turpentine in use, and which is generally sold to be used in the making of flambeaux, instead of white bees' wax. The matter that is received in the hole at the bottom is taken up with ladles, and put into a large basket; a great part of this immediately runs through, and this is the common turpentine. It is received into stone or earthen pots, and is then ready for sale. The thicker matter, which remains in the basket, is put into a common alembic; and a large quantity of water being added, the liquor is distilled as long as any oil is seen swimming upon the water. The oil which is produced in large quantities is then separated from the water, and is the common oil or spirit of turpentine; and the remaining matter, at the bottom of the still, is the common yellow rosin.

Tar is procured from the Scotch pine in great quantities in the north of Europe, and is considered very superior to that produced in the United States from *P. resinosa*, *Ströbus*, *australis*, and other species. The process followed in Sweden, by which both tar and charcoal are obtained, though the latter is there of little value, is thus described by Dr. Clarke:—"The inlets of the gulf (Bothnia) every where appeared of the grandest character; surrounded by noble forests, whose tall trees, flourishing luxuriantly, covered the soil quite down to the water's edge. From the most southern parts of Westro-Bothnia, to the northern extremity of the gulf, the inhabitants are occupied in the manufacture of tar; proofs of which are visible in the whole extent of the coast. The process by which the tar is obtained is very simple; and, as we often witnessed it, we shall now describe it, from a tar-work we halted to inspect upon the spot. The situation most favourable to the process is in a forest near to a marsh or bog; because the roots of the Scotch pine, from which tar is principally extracted, are always most productive in such places. A conical cavity is then made in the ground (generally in the side of a bank or sloping hill); and the roots together with logs and billets of the wood, being neatly trussed in a stack of the same conical shape, are let into this cavity. The whole is then covered with turf, to prevent the volatile parts from being dissipated, which, by means of a heavy wooden mallet, and a wooden stamper worked separately by two men, is beaten down, and rendered as firm as possible above the wood. The stack of billets is then kindled, and a slow combustion of the pine takes place, as in making charcoal. During this combustion the tar exudes; and, a cast-iron pan being fixed at the bottom of the funnel, with a spout which projects through the side of the bank, barrels are placed beneath this spout to collect the fluid as it comes away. As fast as these barrels are filled, they are bunged, and are then ready for immediate exportation. From this description, it will be evident that the mode of obtaining tar is by a kind of distillation *per descensum*.

sum; the turpentine, melted by fire, mixing with the sap and juices of the pine, while the wood itself, becoming charred, is converted into charcoal. (*Trav. in Scand., &c.*)

When pitch is to be made, the tar, without any thing being added to it, is put into large copper vessels (fixed in masonry, to prevent any danger of the tar taking fire), and is there suffered to boil for some time; after which it is let out, and, when cold, hardens and becomes pitch.

Tar and charcoal are obtained in Russia much in the same manner as in Sweden, from the bottoms of the trunks and the roots of the trees. In Germany, the process is conducted with very great accuracy, and is described in detail by Hartig, in his translation of Du Hamel's *Traité des Arbres, &c.*, vol. i. p. 15.; and it is also given in the *Dictionnaire des Eaux et Forêts*, art. Résine, p. 731. In France, it is conducted in a similar manner; though the resinous products of the pine and fir tribe, in that country, are generally obtained from the pinaster, as will be described under that tree. In Britain, tar is sometimes extracted from the roots of the Scotch pine in the Highlands, in a rude manner, for local purposes. The country people, having hewn the wood into billets, fill a pit dug in the earth with them; and, setting them on fire, there runs from them, while they are burning, a black thick matter, which naturally falls to the bottom of the pit, and this is tar. The top of the pit is covered with tiles to keep in the heat; and there is at the bottom a little trough, out of which the tar runs like oil: if this hole be made too large, it sets the whole quantity of the tar on fire; but, if small enough, it runs quietly out. In England, a piece of a branch of the tree is sometimes put in a smithy fire, at one end, while the sap and resinous matter which oozes out at the other is scraped off from time to time, and mixed with tallow for greasing the wheels of carts.

Flambeaux of the roots and trunks of the pine are in use both in Britain and in the north of Europe. Hall, in his *Travels in Scotland*, relates a story of a bet made in London by a Highland chief, that some massive silver candlesticks, on the table at a gentleman's house where he was dining, were not better, or more valuable, than those commonly in use in the Highlands. The chieftain won his bet, by sending to his estate for four Highlanders of his clan, and producing them with torches of blazing fir in their hands, declaring that they were the candlesticks to which he alluded. (vol. ii. p. 440.) Dr. Howison observes "that the little tallow or oil which the peasantry in Russia can procure is entirely consumed at the shrines in the churches, and before the images in their isbas, or huts." To supply the place of candles, "they take long billets of red Scotch pine, which they dry carefully near their peatches, or stoves, during the tedious winter, and split, as occasion requires into long pieces resembling laths. When a traveller arrives, or a light is required for any other purpose, one of these laths is lighted at the peatch, and fixed in a wooden frame, which holds it in a horizontal position. It gives a bright flame, but only burns for a short time." (*For. Trees of Russ. in Jam. Jour.*, vol. xii. p. 60.)

As a timber tree, for planting in poor dry soils, and in exposed situations, none can excel the Scotch pine, and it is only equalled by the larch. In Britain, it surpasses every other species of the pine and fir tribe for sheltering other trees, with the exception of the spruce fir, which, being of a more conical shape, admits more light and air to the heads of the trees which are to be drawn up by it. The Scotch pine is, however, altogether unfit for giving shelter in single rows, unless the branches are allowed to remain on, from the ground upwards, and the roots have free scope on every side. Hence, this pine, like every other species of the tribe, is altogether unfit for a hedgerow tree. When planted in narrow belts round fields for shelter, it soon becomes unsightly, unless the trees stand so thin as to allow of their being clothed with branches from the ground upwards. The true situation for this tree, when grown for timber, is in masses over extensive surfaces.

As an ornamental tree, various opinions are entertained of the Scotch

pine; the diversity of which may be partly owing to the great extent to which the tree has been planted in almost every part of the low country of Britain; and the great difference between the tree in these plantations, and in its native habitats, in hilly or mountainous scenery. Even the difference between the tree standing alone or in small groups, and growing in extensive plantations, is so great, that it can hardly be recognised by a general observer to be the same species of tree. In close plantations, which have never been thinned, the trees assume, after a certain number of years, a gloomy sameness of appearance; and, where these are planted in belts, as they often are, along a public road, "daylight may be seen for miles through their naked stems, chilled and contracted as they are with the cold." The timber, also, of trees grown in the fertile soils of the low country, which have been cut down, being so much less strong and durable than Highland or foreign wood of the same kind, is another cause of the tree having got into bad repute, though the great objection to it is its appearance. Mason says, —

— "The Scottish fir, in murky file,
Rears his inglorious head, and blots the fair horizon."

The great contempt in which the Scotch fir is commonly held, says Gilpin, "arises, I believe, from two causes. People object, first, to its colour: its dark murky hue is unpleasing. With regard to colour in general, I think I speak the language of painting, when I assert that the picturesque eye makes little distinction in this matter. It has no attachment to one colour in preference to another, but considers the beauty of all colouring as resulting, not from the colours themselves, but almost entirely from the harmony with other colours in their neighbourhood. So that, as the fir tree is supported, combined, or stationed, it forms a beautiful umbrage, or a murky spot. A second source of that contempt in which the Scotch fir is commonly held is, our rarely seeing it in a picturesque state. Scotch firs are seldom planted as single trees, or in a judicious group; but generally in close compact bodies, in thick array, which suffocates or cramps them; and, if they ever get loose from this bondage, they are already ruined. Their lateral branches are gone, and their stems are drawn into poles, on which their heads appear stuck as on a centre. Whereas, if the tree had grown in its natural state, all mischief had been prevented: its stem would have taken an easy sweep, and its lateral branches, which naturally grow with almost as much beautiful irregularity as those of deciduous trees, would have hung loosely and negligently; and the more so, as there is something peculiarly light and feathery in its foliage. I mean not to assert that every Scotch fir, though in a natural state, would possess these beauties; but it would at least have the chance of other trees; and I have seen it, though, indeed, but rarely, in such a state as to equal in beauty the most elegant stone pine. All trees, indeed, crowded together, naturally rise in perpendicular stems; but the fir has this peculiar disadvantage, that its lateral branches, once injured, never shoot again. A grove of crowded saplings, elms, beeches, or almost any deciduous trees, when thinned, will throw out new lateral branches, and in time, recover a state of beauty; but, if the education of the fir has been neglected, he is lost for ever." (*For. Scen.*, i. p. 91.)

The Scotch fir, in perfection, continues Gilpin, "I think a very fine tree, though we have little idea of its beauty; and it is generally treated with great contempt. It is a hardy plant, and is therefore put to every servile office. If you wish to screen your house from the south-west wind, plant Scotch firs, and plant them close and thick. If you want to shelter a nursery of young trees, plant Scotch firs; and the phrase is, you may afterwards weed them out as you please. This is ignominious. I wish not to rob society of these hardy services from the Scotch fir; nor do I mean to set it in competition with many trees of the forest, which, in their infant state, it is accustomed to shelter: all I mean is, to rescue it from the disgrace of being thought fit for nothing else, and to establish its character as a picturesque tree. For myself, I admire its foliage, both the colour of the leaf, and its mode of

growth. Its ramification, too, is irregular and beautiful, and not unlike that of the stone pine, which it resembles, also, in the easy sweep of its stem, and likewise in the colour of the bark, which is commonly, as it attains age, of a rich reddish brown. The Scotch fir, indeed, in its stripling state, is less an object of beauty. Its pointed and spiry shoots, during the first year of its growth, are formal; and yet I have sometimes seen a good contrast produced between its spiry points and the round-headed oaks and elms in its neighbourhood. When I speak, however, of the Scotch fir as a beautiful individual, I conceive it when it has outgrown all the improprieties of its youth; when it has completed its full age, and when, like Ezekiel's cedar, it has formed its head among the thick branches. I may be singular in my attachment to the Scotch fir. I know it has many enemies; but my opinion will weigh only with the reasons I have given." (*Ibid.*) Sir Thomas Dick Lauder, in his commentary on this passage, says, "We agree with Mr. Gilpin to the fullest extent in his approbation of the Scotch fir as a picturesque tree. We, for our parts, confess, that, when we have seen it towering in full majesty in the midst of some appropriate Highland scene, and sending its limbs abroad with all the unconstrained freedom of a hardy mountaineer, as if it claimed dominion over the savage regions around it, we have looked upon it as a very sublime object. People who have not seen it in its native climate and soil, and who judge of it from the wretched abortions which are swaddled and suffocated in English plantations, in deep, heavy, and eternally wet clays, may well call it a wretched tree; but, when its foot is among its own Highland heather, and when it stands freely on its native knoll of dry gravel, or thinly covered rock, over which its roots wander far in the wildest reticulation, whilst its tall, furrowed, and often gracefully sweeping red and grey trunk, of enormous circumference, rears aloft its high umbrageous canopy, then would the greatest sceptic on this point be compelled to prostrate his mind before it with a veneration which, perhaps, was never before excited in him by any other tree." (*Laud. Gilp.*, i. p. 174.) To enable the reader to judge of the correctness of the opinion of Gilpin and Sir Thomas Dick Lauder, with which we entirely agree as to the beauty of this tree, in certain circumstances of age and situation, we have only to refer to figs. 2051. and 2052. in p. 2163. and p. 2164.; to the plates of this tree in our last Volume; and to the beautiful views of scenery in the Highlands, by Robson and Nesfield.


Soil and Situation. A granitic soil, it is generally allowed both by British and Continental writers, is the most congenial to the Scotch pine; and the sand and gravel of the Forests of Rastadt and Hagueneau are composed of the debris of this rock. J. S. Menteth, Esq., has remarked that the Scotch pine does not harden its wood well when growing on the grauwacke; and several others have observed that it is short-lived, and never attains a large size on chalk. The Scotch pine, Sang observes, will grow and flourish in any kind of soil, from a sand to a clay, provided the substratum be rubble or rock; "but in wet tilly soils it ought never to be planted; because, whenever the roots have exhausted the turf, or upper soil, and begin to perforate the sub-soil, the tree languishes and dies." It is justly observed by Mathews, that the natural location of the Scotch pine in poor sandy soils does not result from these soils being best adapted for it, but from its growing more vigorously in them than any other tree. Should any one doubt this, he observes, let him make an excursion into Mar Forest, and there he will find the Scotch pine in every description of soil and situation, but always thriving best in good timber soil; and, in short, not differing very materially, in respect to soil, from the sycamore, the elm, the oak, or the ash. Mr. Mathews also mentions that, though the Scotch pine has a superior adaptation to dry, sharp, and rocky soils, yet there are many situations of poor wet till and clay, and even of peat moss ground, where it would be advantageous to plant the Scotch pine; because, from its roots running along the surface, no other timber tree will thrive so well in such soils. The same author observes that nothing conduces so much to the quality of Scotch pine wood, as the exposure of the tree while growing.

“ Under the great shelter of the close-planted woods, the timber is soft and porous, without much resin ; but, under great exposure, especially to dry air, the timber is hard, close, and resinous. This is, however, considerably modified by the soil.” (*On Naval Timber, &c.*, p. 339.) According to Dr. Walker, the Scotch pine may be planted on the thinnest and driest soils, and also in mossy soil, when it is less than 2 ft. in depth, and bottomed with gravel rather than with clay. It may also be planted in sand on the sea shore, and on mountains to the height of 1400 feet. (*Highlands of Scotland*, ii. p. 237.) In England, it is found that the Scotch pine will grow on every soil ; but that, among dry soils, the one on which it thrives the least is chalk. The worse the soil, the farther the plants should be placed apart, in order to insure their vigorous growth ; but, as this distance will admit of their becoming branchy trees, what the timber gains in strength and durability, it will lose in its fitness for many purposes, from the number of the knots produced by leaving on the branches.

Propagation and Culture. The Scotch pine produces cones at the age of fifteen or twenty years ; and every cone generally contains from 60 to 100 seeds. The cones are gathered in the months of December and January, and laid in a dry loft, where they will keep good for a year or two, if not wanted for sowing ; and whence they may be taken in early spring, and exposed to the sun, or at any season and slightly dried on a kiln, as already directed, p. 2131. Eleven imperial gallons, or about a bushel and a half, of cones, will afford 1 lb. of seed with the wings on, or from 13 oz. to 14 oz. without wings. A bushel and a half of seeds, with the wings on, weigh 12 lb. ; and without the wings, 26 lb. As might be expected, the seed keeps longest when the wings are left on. If kept in a dry place, and turned over occasionally, to prevent it from heating, the seed will keep fresh several years ; but its vitality is very doubtful after the second year. Old seeds are easily proved by sowing a few in a pot, and placing it in heat in a moist atmosphere ; when, if the seeds are fresh, they will come up in a few days. In general, however, the freshness of the seeds may be ascertained by opening them ; and, if the kernel is plump and fragrant, there can be little doubt of their germinating. In the *Dictionnaire des Eaux et Forêts*, it is said that, in France, the seeds of the spruce, which are of a reddish colour, are sometimes turned black by means of powdered charcoal, and sold for those of the wild pine ; but nothing of this kind takes place in Britain, as the seeds of the latter species are of all the most abundant, and consequently the cheapest. The seeds should be sown in beds in light rich soil, and covered very slightly, perhaps from a sixteenth to a fourth of an inch, according to the soil, situation, and climate. Sang directs the seeds to be sown so as to rise at the distance of a quarter of an inch from one another, and the covering to be $\frac{1}{4}$ in. thick. In France and Germany, forests of wild pine are frequently raised by sowing the seed where the plants are finally to remain ; in which case an acre, where the soil and situation are favourable, will require 14 lb. of seeds with the wings on, and 11 lb. without the wings ; and, where the soil and situation are unfavourable, 16 lb. with the wings, and 12 lb. without them. If the seeds are sown in rows, half the quantity will suffice in both cases. The time for sowing, whether in the nursery or in the forest, is from the end of March to the beginning of May ; taking the climate of London for one extreme, and that of Aberdeen for the other.

Boutcher, from having observed that the seeds of the Scotch pine are often injured by kilndrying, recommends not gathering the cones in the December of the same year in which they ripen, but deferring this to the March or April following ; and then keeping them in a dry place till June, July, or August, sooner or later, according as the weather becomes hot. At this season, they are to be taken out and exposed to the heat of the sun during the day ; but put under cover in the evenings, and kept constantly from rain and dew. In a few days the cones will expand, and the seeds will rattle within them, when they can be easily taken out by sifting, &c. They are

then to be kept in bags or boxes in a dry room, till the sowing season in the April following. Boutcher recommends sowing the pine seed in shady borders of generous loose mould, about the middle of March; and covering it $\frac{1}{2}$ in. thick, or covering it at first $\frac{3}{4}$ in.; and, just as the seed begins to vegetate, raking off one half of the covering with a short-toothed rake. Many thousands of plants, in stiff grounds and dry seasons, he says, for want of this precaution, are smothered; being unable to struggle with the hard-crusted surface. Baudrillart makes the same remark with reference to the Scotch pine raised in nurseries in France. Boutcher's reason for sowing the Scotch pine so early is, that, when the plants are not well rooted before the hot seasons sets in, they become stunted, and are sometimes killed. It will be observed that, by Boutcher's plan, a year is lost, but in other respects it seems unexceptionable. When the seeds are kilndried with care, and at a low temperature, they will not be injured; and the labour attending this process must be less than that of removing them at least twice a day, for several weeks, from a shed or loft into the open air, and back again. After the plants come up, if they can be supplied with water for two or three weeks, it will greatly increase their vigour. In the following April, they may be transplanted into nursery lines, 1 ft. 3 in. asunder; and 6 in. or 7 in. apart in the row, where they may remain two years; after which they should be removed to their final destination: or, should large plants be required, they may be removed a second time, and planted in the nursery, in rows 3 ft. asunder, and 1 ft. 6 in. apart in the row; where, after standing two years, they "will transplant with absolute safety, and grow as freely as the younger plants; notwithstanding the general prejudice against old Scotch pines, which has only a good foundation when they have not been transplanted seasonably, or properly cultivated." (*Treatise on Forest Trees, &c.*, p. 136.) The general nursery practice is to allow seedling Scotch pines to remain two years in the seed-bed; after which they are taken up, and planted in rows 1 ft. 2 in. apart, and 3 in. apart in the lines, taking care never to prune the tops, and to injure the roots as little as possible. "If they remain a third year in the seed-bed," says Sang, "they are good for nothing." Scotch pines, the same author observes, "should never stand longer in the lines than one year after planting, unless they are to be planted out in very fine soil; in which case, they may be allowed two years in the lines, but at the distance of 6 in. between plant and plant. Two-years seedling Scotch pines of good growth," he says, "one year planted out on good soil, rise with far better roots in proportion to their tops than when of any other age, and are therefore more fit for general use." (*Plant. Kal.*, p. 319.)

Mr. Farquharson of Marlee, writing to Dr. Hunter in 1755, gives the following account of his mode of raising the Scotch pine from seeds, and planting it out on the Highland mountains. He gathers the cones in February or March, from thriving young trees; and sows the seeds in the end of April or the beginning of May, in light loamy soil, trenched 1 ft. 6 in. deep, and laid out in beds 5 ft. broad. He sows the seeds very thick, and covers them with a "thick sifting of mould," from the alleys. Plants raised in this manner, he says, will rise like a brush. No kind of manure should be given to the beds, as productive of weeds; the drawing of which not only brings up many of the tender plants, but loosens the ground, and makes blanks that let in the frost in winter, and the drought in summer. To give an idea of the sowing, he never considers his crop of plants good unless he has above 1000 in each foot long of the beds, that is, in five square feet, upon their having two seasons' growth. "I plant them out," he says, "irregularly from the seed-bed, about 3 ft. asunder, upon the mountainous ground where they are to rise to perfection. I begin to plant the driest ground in autumn, 18 months after sowing, and persist in this operation until the frost prevents me. I begin again in February, or, rather, as the weather admits, and continue this work sometimes till the end of April, so as to plant out the product of 2-year-old seed-beds. I put the plants into the ground with two cuts of a spade, made in the form of the letter V, thus ; I raise the point of the angle with what we call a dibble, or wooden spa-

tula, with a handle about 1 ft. 6 in. in length; and, laying the plant up to the neck, tread down the raised sod with the foot. In this method, two men may plant 1000 plants in a day. When the ground is rocky, or very stony, I use a dibble shod with iron, having a cleft at the extremity to lead down the root, putting the plants into the ground in the manner that cabbages are planted. One man will plant as many in this way as two in the other; yet the first method is preferable where the ground admits of it, as I have always observed fewer plants to fail by it. My reason for planting direct from the seed-bed, without transplanting in a nursery, is, that it comes nearest to the operation of nature. Plants that have been removed from the seed-bed, and transplanted in the nursery, must necessarily have their roots pruned considerably before they can be planted in pits of the kind above described, which adds greatly to the expense. Besides, nursing causes a luxuriant growth in this hardy mountainous tree, which spoils its nature, and robs it of longevity." (*Hunt. Evel. Syl.*, i. p. 290.)

Culture in Plantations. Little remains to be added to what has been said on this subject in our general introduction to the *Abiétinæ*, p. 2132. The Scotch pine, when planted with a view to the production of timber, should always be in large masses; and when with a view to ornament, in single trees or in small groups. It should never be planted in belts, or in narrow plantations, unless the plants are thinned out, so as to admit of their retaining their branches from the ground upwards; in which case the timber produced will be of little use. When the plantations are made on a surface that is tolerably even and regular, the plants should always be inserted in lines, for the greater convenience of future culture; but when the surface is rocky, steep, and in other respects irregular, the plants can only be put in accordingly. The nice points in the management of Scotch pine plantations are, the thinning and pruning; both of which should be performed very sparingly, where tall clean timber is the object in view. Both operations must be guided, in a great measure, by the quantity of timber which the soil is estimated to produce on a given space.

The Culture of the Scotch Pine in the North of Scotland has been thus detailed to us by Macpherson Grant, Esq. of Ballindalloch, in Inverness-shire, a successful and very extensive planter:—"In the northern counties of Scotland, the *Pinus sylvestris* has for a long time been pretty extensively planted; and, although this is the native locality of the tree, it has been very generally remarked that the artificial are very inferior to the natural woods. Much discussion had arisen, and many theories had been broached, to explain this inferiority, till it was at length suggested that it might very probably be caused by the circumstance of the seed, from which the plants were produced, being collected from unhealthy and stunted trees, in districts more accessible than those in which the tree attains its greatest perfection. Premiums for the greatest quantity of plants grown from seed gathered in the natural forests have for some years been offered by the Highland and Agricultural Society of Scotland; and have been awarded to Mr. Grigor, nurseryman at Elgin, who has taken great pains to further this object, and who last year likewise obtained a premium for the best *Report on the Natural Forests of Scotland*. (See p. 2165.) Until within the last 20 years, plantations, in this part of the country, were formed of Scotch pine alone; but it is now usual to mix them with larch in nearly equal proportions; and here we plant about two larches to one pine. The Scotch pines are procured from the nurserymen two-years-old seedlings; and they are placed at once on the hilly ground, where they are finally to remain. A workman, with a common spade, makes a double cut at right angles, like the letter T, thus \perp ; raising the turf slightly with the spade, so as to admit the insertion of the plant at the point where the two cuts meet: a woman or boy follows with the plants; and, having placed one in the opening, compresses the turf by stamping on it with the foot. In this manner, a man and boy will plant about 1000 in a winter day (six hours). The number of plants is about 5000 to the imperial acre. The larches are of the same

age, and are planted in the same way, as the pines. The seasons of planting are autumn and spring; but the former is preferred, from the uncertainty of getting the work accomplished in spring, on account of snow and frost. The men are paid 1s., and the women and boys 6d., per day, of six hours. The Scotch pine plants of the true kind (from Highland seed) cost 2s. per thousand of 1200, and the two-years' seedling larches 3s. per thousand. To these expenses must be added that of fencing, which varies according to the situation of the plantation. If near farms, stone walls or turf dikes faced with stone are required; if further removed from the approaches of cattle, turf fences are sufficient; whilst in the most remote parts, where occasional inroads from sheep are alone to be apprehended, fences are sometimes dispensed with, and a person resident on the spot is employed, at a small salary, (say 5*l.* per annum) to protect the plantation by driving away any sheep or cattle that may encroach on it. A healthy plantation should be safe from injury from sheep in 8 years, and in 12 years from cattle. In wet portions of the hilly ground, narrow surface drains are of great advantage, and may be made at a small expense.

"In the natural forests of Scotch pine, the plants spring up of different ages; and, being consequently of various sizes, the stronger gradually destroy the weaker, until the wood is reduced to the distances at which the trees can ultimately stand; whilst the lateral branches gradually decay and fall off, so that thinning and pruning are quite unnecessary. In short, a natural, or self-sown, forest of Scotch fir is left entirely to nature. Nature sows the seed, rears the tree, prunes and thins the wood; and the hand of man is applied only to cut it down when fit for timber. In this manner, the extensive forests of Glenfeshie, Rothiemurchus, Dulnain, Glenmore, and Abernethy, on the Spey, and those of Braemar and Invercauld on the Dee, were produced. The high price of timber during the war induced the proprietors of these fine woods to cut them down. Most of them are now exhausted; and the few trees which remain of the others scarcely suffice to convey an idea of those that are gone. For several years, 18,000*l.* per annum was produced from the Rothiemurchus wood, after deducting all expenses of felling, sawing, and floating to the mouth of the Spey; and a sum not less than 250,000*l.* has probably been obtained from that forest alone. The ground which has been cleared is rapidly regaining its covering of wood: wherever the heath is short, and especially where the surface is broken so as readily to admit the seed, thousands of plants spring up; nor do I know a more interesting sight, than this gradual progress of nature to repair the destruction caused by the hand of man.—*Macpherson Grant. Ballindalloch, August 26. 1837.*"

Thinning and Pruning, as at present practised in the Scotch Pine Plantations in the North of Scotland. After perusing Mr. Grigor's Report on the native pine forests of Scotland, of which an abstract is given in p. 2165., we wrote to him for information on the subjects of thinning and pruning, as actually practised in these forests, and also in artificial plantations; and as to the effects of the neglect of either or both of these operations. To our application Mr. Grigor kindly and promptly sent us the following answer:—"The old trees of the native Scotch pine forests have trunks quite clean and free from old stumps, so that the side branches must have rotted off when the trees were young, and of a small size. Some of the pines, grown on exposed situations, have strong side branches, but not very near the ground: such branches are commonly found above large clean trunks of from 15 ft. to 30 ft. in length. When the timber of these forests is cut up, loose knots are rarely met with: indeed, knots of any importance are seldom seen, except where such were attached to live branches at the time the trees were felled. The wood of the old trees appears so clean and equal when sawn up, that, in many, only very slight marks of lateral branches are visible. The young trees, of from 25 to 40 years' growth, present regular tiers of decayed branches near the ground, which fall away in course of time. The proprietors of the native forests sometimes prune and thin the woods, but not often: they thin when the

trees are much crowded, and of nearly an equal size, especially when situated near a road or river, where timber is of most value; but this is not attended to in the more remote parts of the forests. I have only seen the trees pruned when they stand quite thin, or, from having lost their leading shoots, by sheep pasturing the ground, or other casualty, have become bushy. In this case, I have seen a considerable extent gone over in January and February, and pruned to the height of from 2 ft. to 4 ft. with the axe; the whole height of the trees being from 5 ft. to 10 ft. In the Highland natural forests, the young plants do not often rise of equal strength and size. There is commonly a portion of them (a sufficient crop) stout enough to overtop the smaller ones; and the latter are of much benefit in preventing the side branches of the former from advancing to a large size. The side branches of the true Highland pine naturally take a wide or horizontal direction, whereby they are more subject to decay by the closeness of the trees, than if they inclined to a more perpendicular figure, as do our Low Country pines. In planted woods, the pine trees are commonly of the same size and age; and then it is absolutely necessary to thin them, as their tops rise equal, and form a surface parallel to that of the ground on which they stand; therefore, without relief by thinning, the whole are, to a certain extent, injured; whereas, in natural forests, the difference of sizes and ages is great, and the strongest prevail unhurt. I am acquainted with many artificial plantations of pine; and the common method is, to thin the trees gradually as they get too close or too high for their girth. Planted pines are not commonly pruned, that being considered the worst mode of treatment. Many proprietors, of late, have given over thinning; but the woods are much hurt by being too much confined. A good tree can scarcely be seen, except near the outside, or where a road opens up and admits air. I am clearly of opinion that we shall not have good pine plantations until they are produced from the seeds of the native Highland forests, which are more healthy and permanent than the kind commonly cultivated. — *John Grigor, Forres, Sept. 9. 1837.*"

The Earl of Aberdeen; Macpherson Grant, Esq., of Ballindalloch; Mr. George Saunders, gardener and forester to the Duke of Richmond at Gordon Castle; Mr. Roy, nurseryman, Aberdeen; and other proprietors and gardeners of the north, have sent us answers to all our queries on the subject of thinning and pruning, which correspond with those given above by Mr. Grigor. From the Earl of Aberdeen's letter, we give the following extract: — "I received your letter during an excursion in the upper part of this county, precisely in the neighbourhood of those natural fir forests respecting which you had written to me. From the information I have received, I think I may venture to assure you that these forests are never thinned, at least with the view of promoting the growth of the trees; nor, in fact, with the exception, perhaps, of draining to a limited extent, in particular situations, does there appear to be any care taken, or any management whatever to exist. This, indeed, is sufficiently obvious from the very appearance of the forest; on large portions of which the trees are thinly scattered, and at considerable intervals; in other parts, they are crowded together, and stand more densely than they could ever have been placed by the hand of the planter. This appearance, however, is not so much the consequence of neglect, as the result of an opinion that it is best not to meddle with the trees at all. They are left to thin themselves, as it is called, by which the weak plants are overpowered, and destroyed by the stronger. I have also been assured that, in cases where the most judicious thinning has been attempted, the admission of the wind has proved much more injurious to the remaining trees, than is experienced in young woods of the planted fir under similar treatment. I imagine that the finest fir forests now existing in Scotland are those to which I have referred, in the upper part of the valley of the Dee, and in the district of Braemar. Many of the trees are of great size and beauty. I have seen none, however, at all to compare with a tree cut in the Duke of Gordon's forest of Glenmore, and of which a plank is preserved at Gordon Castle, measuring 5 ft. 8 in. in diameter, of perfectly

sound wood (see p. 2161.). This, I presume, is by far the largest specimen of *P. sylvestris* on record; at least, I have never seen or heard of any at all like it.—*Aberdeen. Haddo House, September 4. 1837.*"

Thinning and pruning in England. We have already noticed (p. 2134.) the practice of Mr. Salmon and Mr. Pontey in England, both strong advocates for thinning and pruning. On applying to the Duke of Bedford, to know the results of the practice carried on under the direction of these arboriculturists in the woods at Woburn, His Grace's forester, Mr. Ireland, informs us that Mr. Salmon, by cutting off large branches rather carried the practice too far; but that the trees pruned under the direction of Mr. Pontey, about the years 1802 and 1803, were not in the slightest degree injured, as only a few of the smaller branches were taken off. On examining the timber of such trees as were cut down, Mr. Ireland found the places where the branches had been cut off quite sound, with new wood formed over them; but this new wood, though closely covering the part cut off, yet did not incorporate itself with it. On the other hand, he found the timber of some trees, where the branches had died off naturally, in which the wood was unsound, though the wound formed by the decayed branches was closely covered over with new and sound wood; thus, as Mr. Ireland remarks, showing the advantage of cutting off the branches close to the bole when they are quite small, and before they begin to decay. His Grace the Duke of Bedford, after informing us that Mr. Ireland's statement as to the effect of pruning the Scotch pine is correct, adds: "From pruning to thinning, the transition is obvious and natural; and I must confess myself a decided advocate of bold but judicious thinning, in opposition to the practice of the Duke of Portland, at Welbeck. Perhaps I may inherit this from my grandfather, John Duke of Bedford, who was, even in those early days, a decided friend to thinning plantations when young. I will state an anecdote on this subject, which is much at your service, and may possibly amuse the readers of your *Arboretum*. In the year 1743, my grandfather planted the large plantation in Woburn Park, now known by the name of the 'Evergreens' (to commemorate the birth of his daughter, afterwards Caroline Duchess of Marlborough); being something more than 100 acres, and having been before that time a rabbit warren, without a single tree upon it. In the course of a few years, the duke perceived that the plantation required thinning, in order to admit a free circulation of air, and give health and vigour to the young trees. He accordingly gave instructions to his gardener, and directed him as to the mode and extent of the thinning required. The gardener paused and hesitated, and at length said: 'Your Grace must pardon me if I humbly remonstrate against your orders, but I cannot possibly do what you desire: it would at once destroy the young plantation; and, moreover, it would be seriously injurious to my reputation as a planter.' My grandfather, who was of an impetuous and decided character, but always just, instantly replied: 'Do as I desire you, and I will take care of your reputation.' The plantation, which ran for nearly a mile along the road leading from the market town of Woburn to that of Ampthill, was consequently thinned according to the instructions of the duke, who caused a board to be fixed in the plantation, facing the wood, on which was inscribed, 'This plantation has been thinned by John Duke of Bedford, contrary to the advice and opinion of his gardener.'—*Bedford. The Doune of Rothiemurchus, September 2. 1837.*"

Felling. The age at which the Scotch pine should be felled depends on the degree of perfection which the tree will attain in the particular locality. On thin poor soils, where the trees are planted thick, it may be most profitable to cut the whole plantation down, like a crop of corn, as Mr. Main recommends (p. 2132.), at 20 or 30 years' growth; while, on deeper and more substantial soils, the trees will gain in dimensions for double or treble that number of years; and they ought to be left accordingly.

Accidents, Diseases, &c. We are not aware of the Scotch pine being more liable to accidents, diseases, or insects, than any other species of *Abietinæ*, or that it has any which are peculiar to it. Mathews states that the red-

wooded Scotch pine, when come to some age, is, in wet ground, attacked by the rot; which commences in the collar, and spreads to the adjacent roots and up the stem, in a manner very similar to the rot in the larch. The red wood approaches nearer to the outside of the trunk, in trees where the rot exists, than in others, and is nearest that side of the tree where the rot is the greatest. This disease is found in trees growing in poor wet tills, and in flat, sandy, moorish soils, with a retentive subsoil. "The fact that the red pine in Scotland has fewer sap wood layers than the red pine of Memel or of North America, and also the fact that, in most situations in Scotland, the red pine soon decays, and soonest in the places where the trees have fewest sap wood layers, and where the timber has been planted, that is, where the cones have been kilndried, are worthy of notice. Scotch red pine has generally from 14 to 40 layers; Memel, from 40 to 50; Canadian, often 100. We consider the long, moist, open winter, and cold ungenial spring in Scotland, and the kilndrying of the cones, to be the causes of this early loss of vitality or change of sap wood into matured wood. In Poland and Prussia, the earth does not remain so long cold and moist as in Scotland, but is either frozen, or sufficiently warm and dry: this occurs even to a greater degree in Canada; and neither the Memel nor Canadian trees have any chance of being planted, or the seeds kilndried." (*On Naval Timber*, p. 75.) In mountainous countries, and in countries subject to heavy falls of snow, the Scotch pine is liable to the accidents which we have mentioned (p. 2136.) as common to the order generally; and not only forests take fire, but also single trees. A remarkable instance of this last kind of accident is noticed by Dr. Howison, who visited the north of Russia in 1818; and who, having observed many large trees of the *Pinus sylvestris* standing erect in the forest, in a withered, and frequently in a dead state, was led to examine into the reason. He was not a little surprised to find that, in many cases, although the bark was entire, the interior part or wood of the tree was in a great measure charred. On enquiry, he found that this was occasioned by the travelling boors, in the sultry dry weather of summer, seeking the shade of large trees, and making fires for dressing their victuals about the roots of the trees. Many of these roots lie near the surface; and, as they abound very much with resinous matter, they readily catch fire. The fire seems to be propagated slowly, as in match paper; a gradual and stifed combustion creeps onwards, encouraged by the drought, and constantly fed by the empyreumatic oil of turpentine (or tar), which is produced by the heat, until the interior of the trunk itself be destroyed. (*Jameson's Journal*, iv. p. 207.)—We have given these ample details on the subject of the Scotch pine, considering it by far the most valuable timber tree of the genus in Britain, and even in Europe.

Statistics. Recorded Trees. Gilpin mentions Basilsleigh, in Berkshire, as containing some of the most picturesque species of the Scotch pine in England in his time. He also mentions some fine trees at Thirkleby, near Thirsk, in Yorkshire, a few of which still exist. In Scotland, at Inverary, a tree mentioned in the *Argyllshire Report* has a trunk 10 ft. in circumference at 4 ft. from the ground; one at Castle Huntley, in Perthshire, measured in 1796, was 13 ft. 6 in. in circumference at 3 ft. from the ground; and, close by the ground, 19 ft. in circumference. This tree was considered at the time the largest in the county. At Cameron, in Dumbartonshire, on the shores of Loch Lomond, a tree, in 1784, measured 7 ft. 2 in. in circumference at 4 ft. from the ground; one at Bargally, in 1780, measured 9 ft. 3 in. in circumference, and 90 ft. high, with 22 ft. of clear stem. It was planted in 1697, and, consequently, was nearly 100 years old. According to Dr. Walker, in the year 1740, the late Sir J. Nasmyth, formed at New Posso, in Tweeddale, a very extensive Scotch pine plantation on the north side of a barren hill of considerable height. In the year 1791, many of the trees in the plantation measured 4 ft. in girth, and contained from 4 in. to 6 in. of red wood. In Ireland, in 1794, Hayes mentions some Scotch pines, at Ballybeg and at Hillbrook, which measured 7 ft. in girth at 5 ft. from the ground, and 5 ft. at 50 ft. high. One felled in its 70th year was 77½ ft. in length of clear timber, and measured 6½ ft. in girth at 50 ft. from the ground. (*Pract. Treat.*, &c., p. 118.) At Tiny Park, Sir S. Smyth, Bart., was one 10 ft. round, containing nearly the same bulk for 25 ft. At Luttrellstown, Earl of Carhampton, one of 85 years' growth from the seed was 11 ft. in girth; and another, of very great height, was 11 ft. 10 in., or nearly 4 ft. in diameter, which Hayes believed to exceed the dimensions of the largest foreign deal ever imported. These trees stood among oaks and other trees, on very high ground, though flat at top for a considerable extent, and much exposed. At Emo Park, Earl of Portarlington, were several Scotch pines, with trunks from 8 ft. to 9 ft. in girth, clear to the height of 20 ft. or 30 ft., and large wild branching heads, richly clothed with leaves. (*Ibid.*)

Existing Trees. In the Environs of London. At Muswell Hill, it is 60 ft. high; at Ham House, near Richmond, it is 70 ft. high, the diameter of the trunk 4 ft., and of the head 80 ft.; at Whitton there are many specimens, 100 years planted, from 70 ft. to 80 ft. high, with trunks from 2 ft. to 5 ft. in

diameter. — South of London. In Cornwall, at Port Elliott, 70 years planted, it is 45 ft. high; at Carclew, it is 69 ft. high, the diameter of the trunk 3 ft. 3 in., and of the head 40 ft.; another specimen has a trunk 4 ft. in diameter. In Devonshire, at Killerton, it is 59 ft. high, the diameter of the trunk 3 ft. 9 in., and of the head 77 ft.; the trunk is clear, and nearly the same in diameter to the height of 35 ft.; at Bystock Park, 21 years planted, it is 50 ft. high; at Endsleigh Cottage, 22 years planted, it is 60 ft. high. In Dorsetshire, at Melbury Park, 100 years old, it is 76 ft. high, with a trunk 3 ft. in diameter. In Hampshire, at Alesford, 81 years planted, it is 63 ft. high. In Somersetshire, at Brockley Hall, it is 60 ft. high, with a trunk 3 ft. in diameter; at Kingsweston, it is 90 ft. high, with a trunk 3 ft. 4 in. in diameter. In Surrey, at Bagshot Park, 80 years planted, it is 75 ft. high; at Claremont, it is 90 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 40 ft.; at Ashley Park it is 70 ft. high, with a trunk 4 ft. 6 in. in diameter; at Deepdene, 8 years planted, it is 20 ft. high. In Sussex, at Westdean, 70 years planted, it is 45 ft. high; at Kidbrooke, 60 years planted, it is 80 ft. high, the diameter of the trunk 4 ft., and of the head 30 ft. In Wiltshire, at Wardour Castle, 50 years planted, it is 60 ft. high; at Longford Castle, it is 60 ft. high, with a trunk 2 ft. 3 in. in diameter. — North of London. In Bedfordshire, at Woburn Abbey, it is 75 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 40 ft.; at Southhill, it is 30 ft. high, with a trunk 2 ft. 6 in. in diameter. In Berkshire, at Bear Wood, 14 years planted, it is 40 ft. high. In Buckinghamshire, at Harlingford, 160 years old, it is 70 ft. high, the diameter of the trunk 5 ft., and of the head 48 ft., the trunk being clear to the height of 40 ft. This tree has been supposed to be the largest of the species in the kingdom, and several sketches of it have been taken, but, as will be seen, it is exceeded by several trees in height, and by some others in bulk. Here are 5 other very fine pines, with trunks 12 ft. in circumference. In Cambridgeshire, at Gamlingay, it is 20 ft. high, with a trunk 4 ft. in diameter. In Caermarthenshire, at Golden Grove, it is 97 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 30 ft. In Denbighshire, at Llanbede Hall, 70 years planted, it is 65 ft. high. In Leicestershire, at Melbourne Hall, it is 81 ft. high, diameter of the trunk 5 ft. and of the head 56 ft.; another near it is 78 ft. high, diameter of the trunk 4 ft. 2 in., and of the head 47 ft. 6 in. These are remarkably fine trees. In Durham, at Stanwick Park, is one with a trunk 3 ft. in diameter. In Essex, at Audley End, 60 years planted, it is 45 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 27 ft. In Herefordshire, at Hatfield, 105 years old, it is 100 ft. high, the diameter of the trunk 3 ft., and of the head 29 ft. In Hertfordshire, at Brockett Hall, it is 50 ft. high, with a trunk 3 ft. in diameter. In Monmouthshire, at Tredegar Park, 110 years old, it is 70 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 52 ft.; another, of the same age, is 85 ft. high, the diameter of the trunk 3 ft., and of the head 50 ft. In Norfolk, at Merton Hall, it is 86 ft. high, with a trunk 3 ft. in diameter. In Radnorshire, at Maeslugh Castle, it is 60 ft. high, with a trunk 2 ft. in diameter. In Suffolk, at Finborough Hall, 60 years planted, it is 100 ft. high, the diameter of the trunk 3 ft., and of the head 20 ft.; and at Stretton Parsonage, is one 90 ft. high, with a trunk 3 ft. 4 in. in diameter. In Warwickshire, at Combe Abbey, 100 years planted, it is 70 ft. high, the diameter of the trunk 3 ft. 9 in., and of the head 50 ft. In Worcestershire, at Hagley, is one with a trunk 3 ft. 2 in. in diameter; at Hazor House, 13 years planted, it is 22 ft. high; at Croome, 65 years planted, it is 70 ft. high, the diameter of the trunk 3 ft., and of the head 60 ft. In Yorkshire, at Castle Howard, it is 120 ft. high, the diameter of the trunk 3 ft., and with a bole 100 ft. in length; at Studley, one is 99 ft. high, with a trunk 3 ft. 5 in. in diameter; and another is 82 ft. 6 in. high, diameter of the trunk 3 ft. 3 in., and of the head 51 ft. (See fig. 2050, in p. 2163.)

Pinus sylvestris in Scotland. In the Environs of Edinburgh. At Dalmeny Park, it is 60 ft. high, the diameter of the trunk 3 ft., and of the head 36 ft. — South of Edinburgh. In Ayrshire, at Dalquharren, it is 70 ft. high, the diameter of the trunk 2 ft. 9 in.; another, 27 years planted, is 45 ft. high; at Kilkerran, 130 years old, it is 70 ft. high, the diameter of the trunk 3 ft.; at Newark, it is 60 ft. high, with a trunk 3 ft. 9 in. in diameter. In Haddingtonshire, at Tynninghame, 110 years old, it is 40 ft. high, the diameter of the trunk 5 ft. 4 in., and of the head 45 ft. — North of Edinburgh. In Aberdeenshire, at Thainston, it is 55 ft. high, with a trunk 8 in. in diameter; in Glen Dee, in the group fig. 2055. (to a scale of 50 ft. to 1 in.) it is 75 ft. high. In Banffshire, at Gordon Castle, it is 90 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 60 ft. In Forfarshire, at Kinnaird Castle, 150 years old, it is 75 ft. high, the diameter of the trunk 3 ft. 6 in. In Invernesshire, at Coul, 40 years planted, it is 50 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 30 ft. In Perthshire, at Lawers, it is 60 ft. high, the diameter of the trunk 3 ft. 4 in., and of the head 57 ft.; at Dupplin, it is 59 ft. high, the diameter of the trunk 3 ft. 6 in.; at Gleneagles (the Braemar fir), it is 50 ft. high, with a trunk 3 ft. 6 in. in diameter; at Taymouth, it is 60 ft. high, with a trunk 4 ft. in diameter; another, 90 years planted, is 69 ft. high, the diameter of the trunk 4 ft., and of the head 36 ft. In Sutherlandshire, at Ardriss, it is 90 ft. high, the diameter of the trunk 2 ft. 9 in., and of the head 25 ft.; at Kilkalmkill, it is 68 ft. high, the diameter of the trunk 2 ft. 3 in., and of the head 31 ft. In Stirlingshire, at Blair Drummond, 75 years planted, it is 50 ft. high, the diameter of the trunk 3 ft., and of the head 40 ft.; at Airthrey, Tullibody, and Blairlogie, are specimens above 60 ft. high, with trunks 2 ft. 6 in. in diameter; at Callendar Park, it is 60 ft. high, the diameter of the trunk 4 ft. and of the head 80 ft.; in Bannockburn Wood, it is 74 ft. high; and at Dunmore (see fig. 2056., to a scale of 50 ft. to 1 in.), 67 ft. high.

Pinus sylvestris in Ireland. Near Dublin, at Cypress Grove, it is 75 ft. high, the diameter of the trunk 3 ft. 6 in. and of the head 50 ft. In King's County, at Charleville Forest, 45 years planted, it is 76 ft. high, diameter of the trunk 5 ft. In Fermanagh, at Florence Court, it is 90 ft. high, the diameter of the trunk 3 ft. 6 in.; at Castle Coole, it is 85 ft. high, the diameter of the trunk 3 ft. 6 in. In Sligo, at Makree Castle, it is 71 ft. high. In Kilkenny, at Mt. Juliet, it is 72 ft. high. In Tipperary, at the seat of — Walls, Esq., near Carrick on Suir, there is a Scotch pine with a trunk 60 ft. in height, clear of branches, and a circumference of 15 ft., the whole tree is 86 ft. high. The Scotch pine at this place grows spontaneously from seed shed by the old trees; and the timber, which is supposed equal to that of Norway, sells on the spot at 3s. 8d. per cubic foot.



2055



2056

Pinus sylvestris in France. Near Paris, at Verrières, 20 years planted, it is 32 ft. high; and a pyramidal variety, of the same age, is 18 ft. high. In Brittany, at Barres, 12 years planted, it is 14 ft. high. At Colombey, near Metz, 70 years planted, it is 99 ft. high, the diameter of the trunk 2 ft. 6 in. In the Botanic Garden at Avranches, 40 years planted, it is 40 ft. high. In the Park of Clervaux, near Chât Meraut, 33 years planted, it is 69 ft. high.

Pinus sylvestris in other Countries. In Bavaria, in the Botanic Garden at Munich, 24 years planted, it is 24 ft. high. In Austria, near Vienna, at Brück on the Leytha, 60 years planted, it is 90 ft. high. In Sweden, in the Botanic Garden at Lund, it is 54 ft. high. In Russia, near St. Petersburg, on the small island of Sosnovy Rosh, it is 77 ft. high, the diameter of the trunk 2 ft., and of the head 16 ft. In Italy, at Monza, 65 years planted, it is 60 ft. high.

Commercial Statistics. In the London nurseries, one year's seedling plants of the common variety are 1s. 6d. a thousand; two years' seedlings, 3s. 6d. a thousand; plants one year transplanted, 10s. a thousand; and two years transplanted, 20s. a thousand. At Bollwyller, single plants transplanted are 3 cents each; and at New York, 50 cents. Plants of the Highland red pine are, in London, 1s. 9d. a thousand; and at Grigor's Nursery, Forres, N. B., 1s. 6d. a thousand; and of the pin de Hagueneau, at Bollwyller, 8 cents each. Seeds of the common Scotch pine are, in London, 2s. per lb.; of the Highland pine, 2s. 6d. per lb.; and seeds of the pin de Hagueneau, at Bollwyller, are 1 franc 50 cents per lb.

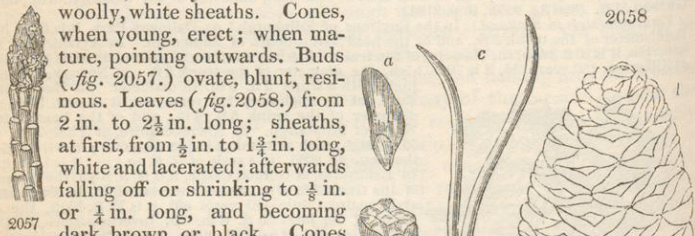
* ♀ 2. *P. (s.) PUMILIO* Hænke. The dwarf, or Mountain, Pine.

Identification. Hænke Beob., 68.; Willd. Sp. Pl., 4. p. 495.; Lamb. Pin., ed. 2., 1. t. 2.; Cam. Hort., 127.; Clus. Pan., 15.; Hall. Helv., No. 1668. γ; Ait. Hort. Kew., ed. 2., 5. p. 314.; Lodd. Cat., ed. 1836.; Baum. Cat., ed. 1835.

Synonymes. *P. sylvestris montana* γ Ait. Hort. Kew., ed. 1., 3. p. 366.; *P. s. humilis* γ Nees. Cat. Hort. Blackb., 50.; *P. cōnis erectis* Tourn. Inst. 586.; Scheuchz. It., 460.; Du Ham. Arb., 2. p. 126.; *P. humilis*, &c., Tourn. Inst., 586.; *P. suædeticus* seu *carpaticus* Ungarisch Mag., 3ter bande, 38.; *Pinaster cōnis erectis* Bauh. Pin., 492.; *P. tatãrica* Mill. in Herb. Banks.; *P. p. montanus* Park., 1537. f. 8.; *P. quartus australicus* Clus. Hist., 1. p. 32.; Pin nain, Fr.; Krumholz, Ger.

Engravings. Lamb. Pin., ed. 2., 1. t. 2.; our fig. 2061., to our usual scale, and figs. 2057. and 2058., of the natural size.

Spec. Char., &c. Branches generally recumbent. Leaves short, stiff, somewhat twisted; thickly distributed over the branches, with long, lacerated,



woolly, white sheaths. Cones, when young, erect; when mature, pointing outwards. Buds (fig. 2057.) ovate, blunt, resinous. Leaves (fig. 2058.) from 2 in. to 2½ in. long; sheaths, at first, from ½ in. to 1¾ in. long, white and lacerated; afterwards falling off or shrinking to ⅓ in. or ¼ in. long, and becoming dark brown or black. Cones (d) from 1½ in. to 2 in. long, and from ¾ in. to 1 in. broad; reddish or dark purplish brown when young, and of a dull brown when mature. Scales (b) and seeds (a) resembling those of *P. sylvestris*, but smaller. Cotyledons 5 to 7. A large spreading bush, or low tree; a native of Europe, on mountains. Introduced in 1779; flowering and ripening its cones at the same time as the Scotch pine. Fig. 2063. in p. 2190. is a portrait of a bush at Dropmore, which, in 1837, was 12 ft. high and 25 ft. in diameter.

Varieties.

* ♀ *P. (s.) p. 2 rubraeflora* has red flowers, but does not differ in any other respect from *P. (s.) pumilio*. There is a bush of it at Dropmore above 12 ft. high, and covering a space 21 ft. in diameter.

* ♀ *P. (s.) p. 3 Fischeri* Booth, Lodd. Cat., ed. 1836, Lawson's Man., p. 333. — Only small grafted plants of this variety are in the country, it not having been introduced till about 1832. In the shoots and foliage, it bears so strong a resemblance to *P. (s.) pumilio*, that we doubt very much if it even merits to be considered as a variety of

that species; nevertheless we give it as such, till it shall be farther known. In the Horticultural Society's Garden, it was, in August, 1837, 4 ft. 6 in. high, and produced two cones, which, however, did not arrive at maturity. The scales were not hooked, and they did not appear to differ from those of *P. (s.) pumilio*. Mr. Booth states that he raised *P. (s.) p. Fischeri* in 1825-6, from seeds received from M. Kin of Philadelphia; from which it might be presumed that it was something quite distinct from any European species or variety. Plants, in the Floetbeck Nurseries, are 10s. 6d. each.

* † *P. (s.) p. 4 Mughus*; *P. s. Mughu* Matt. Camer.; *P. montana Baum. Cat.*; *P. Mughu* Jacq., Poir, and N. Du Ham., v. p. 233. t. 68.; *P. echinata Hort.*; *P. uncinata Dec., Lod. Cat.*, ed. 1836; and our *figs. 2059.* and 2060.; the latter showing the cone, seed, scale, and sheath of leaves, of the natural size. The Mughu wild Pine; Pin Mughu, Torchepin, Pin suffis, Pin crin, Pin du Briançonnais, Pin de Montagne, *Fr.*; Bergfichte, *Ger.* — This variety is included by Aiton and others in the preceding one; but, having seen both sorts bearing cones, we are satisfied that they are distinct, though they bear so close a resemblance to each other in foliage and habit, that, when the cones are absent, they might be supposed to be identical. It is remarked in the *Nouveau Du Hamel*, that all the published figures of this variety are bad, with the exception of the one given in that work, from which ours is copied. On comparing *figs. 2058.* and 2060., it will be found that the cones of *P. (s.) p. Mughus*, independently of the peculiar protuberant appearance of the scales, are larger than those of *P. (s.) pumilio*. This and other differences in the cones are quite sufficient, in a technical point of view to constitute *P. (s.) p. Mughus* and *P. (s.) pumilio* distinct species; but, notwithstanding this, they bear such obvious marks of belonging to *P. sylvestris* in their foliage, habit, and locality, that we cannot for a moment hesitate about uniting them to that species. The only plants which we feel quite certain are the *P. Mughu* of the *Nouveau Du Hamel* are at Syon, at Dropmore, and in the Horticultural Society's Garden, because the cones on the plants in all these places exactly resemble that in our *fig. 2060.*, which, as before stated, is copied from the *Nouveau Du Hamel*. *Fig. 2061.* is a portrait of the tree, or rather bush, at Dropmore,

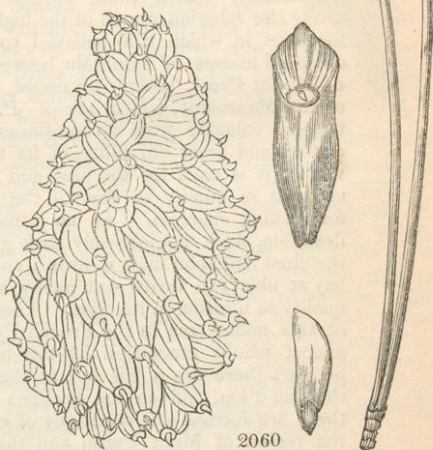
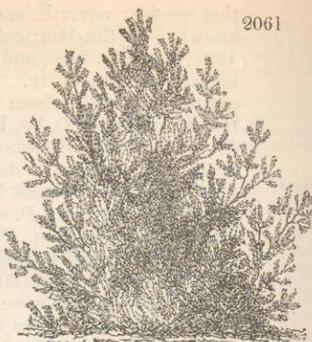


Fig. 2061. is a portrait of the tree, or rather bush, at Dropmore,

to a scale of 8 ft. to 1 in.; and which was, in 1837, 14 ft. high. This variety is described, in the *Nouv. Du Hamel*, as having the leaves rigid, and of a deep green; the cone conical, often two together, shorter than the leaves, with their scales ending in a pyramidal quadrangular point, which is turned back. The catkins of the male flowers are almost sessile, and the anthers have a round membranaceous crest. It forms a bush in some cases, and a tree in others, according to the soil and situation in which it springs up or is planted. The cones readily distinguish it from *P. (s.) pumilio*. It is found on the Carniolan Mountains, the Pyrenees, on Mount Ventoux, and in other places. M. Villars observes that, when it grows on the summits of mountains, it is a mere bush; but that, as it descends to the plains, it becomes a tree.



The *P. s. uncinata* of Captain S. E. Cook (*Sketches*, ii. p. 230.), we believe, judging from the young plants in the Horticultural Society's Garden, and from cones sent to Captain Cook from M. P. Boileau, through M. Vilmorin, to be either identical with, or a subvariety of, *P. (s.) Mughus*. The following note has been sent to us by Captain Cook:—" *P. uncinata* is found on the upper zone, or line, of the forest vegetation of the Pyrenees, on both sides the chain. At the Lac de Gaube, and in a few other localities where the forests have been allowed to attain their natural state, it is mixed, at first, with *Picea pectinata* and *Pinus sylvestris*; but, as you ascend, it gradually leaves these species below, and occupies exclusively the Siberian region of the high or central Pyrenees. Other localities in which it is believed to occur are, on some elevated detached masses of mountain between the Pyrenees and the Alps of Mount Cenis, where, no doubt, it lies over the great forests of the Maurienne, which are of *P. sylvestris*. This pine is extremely valuable from its hardiness, as well as for the resinous quality and great durability of its timber. In the Spanish provinces, it is used for torches; and its timber is considered to be superior in quality to that of the *P. sylvestris*; it is also used for making charcoal. As an ornamental tree, it will be highly desirable, from the intensely dark green of its foliage, as well as the close and solid mass it forms, and the habit of the tree, where left at liberty to throw out massy arms, trailing on the ground, a quality so unusual in its class. There are now very scanty remains of this noble tree in the French Pyrenees, where they have been almost wholly eradicated by the barbarous improvidence of the people: there are a few left at the Lac de Gaube, at Gavarnie, at the Lac d'Oo, and on the Arriège; but in Aragon and Catalonia there are forests still remaining of vast extent. They extend from the region of Mont Perdu and the Maledetta, to the Valley of Andorre on the Sègre; the most considerable forests being those opposite to the Valley of Arreau, within the Spanish territory, those to the north-east of Bènarque, and those of the republic of Andorre. It must be grouped with *P. sylvestris*, to which it is nearly related; but the port, colour, and strength of the leaves, and the

form of the cones, enable the practised eye to distinguish it in a moment from that species. — *S. E. Cook. Carlton, near Darlington, May, 1837.*"

- ♁ † *P. (s.) p. 5 M. nana*, the Knee Pine of the Styrian Alps, never grows above 3 ft. high. A plant has been in the Trinity College Botanic Garden, Dublin, since 1817; and, in 20 years, it has not attained a greater height than an ordinary-sized man's knee.

Other Varieties. *P. (s.) pumilio* and *P. (s.) p. Mughus* vary so much according to the localities in which they are found, that, if it were desirable to increase the number of subvarieties, there might be a dwarf, a tall, and a medium form given to each. In the Horticultural Society's Garden, there is a handsome, erect-growing, small tree of *P. (s.) p. Mughus*, under the name of *P. uncinata*, and also a dwarf plant, under the same name; both producing hooked cones. At White Knights, where there are 20 or 30 plants of *P. (s.) pumilio*, they vary in size from a recumbent bush, 5 ft. or 6 ft. high, and 20 ft. or 30 ft. in diameter, to trees of between 30 ft. and 40 ft. in height; some of them with trunks clear of branches to 3 ft. or 4 ft. from the ground. Some of these trees have been drawn up in this form in consequence of being crowded among others.

Description, &c. The common character belonging to all the varieties of *P. (s.) pumilio* is, that of being smaller in all their parts, and less glaucous in the general appearance of their foliage, than *P. sylvestris*. The leaves are also much more thickly set on the branches; and the sheaths on the leaves of the current year are much longer and whiter, especially towards the extremities of the shoots. In the dwarf varieties, the cones are small; and those of *P. (s.) p. Mughus* have often a deformed stunted appearance; but, in some of the tall varieties of *P. (s.) pumilio*, the cones are exactly like those of the Scotch pine, as are also the buds. The rate of growth is slow in all the varieties, in the tallest not exceeding 4 in. or 5 in., or at most 6 in., in the year. All the varieties are natives of the mountains of most parts of Europe, more especially in France and Germany; and they have been recognised by botanists from the time of Mathioli. *P. (s.) pumilio* appears to have been first cultivated in England in 1779, by John Blackburn, Esq., at Orford Hall, near Warrington, in Lancashire, where the original plant still exists, forming a large recumbent bush, but in a shattered condition. All the varieties have a powerful terebinthinate odour; and produce abundantly, when the branches are broken, a fragrant and fluid resin, which is sold, in Hungary, Carniola, &c., as a balsam for curing ulcers, contusions, and rheumatism. The krumholz oil, which is produced by distillation from the burned branches, is of a golden colour, agreeable odour, and acrid oily flavour; and it is used for similar diseases, particularly in veterinary surgery. In Britain, *P. (s.) pumilio* and its varieties are curious or ornamental bushes or trees, and, as such, are valuable objects in small gardens, and in miniature pinetums. The vigour of the foliage, and the intensity of its colour, vary exceedingly, according to the soil and situation in which any of the varieties of this plant and *P. (s.) p. Mughus* are placed. The different varieties come tolerably true from seed, by which means they are generally propagated; but *P. (s.) p. Fischeri* has hitherto been inarched, not having yet ripened cones, either on the Continent or in Britain.

Statistics. The largest plants of *P. (s.) pumilio* in the immediate neighbourhood of London are at Syon, and in the Horticultural Society's Garden, where they are from 4 ft. to 6 ft. high. The largest in England are at White Knights, where there are a number of trees upwards of 30 ft. high; and several bushes of from 20 ft. to 30 ft. in diameter, and 10 ft. or 12 ft. high. At Dropmore, the bush of which *fig. 2063.* is a portrait, to a scale of 8 ft. to 1 in., is above 12 ft. high, and covers a space 25 ft. in diameter. At Hendon Rectory, there are several handsome conical plants in pots, from 3 ft. to 5 ft. high. At Bollwyller, plants of *P. (s.) pumilio* are 1 franc 50 cents, and of *P. (s.) p. Mughus* 1 franc, each. Plants of *P. uncinata*, in the London nurseries, are 10s. 6d. each; but, whether they are identical with *P. (s.) p. Mughus*, or with *P. s. 4 uncinata* (p. 2156.), we are uncertain, having only seen very small plants.





2063

‡ 3. *P. BANKSIANA* Lamb. Banks's, or the Labrador, Pine.

Identification. Lamb. Pin., ed. 2., 1. t. 3.; Smith in Rees's Cyclo., No. 4.; N. Du Ham., 5. p. 254.; Pursh Fl. Amer. Sept., 2. p. 642.; Lodd. Cat., 1836; Bon Jard., ed. 1837, p. 974.

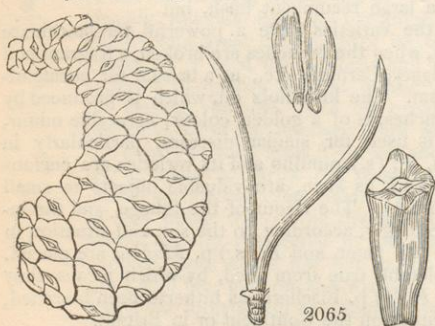
Synonymes. *P. sylvestris divaricata* Ait. Hort. Kew., 3. p. 366.; *P. rupéstris* Michx. N. Amer. Syl., 3. p. 118.; *P. hudsonica* Lam. Encyc., 5. p. 339.; Scrub Pine, Grey Pine, Hudson's Bay Pine; Ypres, Canada.

Engravings. Lamb. Pin., ed. 2., 1. t. 3.; N. Du Ham., 5. t. 67. f. 3.; Michx. N. Amer. Syl., 3. t. 136.; our fig. 2064., to our usual scale of 1 in. to 2 ft.; and fig. 2065., of the natural size; all from Dropmore specimens.

Spec. Char., &c. Leaves in pairs, divaricated, oblique. Cones recurved, twisted. Crest of the anthers dilated. (Smith.) Bud $\frac{1}{4}$ in. long, and $\frac{1}{8}$ in. broad; cylindrical, blunt at the point, whitish, and covered with resin in large particles; central bud surrounded by from three to five smaller buds, as shown in fig. 2064. Leaves (see fig. 2065.) from 1 in. to $1\frac{1}{2}$ in. in length, including the sheath, which is short, and has three or four rings. Cones from $1\frac{1}{2}$ in. to 2 in. long. Leaves and cones retained on the tree three or four years. Scales terminating in a roundish protuberance, with a blunt point. Seeds extremely small.



Description. A low, scrubby, straggling tree, not rising higher in its native country, where it grows among barren rocks, than from 5 ft. to 8 ft.; but in British collections, in good soil, attaining more than three times that height. Occasionally, among the rocks of Labrador, Michaux observes, this pine produces cones, and even exhibits the appearance of decrepid old age, at the height of 3 ft.; and in no part of North America did he find it more than 10 ft. high. Dr. Richardson, however, in Franklin's *Narrative of a Journey to the Shores of the Polar Seas in 1819 and 1822*, describes *P. Banksiana* as a "handsome tree, with long, spreading, flexible branches, generally furnished with whorled curved cones, of many years' growth. It attains," he adds, "the height of 40 ft. and upwards in favourable situations; but the diameter of its trunk is greater, in proportion to its height, than in the other pines of the country. In its native situations, it exudes much less resin than *A'bies álba*." (App. No. 7. p. 752.) Douglas found it on the higher banks of the Columbia and in the valleys of the Rocky Mountains, and his specimens have much longer leaves than are produced by the trees in Britain.



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The species is readily known by the leaves being regularly distributed over the branches, instead of being collected in tufts alternating with naked spaces, as they appear to be in most other pines. In America, the leaves are about 1 in. long; but at Dropmore they are sometimes more than $1\frac{1}{2}$ in. The catkins of both sexes are expanded in May, before those of *P. sylvestris*; but, as in that species, the cones do not attain their full size and maturity till the November of the second year, and do not open to shed their seeds till the spring of the third year. The cones are commonly in pairs, of a grey or ash colour (whence the American name of grey pine); they are above 2 in. long, and have the peculiarity of always pointing in the same direction as the branches. They are remarkable for curving to one side, which gives them the appearance of small horns. They are extremely hard, and often remain on the trees several years.

Geography, History, &c. *P. Banksiana*, according to Michaux, is found farther northward than any other American pine. In Nova Scotia and the district of Maine, where it is rare, it is called the scrub pine; and, in Canada, the grey pine. According to Titus Smith (*Mag. Nat. Hist.*, viii. p. 655.), it is called, in the neighbourhood of Halifax, the long-limbed Hudson's Bay pine. "In the environs of Hudson's Bay, and of the Great Mistassin Lakes, the trees, which compose the forests a few degrees farther south, disappear almost entirely, in consequence of the severity of the climate and the sterility of the soil. The face of the country is almost everywhere broken by innumerable lakes, and covered with large rocks piled upon one another, and usually overgrown with black lichens, which deepen the gloomy aspect of these desolate and almost uninhabited regions." (*Michx.*) Here and there, in the intervals of the rocks, Michaux adds, are seen a few individuals of the scrub pine; but they seldom grow higher than 3 ft. Dr. Richardson, in Franklin's *Narrative*, states that *P. Banksiana* was found exclusively occupying dry sandy soils. It occurred as far to the northward as lat. 64° ; but it was said to attain higher latitudes on the sandy banks of the Mackenzie River. At what time, and by whom, this pine was introduced into Britain, is uncertain: it was in cultivation by Forsyth, in the Chelsea Botanic Garden, before 1785; but, as Mr. Lambert, in 1804, found a remarkably fine tree growing at Pain's Hill, it was in all probability planted there by the founder of the place, the Hon. Charles Hamilton, pre-



2067



vously to 1735 (see p. 70.). Mr. Lambert, writing in 1804, says that he then only knew of three trees of *P. Banksiana* in England that were of any size; viz., the one at Pain's Hill we have just mentioned, one at Kew, and another at Croome. The first is probably no longer in existence, because a party of four, of which we were one, searched a whole day for it in vain, in the grounds at Pain's Hill, on July 22. 1837; that at Kew is no more; and that at Croome, if it still exists, is not known to the gardener there. The handsomest tree that we know of *P. Banksiana* in England is that at Dropmore, of which *fig.* 2067. is a portrait to a scale of 1 in. to 8 ft.; and which was, in August, 1837, 27 ft. high, the diameter of the trunk 18 in., and that of the space covered by the branches 24 ft. It is a most elegant tree, well characterised by Dr. Richardson as having long, spreading, flexible branches. It bears abundance of cones, which remain on the trees for several years, and give the branches a singular appearance. There is a tree of this species 30 ft. high at White Knights, but it has not assumed so elegant a shape as that at Dropmore. There is a plant of it at Messrs. Loddiges's, 3 ft. 6 in. high; and one in the Horticultural Society's Garden, 3 ft. high. The only one that we have heard of in France is in the Jardin des Plantes, where, in 1837, it was 4 ft. high. The species is rather scarce in British nurseries.

Properties and Uses. Dr. Richardson mentions that the Canada porcupine feeds on the bark of this tree, and that the wood, from its lightness, and the straightness and toughness of its fibres, is much prized for canoe timbers. Titus Smith says that, on the shallow soils in the neighbourhood of Halifax, if not consumed by fires, it produces timber of a useful size. Michaux informs us that the Canadians find a speedy cure for obstinate colds, from a diet drink made by boiling the cones of *P. Banksiana* in water; and this is all, he says, that the tree is good for. As an ornamental tree, we think it one of the most interesting of the genus, from the graceful manner in which it throws about its long, flexible, twisted branches, which are generally covered throughout their whole length with twisted glaucous green leaves, with here and there a whorl of curiously hooked horn-like cones. It is one of the hardiest of the *Abietinæ*; enduring, in the Floetbeck Nurseries, 12° of Réaumur (5° Fahr.); and, therefore, it may be safely planted in pinetums in the extreme north, not only of Britain, but of Europe.

Soil, Propagation, Culture, &c. (See p. 2127.) Plants are raised from imported seeds, when these can be procured; but the species may be inarched, or grafted in the herbaceous manner, on *P. sylvestris*. (See p. 2129.) In the herbarium of the Horticultural Society, there are specimens of *P. Banksiana* sent home by Douglas, infested with a parasitic plant, resembling, in its ramifications, foliage, and colour, a mistletoe in miniature. It is the *Arceuthobium Oxycedri Hook.*, and will be found figured in a future page.

Commercial Statistics. Price, in the London nurseries, 7s. 6d. each; at Bollwyller, 2 francs.

B. Cones large, having the Scales furnished with Prickles.

4. *P. INOPS* Ait. The Jersey, or poor, Pine.

Identification. Ait. Hort. Kew., ed. 1., 3. p. 367., ed. 2., 5. p. 316.; Smith in Rees's Cyclo., No. 10.; Willd. Sp. Pl., 4. p. 496.; Baumz., 208.; Mart. Mill., No. 3.; Lamb. Pin., ed. 2., 1. t. 12.; N. Du Ham., t. 5. p. 236.; Michx. N. Amer. Syl., 3. p. 129.; Hayne Dend., No. 4.; Lodd. Cat., ed. 1836.; Bon Jard., 1837., p. 976.; Lawson's Manual, p. 346.

Synonymes. *P. virginiana Du Roi Harbk.*, ed. Pott., 2. p. 47., Mill. Dict., No. 9., Wagh. Bell., p. 74.; Pin chétif, Fr.

Engravings. Lamb. Pin., ed. 2., 1. t. 12.; N. Du Ham., t. 69. f. 1.; Michx. N. Amer. Syl., 3. t. 137.; our *fig.* 2070., to our usual scale; and *figs.* 2068. and 2069., of the natural size; all from Dropmore specimens.

Spec. Char., &c. Leaves in pairs. Cones drooping oblong-conical, longer than the leaves. The scales awl-shaped, with prominent prickles. Crest of the anthers short, broad, jagged. (*Smith.*) Bud (*fig.* 2068.) from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. long, and $\frac{1}{8}$ in. broad; cylindrical, blunt at the point, resinous, brown, and surrounded by three small buds. Cone (*fig.* 2069.) from $2\frac{3}{4}$ in. to $3\frac{1}{2}$ in. long, and from 1 in. to $1\frac{3}{8}$ in. broad. Some of those at Dropmore are of the last dimensions. Scales of a hard woody texture, of a yellowish brown colour, with a sharp woody prickle pro-

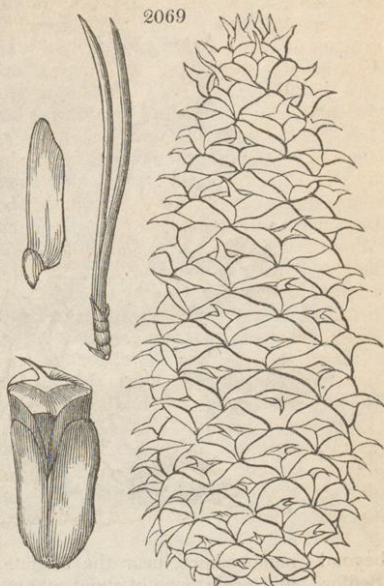


jecting from each, which is generally straight. Leaves from $1\frac{3}{4}$ in. to $2\frac{3}{4}$ in. long. Sheaths with 3 or 4 rings. Seeds small, cotyledons 6 to 8. Young shoots covered with a fine purplish glaucous bloom.

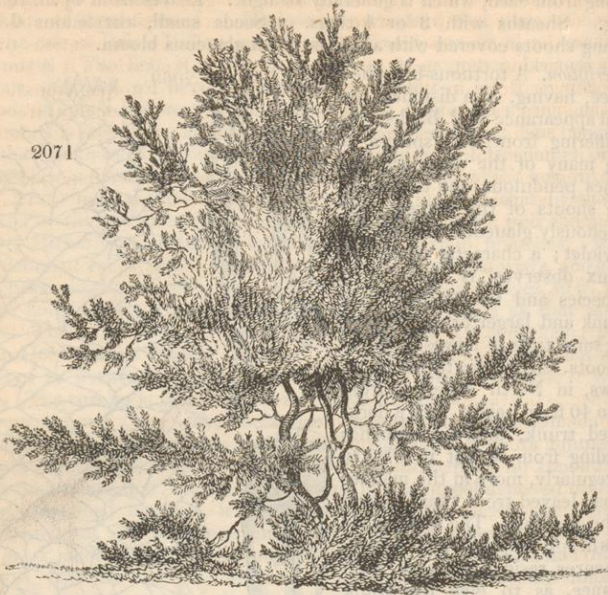
Description. A tortuous-branched low tree, having, at a distance, the general appearance of *P. Banksiana*; but differing from that species in having many of the more slender branches pendulous, and the wood of the shoots of the current year conspicuously glaucous and tinged with violet; a character which, as Michaux observes, is peculiar to this species and to *P. mitis*; and the trunk and larger branches producing small tufts of leaves, or abortive shoots. According to Michaux, it grows, in North America, from 30 ft. to 40 ft. in height, with a dark-coloured trunk, and the branches proceeding from it, not in whorls, but irregularly, more in the manner of broad-leaved trees than is usual with the *Abietinæ*. The bark, in old trees, is deeply cracked; and through the fissures resin exudes in such abundance, as to give the trunk and branches the appearance of being candied over with sugar. The

leaves are of a dark green, and scattered equally over the branches, in the manner of *P. Banksiana*; but they are not so persistent, nor so glaucous, as in that species. The cones, Michaux describes as about 2 in. long, and 1 in. in diameter at the base: they are attached by short thick peduncles, and are armed with long fine awl-shaped spines; they are usually single, and turned more or less towards the ground. In the neighbourhood of New York, in lat. 41° , the flowers appear in the beginning of May; the cones are mature in the November of the second year; and the seed drops out the following spring. The trees of this species in the pinetum at Dropmore agree very well with Michaux's description; but they are not yet sufficiently old, or, perhaps, our summers are not sufficiently warm, to cause an exudation of resin to the extent mentioned by that author. The buds, however, are resinous; and this matter very readily exudes, and incrusts the surface of the sections wherever a branch is cut off. At Dropmore, in warm weather during sunshine, the fragrance of the air in the neighbourhood of this tree is delightfully balsamic.

Geography, History, &c. The Jersey pine inhabits the interior of North America, chiefly south of latitude 45° ; and, according to Pursh, it is found from New Jersey to Carolina, on dry barren soils. Michaux states that it abounds in the lower parts of New Jersey, where the soil is meagre and sandy, and where it is often accompanied by the yellow pine (*P. mitis*); and that it is also found in Maryland, Virginia, and Kentucky; in Pennsylvania,



2071



beyond Chambersburg, near the Juniata, and on the scrubby ridges beyond Bedford, at the distance of about 200 miles from Philadelphia. In this part of Pennsylvania, it is called the scrub pine; and it is seen wherever the soil is composed of argillaceous schistus, and is consequently poor. The poorness of the soil on which it grows is attested by the decrepid appearance of the scarlet, red, black, white, and rock-chestnut oaks, among which it grows. Michaux never saw it northward of the river Hudson; and neither in the Carolinas, nor in Georgia. According to the *Hortus Kewensis*, it was cultivated in 1739, by Miller; but, though it is a singular-looking, and in our opinion most interesting, tree, it is not common in British collections. The finest trees of it which we have seen are at Pain's Hill, where it is 40 ft. high, with a trunk 1 ft. 6 in. in diameter; and at Dropmore and White Knights, at both which places, it bears abundance of cones. Fig. 2071. is a portrait of one of the three Dropmore trees, which, after being 17 years planted, was, in 1837, 25 ft. high, with a head covering a space 24 ft. in diameter. There are three fine trees at White Knights, from 25 ft. to 30 ft. high, which have retained their cones ten or twelve years; and many of the shoots of which appear to be as amply furnished with cones as leaves. A tree at Syon is 14 ft. high. There is a low, crooked, pendulous-branched tree of this species in the arboretum at Kew, about 10 ft. high; one at Messrs. Loddiges's 5 ft. high; and one of the same height, which has been 7 years planted, in the Horticultural Society's Garden. In France, according to the *Nouveau Du Hamel*, there is a tree 20 ft. high in the gardens of the Trianon; and M. Héricaut de Thury has several trees which produced cones at the age of 20 years, and have since continued to do so every year.

Properties and Uses. The wood of the Jersey pine, according to Michaux, is of little use, except for fuel, on account of its small dimensions, and the large proportion of sap wood which it contains; but, as it abounds in resin, tar is obtained from it. Kalm mentions, in his *Travels in North America*, that, in the heat of summer, cattle resort for shade to this tree, in preference to any other, even though their foliage were much thicker. He saw cattle studiously singling out *P. inops* in order to get under its branches; probably

from the gratefulness of its fragrance; for it is highly probable that the brute animals, especially in a wild state, are even more sensible of the odour of trees than the human species. Michaux concludes his observations on this tree by remarking that, next to the grey pine (*P. Banksiana*), it is the most uninteresting species in the United States; but as, in Europe, almost all the American pines can only be considered in the light of ornamental trees, this species, as such, well deserves a place in collections, from the singularity of its form, its delightful fragrance, and its hardness.

Soil, Propagation, &c. Plants are sometimes raised from imported seeds; or they may be inarched, or grafted in the herbaceous manner, on *P. sylvêstris*. (See p. 2127. and p. 2129.)

‡ 5. *P. MITIS* Michx. The soft-leaved, or yellow, Pine.

Identification. Michx. Fl. Bor. Amer., N. Amer. Syl., 3. p. 190; Lodd. Cat., ed. 1836; Bon Jard., ed. 1837.

Synonymes. *P. variabilis* Pursh Fl. Amer. Sept. p. 642., N. Du Ham. 5. p. 234.; ? *P. echinata* Mill., Diet. No. 12.; New York Pine, Spruce Pine, Short-leaved Pine, Amer. Engravings. Michx. N. Amer. Syl., 3. t. 137; our figs. 2076. from Dropmore, and 2075. from Michaux, to our usual scale; and figs. 2072., 2073., and 2074., of the natural size.

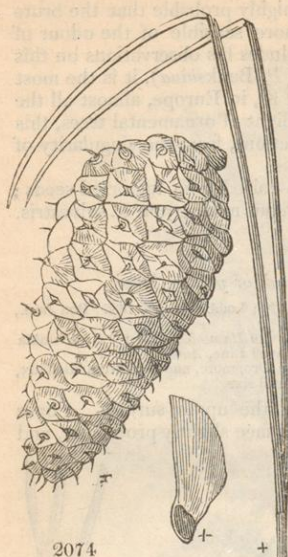
Spec. Char. Leaves long, slender; hollowed on the upper surface. Cones small, ovate-conical. Scales with their outer surface slightly prominent, and

terminating in a very small slender mucro, pointing outwards. (*Michaux.*) Buds, on a young tree (*fig. 2072.*), $\frac{3}{16}$ in. long, and $\frac{2}{8}$ in. broad; on an old tree, larger (*fig. 2073.*); scarcely resinous. Leaves (*fig. 2074.* from Michaux), from $2\frac{1}{2}$ in. to 4 in. long, with sheaths $\frac{1}{2}$ in. long; white, lacerated, afterwards becoming dark, slightly ringed. Cone, 2 in. long, and 1 in. broad in the widest part. Seeds small; with the wing, $\frac{3}{4}$ in. long.

Young shoots covered with a violet-coloured glaucous bloom, like those of *P. inops*, by which it is readily distinguished from the *P. variabilis* of Lambert.

Description. A beautiful tree; according to Michaux, 50 ft. or 60 ft. high, with a trunk of a uniform diameter of 15 in. or 18 in. for nearly two thirds of its length. The branches are spreading on the lower part of the trunk, but become less divergent as they approach the head of the tree, where they are bent towards the body so as to form a summit regularly pyramidal; but not spacious in proportion to the dimensions of the trunk. This narrow conical appearance of the head, as compared with the spreading character of those of other species, seems to have given rise to the name of spruce pine in America. The leaves, according to Michaux, are 4 in. or 5 in. long, fine and flexible (whence the specific name of *mitis*, soft), hollowed on the upper surface, of a dark green, and united in pairs. Sometimes, from luxuriancy of vegetation, three leaves are found in the same sheath on young shoots, but never on old branches. The cones are oval, armed with fine spines, and smaller than those of any other American pine; scarcely exceeding $1\frac{1}{2}$ in. in length, even upon old trees. The concentric circles of the wood of the yellow pine, Michaux states, are six times as numerous, in a given space, as those of the pitch pine (*P. rigida*) and the loblolly pine (*P. Tæda*). "In trunks 15 in. or 18 in. in diameter, there are only 2 in. or $2\frac{1}{2}$ in. of sap wood, and still less in such as exceed this size. The heart wood is fine grained, and moderately resinous, which renders it compact, without its being of great weight. Long experience has proved its excellence, and durability." (*Michx.*)





2074

Geography. The yellow pine is found in most pine forests, from New England to Georgia. Towards the north, it does not extend beyond some districts of Connecticut and Massachusetts. It is abundant in the lower part of New Jersey, and still more so on the eastern shore of Maryland, and in the lower parts of Virginia, where it is seen only on the most arid soils. Michaux "also met with it on the right bank of the river Hudson, at a little distance from Albany; at Chambersburg, in Pennsylvania; near Mudlick, in Kentucky; on the Cumberland Mountains, and in the vicinity of Knoxville, in East Tennessee; at Edgefield Court House, in the upper part of South Carolina; and on the river Oconee, in the upper part of Georgia. In all these places, it is found growing along with other



2075

trees; and it enters, in a greater or less proportion, into the composition of the indigenous forests, according to the nature of the soil. It abounds

on the poorest lands; but on those of a certain degree of fertility, which is indicated by the flourishing appearance of the oaks and walnuts, it is more rare, though it still surpasses the surrounding trees in bulk and elevation. The yellow pine is also occasionally seen in the lower part of the Carolinas, in the Floridas, and probably in Louisiana; but in these regions it grows only on spots consisting of beds of red clay mingled with gravel, which here and there pierce the light covering of sand which forms the surface of the country to the distance of 120 miles from the sea."

History. When *P. mitis* was introduced into England is uncertain; unless we conclude that it was the *P. echinata* of Mill. *Dictionary*, in which case it was in cultivation in 1739. The *P. variabilis* of Lambert's *Pinus* is unquestionably a totally different plant from the *P. mitis* of Michaux; being without the violet-coloured glaucous bloom on the young shoots; having rigid leaves, generally in threes; and a cone with very strong prickles, like that of *P. Tæ'da*, to which species we have referred it. The only plants that we know which answer to Michaux's description of *P. mitis* are at Dropmore, where they are readily known by the violet-coloured glaucous bloom on the young shoots, and by the leaves being almost all in twos; at the same time, it is proper to mention, that the leaves there, though soft and slender, are much shorter than those in Michaux's figure. The name applied to this species at Dropmore is *P. variabilis*. There is also a plant at Dropmore named *P. mitis*; but it is wholly with three leaves; and, as far as we can ascertain (the tree not having yet borne cones), it belongs either to *P. serótina*, or to some variety of it. The description given by Miller of *P. echinata*, as having finely elongated leaves, and a cone with very slight slender prickles, agrees perfectly



2076

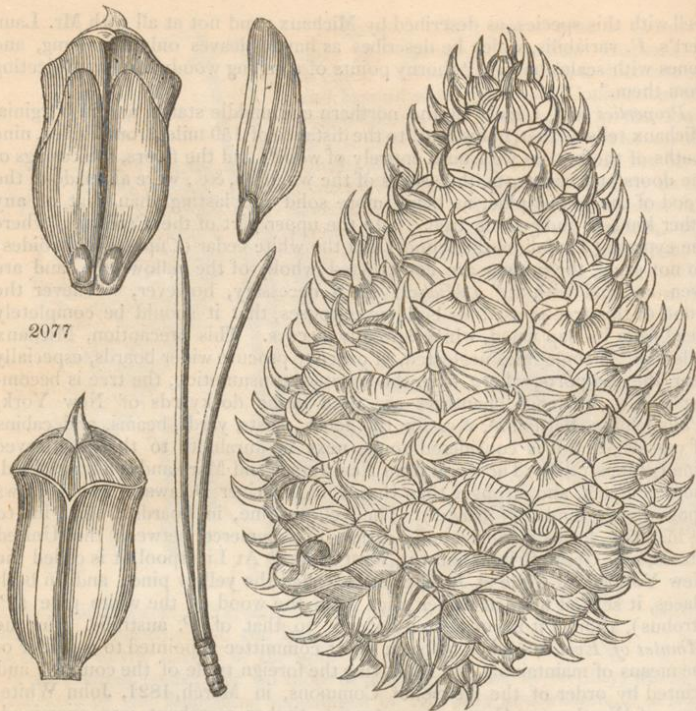
well with this species, as described by Michaux; and not at all with Mr. Lambert's *P. variabilis*, which he describes as having leaves only 2 in. long, and cones with scales having "thorny points of a strong woody texture projecting from them."

Properties and Uses. In the northern and middle states, and in Virginia, Michaux tells us that, in his time, to the distance of 159 miles from the sea, nine tenths of the houses were built entirely of wood; and the floors, the casings of the doors and wainscots, the sashes of the windows, &c., were all made of the wood of the yellow pine, as being more solid and lasting than that of any other kind of indigenous tree. "In the upper part of the Carolinas, where the cypress (*Taxodium distichum*) and the white cedar (*Cupressus thyoides*) do not grow, the houses are constructed wholly of the yellow pine, and are even covered with it." (*Michx.*) It is necessary, however, whenever the wood of this tree is used for building purposes, that it should be completely freed from its sap wood, which speedily decays. This precaution, Michaux tells us, "is sometimes neglected, in order to procure wider boards, especially near the sea-ports, where, from the constant consumption, the tree is becoming rare. Immense quantities are used in the dockyards of New York, Philadelphia, Baltimore, &c., for the decks, masts, yards, beams, and cabins of vessels; and it is considered to be next in durability to the long-leaved pine (*P. australis*). The wood from New Jersey and Maryland is finer grained, more compact, and stronger than that from the river Delaware, which grows upon richer lands." (*Michx.*) The yellow pine, in boards from 1 in. to 2½ in. thick, forms a considerable article of commerce between the United States, and Great Britain and the West Indies. At Liverpool, it is called the New York pine, while at Jamaica it is called the yellow pine; and, in both places, it sells at a much higher price than the wood of the white pine (*P. Ströbus*), though it is considered inferior to that of *P. australis*. In the *Minutes of Evidence* taken before a select committee appointed to consider of the means of maintaining and improving the foreign trade of the country, and printed by order of the House of Commons, in March, 1821, John White, Esq., of Westbourne Green, an extensive timber merchant, was examined. In answer to the question, "Can you speak at all to the durability of different kinds of wood?" he says, "In general, Norway timber is the most durable of the fir timbers of Europe; because, after many years, it does not part with its resinous particles; but I consider," he adds, "that the American soft, or yellow, pine (*P. mitis Michx.*) is the most durable of the American firs. I have known it last, when exposed to the action of the sun and weather, for a long period, by the side of Norway timber, with equal effect, fully exposed to wind and rain; but, if painted, it does not stand at all so well." (*Report, &c.*, 1821, p. 23.) "Though this species," Michaux observes, "yields turpentine and tar, their extraction demands too much labour, as this pine is always mingled in the forests with other trees." This is another point in which Michaux's account differs from that of Mr. Lambert; as the latter informs us that "the wood has a sponginess and lightness which deprive it of durability, and render it useless in building, or, indeed, for any purposes of a similar kind; but it is tolerably full of resin, so that the Americans employ it for its tar and pitch." (*Lamb. Pin.*, ed. 2., i. t. 14.) The tree of *P. mitis* at Dropmore (there named *P. variabilis*, and easily known from others having the same name, by the characteristics already mentioned) was, in 1837, after being 41 years planted, 29 ft. high.

Commercial Statistics. Cones, in London, are 1s. per quart, and plants 5s. each; at Bollwyller, plants are 2 francs each; and at New York, 50 cents.

‡ 6. *P. PUNGENS Michx.* The prickly-coned, or Table Mountain, Pine.

Identification. Michx. Arb., i. p. 61.; Pursh Fl. Amer. Sept., 2. p. 643.; Lamb. Pin., ed. 2., i. t. 17.; N. Du Ham., 5. p. 236.; Lawson's Manual, p. 353., Lodd. Cat., ed. 1836.
Engravings. Lamb. Pin., ed. 2., i. t. 17.; N. Du Ham., t. 67. f. 4.; Michx. N. Amer. Syl., lii. t. 140.; our fig. 2079., to our usual scale; and figs. 2077. and 2078., of the natural size; all from Dropmore specimens.

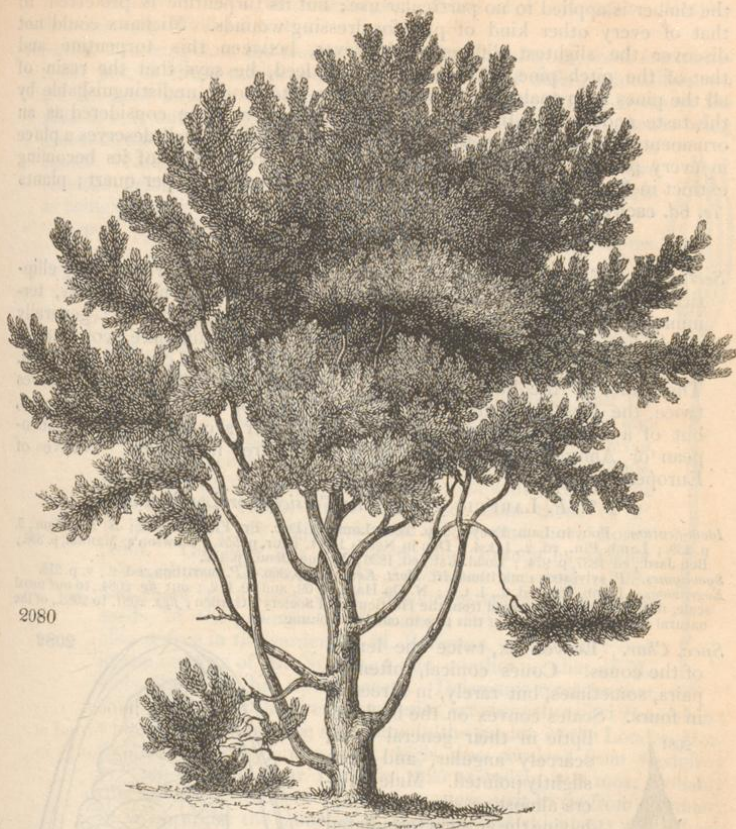


Spec. Char., &c. Leaves short and thickly set. Cones top-shaped, very large, yellow. Scales with hard incurved prickles, thick, and broad at the base. (*Michx.*) Bud (*fig. 2078.*) from $\frac{1}{2}$ in. to $\frac{5}{8}$ in long, and $\frac{1}{4}$ in. broad; cylindrical, blunt at the point; brownish, and covered with white resin; generally without small buds. Leaves (*fig. 2077.*) $2\frac{1}{2}$ in. long, including the sheath, which has 4 or 5 rings; the leaves are much broader, and rather shorter and lighter, than those of *P. (s.) pumilio*, and tipped with a sharp point. Cone $3\frac{1}{2}$ in. long, and about $2\frac{1}{2}$ in. broad. Scale woody, and furnished with a strong awl-shaped hook, exceeding $\frac{1}{4}$ in. in length. Seeds nearly as large as those of *P. sylvestris*, rough and black. Cotyledons from 6 to 8.

Description, &c. A tree 40 ft. or 50 ft. high, with the habit of *P. sylvestris*, but with a much more branchy head; and readily distinguished from that species by the young leaves not being glaucous, and by the leaves generally being more straight and rigid, slightly serrated at the margins, and with shorter sheaths. The leaves are also of a paler green, both when young and full grown, so that the tree, when of large size, has nothing of the gloomy appearance attributed to the Scotch pine. The cones are of a light yellowish brown colour, without footstalks; and they are generally in whorls of 3 or 4 together, pointing horizon-



2079



2080

tally, and remaining on the tree for many years. At Dropmore, there are cones adhering to the trunk and larger branches of more than 20 years' growth, giving the tree a very singular appearance; and rendering its trunk easily distinguishable, even at a distance, from those of all others of the pine tribe. The geographical range of this tree, according to Michaux, is very limited, it being chiefly found on the Table Mountain in North Carolina, one of the highest points of the Alleghanies, at nearly 300 miles from the sea, which summit it covers almost exclusively, being rare on the adjoining ones. Pursh only mentions the Grandfather and Table Mountains as its habitats; but Mr. William Strickland, who introduced the species into England, stated to Mr. Lambert that he observed large forests of it on the Blue Mountains, on the frontiers of Virginia. Of all the forest trees of America, Michaux observes, this is the only species restricted to such narrow limits; and it will, probably, be among the first to become extinct, as the mountains which produce it are easy of access, are favoured with a salubrious air and a fertile soil, and are rapidly peopling; besides which, their forests are frequently ravaged by fire. *P. pungens* was introduced into England in 1804; and, as cones are frequently imported, it is occasionally to be found in collections. The largest tree we know of is at Dropmore; where, in 1837, it was 34 ft. high; the diameter of the trunk 1 ft. 9 in., and of the head 33 ft. *Fig. 2080.* is a portrait of this tree. There is a tree in the Horticultural Society's Garden, 8 ft. high; and a small plant at Messrs. Loddiges's. In America,

the timber is applied to no particular use; but its turpentine is preferred to that of every other kind of pine for dressing wounds. Michaux could not discover the slightest difference, however, between this turpentine and that of the pitch pine (*P. rigida*); and, indeed, he says that the resin of all the pines is so analogous in properties, as often to be undistinguishable by the taste and smell. In Britain, *P. pungen* can only be considered as an ornamental tree; but, from the singularity of its cones, it well deserves a place in every pinetum. Another inducement is the probability of its becoming extinct in North America. Price of cones, in London, 3s. per quart; plants 7s. 6d. each; and at Bollwyller, 3 francs each.

§ ii. *Laricio*.

Sect. Char. Cones with the outer surface of the scales more or less elliptical in shape, with a horizontal rib or line from each extremity, terminating in a blunt slightly protruding point in the centre; generally much shorter than the leaves. Buds large, ovate-acuminate, concave on the sides, and terminating in an elongated point, like a camel-hair pencil. The scales of the buds adpressed, incrustated with white resin. Leaves twice the length of the cones; in no stage of their growth glaucous, but of a darker green than those of any other section of either European or American pines; remaining on the tree four years. Natives of Europe.

‡ 7. *P. LARICIO* Poir. The Corsican, or Larch, Pine.

Identification. Poir. in Lam. Encyc., 5. p. 339.; Lam. et Dec. Fr. Fl., 3. p. 274.; N. Du Ham., 5. p. 233.; Lamb. Pin., ed. 2., 1. t. 4.; Don in Neill's Hort. Tour, p. 552.; Lawson's Manual, p. 336.; Bon Jard., ed. 1837, p. 974.; Lodd. Cat., ed. 1836; Hayne Dend., p. 172.
Synonymes. *P. sylvestris*; *maritima* Ait. Hort. Kew., iii. p. 366.; *P. maritima*, ed. 2., v. p. 315.
Engravings. Lamb. Pin., ed. 2., 1. t. 4.; N. Du Ham., t. 69. and 69. f. 2.; our fig. 2084., to our usual scale, from a specimen received from the Horticultural Society's Garden; figs. 2081. to 2083., of the natural size; and the plates of this tree in our last Volume.

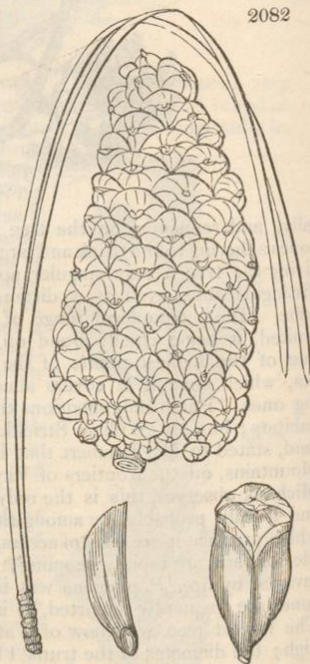
Spec. Char. Leaves lax, twice the length of the cones. Cones conical, often in pairs, sometimes, but rarely, in threes or in fours. Scales convex on the back, elliptic in their general form, scarcely angular, and very slightly pointed. Male flowers almost sessile, elongated, having the anthers terminated by a small round crest. (N. Du Ham., and obs.) Bud

2081



(see fig. 2081.) from $\frac{3}{4}$ in. to 1 in. long; and from $\frac{5}{8}$ in. to $\frac{1}{2}$ in. broad; ovate, with a long narrow point, and concave at the sides, resembling a camel-hair pencil. Scales adpressed, and incrustated with white resin. The centre bud generally surrounded by three or more small buds. Cones varying from 2 in. to 3 in. or more in length; and from $\frac{3}{4}$ in. to $1\frac{1}{2}$ in. in breadth. The points of the scales turned over like an under lip, and terminating in a point which has a very small prickle, often scarcely perceptible. The colour of the cone tawny, and the interior part of the scales purple. Leaves varying in length from 4 in. to 6 in. and upwards; generally two in a sheath on the side branches, but occasionally three on the leading shoots.

2082



Seeds greyish or black, twice as large as those of *P. sylvestris*. Cotyledons (see fig. 2083.) 6 to 8.

Varieties. Judging from the names in Continental catalogues, these are numerous; but, as these names are chiefly expressive of different localities, we are ignorant how far the plants are really distinct. In the *Nouveau Du Hamel*, only one variety is given, which is characterised by the cones being greenish, those of the species being described as of a tawny or fawn colour. Delamarre, in his *Traité Pratique, &c.*, enumerates five varieties, some of which, however, are considered by M. Vilmorin as being probably species; the cones not having yet been seen.

† *P. L. 1 corsicàna*; Laricio de l'Île de Corse, *Delamarre*.—Cones of a tawny or fallow colour.

† *P. L. 2 subviridis* Nouveau Du Hamel. — Cones of a greenish yellow.

† *P. L. 3 caramànica*; *P. caramànica Bosc*; *P. caramaniénsis Bon Jard.*, ed. 1837, p. 974.; Laricio de Caramanie, ou de l'Asia Mineure, *Delamarre*; ? *P. romàna Lond. Hort. Soc. Gard.*—*P. L. caramànica* seldom grows to above half the height of *P. L. corsicàna*: it has a much rounder and more bushy head, with straight, or nearly straight, leaves, slender branches, reddish-coloured bark, and reddish buds, which are wholly, or in part, covered with white resin. The scales of the cones, which are larger than those of *P. L. corsicàna*, are tipped with a harder and more horny point. This pine was introduced into France by Olivier, the author of *Travels in the Levant*, in the year 1798; and there were trees of it, producing cones with fertile seeds, in the grounds of Malmaison, in 1836. There is also a tree in the garden of M. Pérignon, at Auteuil; one in the nursery of M. Noisette; and another in that of M. Cels, fils, which has ripened seeds. *Delamarre* remarks that this variety is, in the French nurseries, erroneously called *P. romàna*; and, as the tree bearing this name in the garden of the London Horticultural Society, now 20 ft. high, was received from Godefroy of Ville d'Avray, near Paris, in 1825 or before, it is most probably this variety. Seeds of this variety were sent to us from Germany in 1829, under the name of *P. resinosa*, and the plants which have been raised from them are found, at Methven Castle, to produce annual shoots surpassing in length those of the common Scotch pine, near to which they are planted. Mr. Bishop states that this variety bids fair to become available for the poorer soils of Scotland. (See *High. Soc. Trans.*, vol. xi. p. 124.)

† *P. L. 4 calàbrica*; Laricio de Mont Sila en Calabre, *Delamarre*.—This pine, Michaux and Vilmorin remark, in a note to *Delamarre's* work, resembles the pine of Caramania; but, as there are only young plants of it in France, which have not yet fruited, very little can be said about it. It was introduced into France by M. Vilmorin in 1819, 1820, and 1821; and 100 lb., of seeds, containing about three millions, distributed.

† *P. L. 5 austriaca*; Laricio d'Autriche, ou de la Hongrie, *Delamarre*.—Noisette is said to have found this variety in Hungary; but, according to Michaux and Vilmorin, in their notes to *Delamarre's Traité, &c.*, it scarcely differs from *P. caramànica*, which they say grows also in Romania, and in the Crimea. The *P. austriaca* of Höss (*Anleit. die Bäume und Sträucher Oesterreichs, &c.*, p. 6.), judging from the author's description, and from comparing the buds of the young plants in the Horticultural Society's Garden, received from Mr. Lawson's, with plants of the same age of *P. L. corsicàna*, appears to be a variety of that species, and is probably identical with the Laricio d'Autriche of *Delamarre*; but, as we have not



2083

seen the cones, and as the plant is now being extensively distributed, through the activity of Mr. Lawson, we have considered it best, in the meantime, to give it in the form of a species.

‡ *P. L. 6 pyrenæica*; *P. hispánica* Cook; ? *P. pyrenæica* Lap.—From the buds of the young plants of this pine, in the Horticultural Society's Garden, and more especially from the cones, some of which we received from Captain Cook, we are induced to refer it also to *P. Laricio*; but, as it seems a very distinct and beautiful variety, and as it has been lately extensively distributed by Captain Cook, who introduced it, we shall also give it in the form of a species.

‡ *P. L. 7 taúrica*.—There is a tree bearing this name in Loddiges's arboretum, which is not introduced into their catalogue for 1836, and which appears, from its buds, to be identical with *P. taúrica* (*Lodd. Cat.*, ed. 1836.) of the same collection; and of which name *P. Pallasiána* is a synonyme: but, as this variety of *Laricio* is very distinct, particularly in the greater length of the cones and leaves, we have given it as a species.

Other Varieties. *P. altissima* and probably some other names are applied to *P. Laricio*, or some of its varieties, but not in such a manner as to enable us to state anything satisfactory respecting them. The only truly distinct forms of this species, in our opinion, are, *P. L. corsicána*, *P. L. caramánica* (of which there is a handsome tree in the Horticultural Society's Garden, under the name of *P. romána*), *P. L. Pallasiána* (of which there are trees at White Knights and Boyton), and perhaps *P. L. pyrenæica*.

Description. A tree, attaining the height of from 80 ft. to 100 ft., with a regular pyramidal head, and the branches disposed in whorls, of five or six in a whorl; which are distinguished from the branches of *P. Pináster*, by being often twisted and turned in a lateral direction at their extremities, especially in full grown trees. In the Island of Corsica, it is said that there are trees of this species from 140 ft. to 150 ft. in height. The trunk and branches of full-grown trees have a reddish grey-coloured bark, not unlike that of *P. sylvéstris*; and the bark of the trunk cracks, and partially separates in the form of large plates, as in that tree. The leaves vary much in length, according to the age of the tree, and the soil on which it grows. The shortest are generally 4 in. or 5 in., and the longest 7 in. or 8 in. long. They are slender, not sensibly rough, and much darker-coloured than those of either *P. sylvéstris* or *P. Pináster*. In young plants, and on the extremities of the shoots of the lower horizontal branches of old trees, they are frequently much waved and twisted; but near the top of the tree they are straight; and on the leading shoot of young trees, three leaves are occasionally found in a sheath. The sheaths of the leaves vary from $\frac{1}{2}$ in. to 1 in. in length, and have generally 4 or 5 rings. At first, the sheath is white and membranaceous; but it becomes torn and shortened as the leaves advance in age, and ultimately becomes black. The male catkins, which are produced at the extremities of the shoots, are from 6 to 15 in number, and they are surrounded by numerous scales. They are from 1 in. to $1\frac{1}{2}$ in. in length, and from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. in breadth; yellowish before the bursting of the anthers, which are terminated by a round crest, and which contain abundance of pollen, of a beautiful sulphur colour. After the male catkins drop off, the part of the young shoot which they occupied is left naked; and hence the branches of old trees, particularly at their extremities, have those tufts of leaves, alternately with naked places, which are so conspicuous

2084



in *P. Pináster*, and all the pines which have either large and very scaly buds, or which produce a great number of male catkins. The female catkins are egg-shaped, reddish, becoming straight after flowering, and they are borne on peduncles, from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in length, surrounded at the base with scarios scales; the fleshy scales which form the female catkin are terminated by a blunt triangular point, which is often persistent, and which, when the cone is mature, renders it very slightly prickly. The cones are commonly in pairs, but sometimes three and sometimes four occur together: they point horizontally and slightly downwards, and sometimes they are slightly curved, so as to be concave at the extremity of the side next the ground. They are from 2 in. to 3 in., or more, in length; of a ruddy yellow or tawny colour, or greenish. They attain their full size in the November of the second year, and shed their seeds in the April of the third year. The scales of the cones are remarkably distinct from those of *P. sylvéstris*, and the prickly cones of *Pinops*, and *Tæda*, on the one hand, and from the hard, angular, regular-sided scales of the cones of the sections of *Pináster* and *Halepenses*, on the other. The seeds of *P. Larício* are greyish, and marked with black spots: deprived of their wings, they are scarcely $\frac{1}{4}$ in. in length, but with the wings they are more than 1 in. The tree is readily known from *P. sylvéstris* by its more conical form, and crowded, longer, and darker foliage; and from *P. Pináster*, from many of its branches being twisted, as it were, round the tree, and from its foliage being shorter, more slender, and much darker. The rate of growth, even in Britain, is more rapid than that of *P. sylvéstris* in a similar soil and situation; being, in young trees, in the climate of London, from 2 ft. to 3 ft. in a year. A tree in the Horticultural Society's Garden (see the portrait of this tree in our last Volume), having been 12 years planted, was, in 1834, 20 ft. high; and is now (1837) 25 ft. high. A shoot of the year 1829, with part of 1828, cut from a tree 5 years old, on M. Vilmorin's estate at Barres, and sent to Mr. Lawson's museum, measured 3 ft. in length, and $3\frac{1}{2}$ in. in circumference at the thickest end. The leading annual shoot of a tree in the Horticultural Society's Garden, which was blown off on August 20, 1837, measured 2 ft. 6 in. in length, and $\frac{3}{4}$ in. in diameter at the lower end, where it had been pierced by an insect; and, though not arrived at their full growth, its leaves, which are in part in threes, were 4 in. in length; whilst those of the last year's shoot, from which it sprang, were $8\frac{1}{2}$ in. In the *Gardener's Magazine* (vol. i. p. 79.), it is stated, that, a young plant of *P. Larício* being planted in 1817, at the same time with a young plant of *P. sylvéstris*, on a sandy hill in one of the coldest counties of the eastern part of England, in 1825 the Scotch pine was only 6 ft. or 7 ft. high, while *P. Larício* had attained a height of upwards of 12 ft. In the arboretum of Messrs. Loddiges, this pine has attained a larger size than any other species, and thrives better than any other, with the exception of *P. Pináster* and *P. Pinea*, there being four trees, under the names of *P. Larício*, *P. L. taúrica*, *P. taúrica*, and *P. romàna*, from 20 ft. to 30 ft. high; while the Scotch pine and its varieties are not above 12 ft. high, and the American pines not above half that height. In France, according to Thouin, *P. Larício* grows two thirds faster than the Scotch pine, placed in a similar soil and situation. The duration of the tree in Corsica is from 70 to 80 years, and its average height about 130 ft. (40 mètres); and the diameter of the trunk from 23 in. to 27 in. (6 to 7 décimètres). The finest young trees in the neighbourhood of London are in the Horticultural Society's Garden; and the finest old tree at Kew, where it is named *P. maritima*, and of which a portrait is given in our last Volume.

Geography. The *Pinus Larício* is a native of Corsica, and of various other parts of Europe. P. B. Webb, Esq., discovered it on Mount Ida, in Phrygia, and Mr. Hawkins found in Greece, on Cyllene, Taygetus, and the mountains of Thasos, a sort of pine which, from the description given in Walpole's *Memoirs* relative to Turkey, is considered by Mr. Lambert to be this species. According to Baudrillart, it grows equally well on mountains of the second order in the interior of Spain, on the sandy plains along the shores of the Mediterranean, and in a great part of the north of France. It is said to be

found in Hungary, in the Hartwold in Leimerslachle, in Germany; and it abounds on Caucasus, and in the south of Russia, and probably generally throughout the south of Europe, and great part of the west and north of Asia. It does not appear to grow on the very poorest soils, or at very great elevations; and to require a deeper soil than *P. sylvestris*.

History. The Corsican pine was scarcely known in France, as a distinct species, in the time of Du Hamel; and was subsequently, according to Bosc, confounded by authors with the *Pinus sylvestris*, under the name of *P. s. altissima*; and with the *Pinus maritima* (our *P. Pinaster*), under the name of *P. m. Pinaster*; from its, in fact, holding a middle place between these two species. The name of *P. Laricio* was first given to it by Poiret, in the *Dictionnaire Encyclopédique*; and it was subsequently adopted by De Candolle, in the *Flore Française*. *P. Laricio* was introduced into England under the name of *P. sylvestris* η *maritima* in 1759; and that name was adopted by Aiton, in the first edition of the *Hortus Kewensis*; and afterwards changed, in the second edition, to *P. maritima*. The name of *P. Laricio* was first adopted in Britain in 1822, in consequence of the description, by Professor Don, of a tree in the Paris Garden, being published under that name in an Appendix to Neill's *Horticultural Tour through France and the Netherlands*. Seeds were soon after imported by Mr. Malcolm, from M. Vilmorin, and a number of plants raised, which have been distributed throughout the country, though we are not aware that they have been planted any where in large masses. In France, according to Mordant de Launay, as quoted by Delamarre, *P. Laricio* first attracted the notice of government under the ministry of Turgot, in the time of Louis XVI.; and the fine tree in the Paris Garden was planted where it now stands in the year 1774, being then several years old. The government had great difficulty in procuring seeds from its agents in Corsica: the cones being produced only in small quantities, and at the summits of the trees, it was difficult, and even dangerous, to gather them; and this circumstance tempted the dealers in these seeds to mix them with those of *P. Pinaster*, which they could procure with facility. In 1788, the Corsican pines began to be employed for masts for the French navy; and, when the trees were cut down, the cones were easily gathered. The late André Thouin was employed by the French government, about the year 1814, to draw up directions for cultivating this tree, which were printed and published, together with an account of its properties and uses in Corsica, and a strong recommendation for its culture in France. Nevertheless, the seed not having been procured in sufficient quantities, grafting was resorted to, in the year 1822; and M. Larminat (as we have seen, p. 2130.) grafted many thousands of *P. Laricio* on *P. sylvestris* in the Forest of Fontainebleau. Since that time, this pine has been strongly recommended for culture by M. Vilmorin, who has planted all the varieties of it extensively on his estate at Barres, and supplied all the principal seedsmen of Europe with seeds. It succeeds well in Scotland, even in the Highlands.

Properties and Uses. According to M. Thouin, the timber of *P. Laricio* is somewhat heavier than that of the *P. sylvestris* brought from Riga; but, being more resinous, it is less brittle and more elastic. Other authors assure us, on the contrary, says Baudrillart, that the wood of *P. Laricio* has neither the strength nor the elasticity of that of *P. sylvestris*. Previously to the year 1788, the wood was only used by the French government for the beams, the flooring, and the side planks of ships; but, in that year, the administration of the marine sent two engineers to examine the forests of Lonca and Rospa in Corsica, in which abundance of trees were found fit for masts. After this, entire vessels were built with it: only it was found necessary to give greater thickness to the masts, in order to supply its want of strength and elasticity. The thickness of the sap wood in *P. Laricio* is greater than in most other species of pine; but the heart wood is found to be of very great duration. In Corsica, it is employed for all the purposes for which it is used, when of 36 or 40 years' growth. It is easily worked, and is used both by cabinet-makers and sculptors in wood; the figures which ornament the heads of vessels being generally made of it. In Britain, the tree hitherto can only be

considered as being one of ornament; and, as such, it deserves to be planted extensively for its very regular and handsome form, and the intensely dark green of its abundant foliage. It also deserves planting on a large scale as a useful tree, on account of the great rapidity of its growth. In the low districts of Britain, it might probably be a good substitute for *P. sylvestris*.

Statistics. In the Environs of London. In the Horticultural Society's Garden, 12 years planted, it is 25 ft. high; at Muswell Hill, 8 years planted, it is 16 ft. high; in the Hackney arboretum, from 25 ft. to 30 ft. high; at Syon, 40 ft. high; at Kew, the tree figured in our last Volume, which is between 80 ft. and 90 ft. high.—North of London. In Bedfordshire, at Woburn Abbey, 7 years planted, it is 10 ft. high. In Berkshire, at White Knights, 37 years planted, it is 60 ft. high; at Dropmore, 20 ft. high. In Essex, at Audley End, 7 years planted, it is 9 ft. 6 in. high. In Hertfordshire, at Cheshunt, 4 years planted, it is 8 ft. high. In Staffordshire, at Trentham, 6 years planted, it is 16 ft. high. In Suffolk, at Ampton Hall, 12 years old, it is 10 ft. high.

In Foreign Countries. In France, in the Jardin des Plantes, 55 years planted, it is 80 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 40 ft.; at Fromont, in the garden of M. le Chevalier Soulange-Bodin, it is 42 ft. high, the diameter of the trunk, at 6 ft. from the ground, 1 ft. 4 in.; in Brittany, at Barres, 12 years planted, it is 24 ft. high; at Nantes, in the nursery of M. Nerrières, 15 years planted, it is 25 ft. high; in the Botanic Garden at Metz, 18 years grafted, it is 24 ft. high; at M. Brunel's, at Avranches, 20 years planted, it is 40 ft. high; in the Park at Clerveaux, 42 years planted, it is 78 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 32 ft. In Hanover, at Harbecke, 10 years planted, it is 16 ft. high.

Commercial Statistics. Plants, in the London nurseries, are 1s. 6d. each; and at Bollwyller, 1 franc; but, if there were a demand for them, they would doubtless be procured at 30s. or 40s. per thousand.

♁ 8. *P. (L.) AUSTRIACA* Höss. The Austrian, or black, Pine.

Identification. Höss Anleit., p. 6.; Lawson's Manual, p. 338.

Synonymes. *P. nigricans* Hort.; *P. nigrescens* Hort.; schwarz Föhre, Ger.

Engravings. Fig. 2085., showing the bud of a plant of two years' growth in the Horticultural Society's Garden.

Spec. Char., &c. Shoots with from 3 to 5 rings, at first of a clear ash grey, then becoming reddish, afterwards darker, and at last black. Leaves from 2 in. to 5 in. long; seldom, and but little, twisted; when young, erect; when older, standing out, and curved towards the twig; outer surface half round, dark green, glossy, and with a sharply serrated margin; inner surface nearly even, but slightly dotted along the ridge; points prickly, of a yellowish brown or fawn colour. Buds large, the leader often from 1 in. to 1½ in. long, ovate, with a long point. Scales dark brown, thinner at the margin and point, and furnished with whitish fringe; the lower ones curving back from the bud; the inner ones collapsed, and incrustated with white resin. Flowers produced about the end of May. Male catkins on short peduncles, oblong, cylindrical, round, or bluntly pointed, becoming conical after arriving at maturity, placed many together in verticillate bundles round the bottom of the young shoots. The female catkins two or three, or occasionally more, together, with rather long peduncles from the extremity of the young branches; round-oblong, erect, and dark red; becoming, in July, about ½ in. long, and ¼ in. broad; elliptical, and assuming a reddish brown colour. The cone does not arrive at maturity till October in its second year; it is conical, rounded at the base, 2 in. or 3 in. long, pointing horizontally, or nearly so; of a light yellow brown, polished, and shining. Seeds very closely resembling those of *P. Laricio*; and the cotyledons 6 or 8, as in that species. Trunk cylindrical. Bark very thick, of a blackish ash-green, marked with reddish brown spots. Scales deeply and longitudinally cleft; the fissures of a uniform reddish brick-colour, lighter than that of *Picea pectinata*. The branches are produced in regular whorls, at first inclined upwards towards the trunk, then spreading horizontally, and finally drooping at the extremity. In full-grown trees, the top becomes flat and spreading to a great extent. The bark of the shoots of the current year is of a greenish yellow, regularly and deeply raised by the insertions of the leaves, furrowed, and shining. (Höss's *Gemeinfassliche Anleitung*, &c., p. 8.; and *Lawson's Manual*, p. 339.)



2085

Geography and History. *P. austriaca* grows naturally in Austria, in the Breima Forest (Wienerwald), the Banate, upon the Demoglet, near Mehadia; and, in the neighbourhood of the Snowy Mountains, it grows at higher altitudes than *Picea pectinata*. It prefers a deep, dry, calcareous sand;

but it will succeed in any soil, provided it is loose; and it even loves a moist soil, if not too wet. It thrives best in situations having a southern aspect. This pine was first introduced into Britain by Mr. Lawson of Edinburgh, in 1835. The seeds were sown in that year, on light sandy soil; and, at the end of the first season, the plants were twice as large as those of *P. sylvestris* sown at the same time in the same soil; and they had remarkably large deep-penetrating roots. (*Man.*, p. 339.)

Properties and Uses. The sap wood of *P. austriaca* is said by Höss to be of a whitish yellow, and the heart wood of a rusty yellow; the latter being very resinous, strong, and tough. It is much valued in Austria, when kept dry; and is said to surpass even the larch in resisting the injurious effects of water, or of alternate moisture and dryness. It is used by joiners, coopers, &c., and makes excellent fuel. When burned, the flames, on account of the resin contained in the wood, produce a very dense black smoke; and, where lampblack is the object, it is very productive of that substance. The wood is preferred to that of the beech for charcoal; and the roots afford splinters for torches. Among all the native pines of Austria, this one is said to afford the greatest quantity of turpentine.

Commercial Statistics. Price of plants, in Lawson's Nursery, Edinburgh, 10s. a thousand for one-year's seedlings, and 20s. for two-years' seedlings.

‡ 9. *P. (L.) PALLASIANA* Lamb. Pallas's, or the Tartarian, Pine.

Identification. Lamb. Pin., ed. 2., 1. t. 5.; Lawson's Manual, p. 339.

Synonymes. *P. tatarica* Hort.; *P. tatarica* in the Hammersmith Nursery in 1797; *P. maritima* Pall. *Ind. Taur.* (according to a specimen in Mr. Lambert's herbarium); *P. Pinea* *Habl. Taur.*, p. 97.; *P. halyensis* *Bieb. Fl. Taur. Cauc.*, 2. p. 408. (exclusive of the synonymes, except those of Pall. and Habl.); *P. Laricio* *Bieb. Fl. Taur. Cauc. Suppl.*, 3. p. 623. (exclusive of the synonymes, except those of Pall. and Habl.); Tzaam in the Tartar language.

Engravings. Lamb. Pin., ed. 2., 1. t. 5.; our figs. 2087. and 2089., to our usual scale; figs. 2086. and 2088., of the natural size, from living specimens received from A. Lambert, Esq., taken from his trees at Boyton; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves in pairs, very long, erect, rigid, channeled; sheaths



2086

very short. Crest of the anthers roundish, convex repand. Cone ovate-oblong often curved. Scales slightly tuberculate, and terminated by a very small prickle. (*Lamb.*) Bud (*fig.* 2086.) $\frac{3}{4}$ in. to $1\frac{1}{4}$ in. long, and from $\frac{1}{2}$ in. to 1 in. broad; ovate, and pointed, with the sides concave, like those of *P. Laricio*, but much larger. Leaves (see *fig.*

2088.) from 4 in. to 7 in. or 8 in. in length; sheath from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length. Cones from 4 in. to 5 in. in length, and from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. in breadth at the widest part; ovate-oval, acuminate, horizontal in their direction, and slightly incurved at the extremities, which point downwards. Scales as in those of *P. Laricio*, but larger. (From specimens received from Mr. Lambert, White Knights, and the Glasnevin Garden, in August, 1837.)

Varieties. We can readily conceive that *P. L. Pallasiana*, like every other variety of *P. Laricio*, is liable to sport; and, accordingly, of the trees possessed by Mr. Lambert, one has the cones straight and short, and another long and crooked. In the Glasnevin Botanic Garden, there are two trees of *P. Pallasiana*, which were planted in the year 1797, and are now

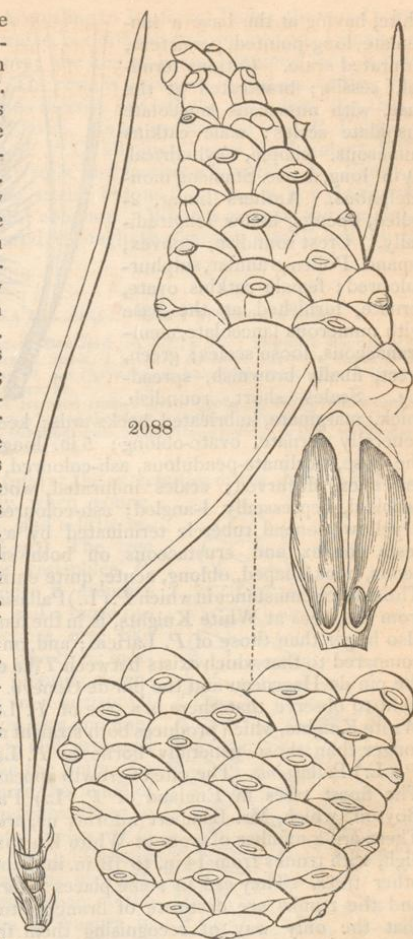


2087

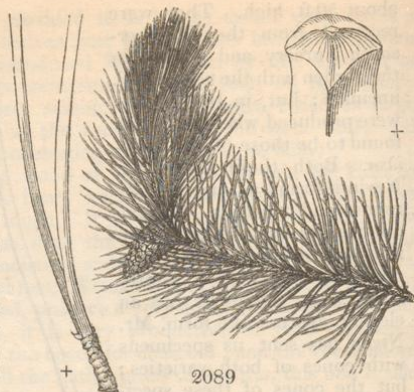
about 50 ft. high. They were received from the Hammer-smith Nursery, and marked in the garden with the name of *P. uncinata*; but, in 1834, cones were produced, when they were found to be those of *P. Pallasiana*. Both these trees, Mr. Nevin informs us, are equally robust and vigorous; but the one throws out its branches in the most grotesque and luxuriant manner, with a knotty stem, while the other has an elegant cypress-like form. Mr. Niven has sent us specimens with cones of both varieties; but the cones of these specimens do not appear to differ in the least. There is a tree in the Horticultural Society's Garden, considered there as the true *P. Pallasiana*, which has borne cones, and of which fig. 2089. is a portrait, to our usual scale; but it is evidently not the *P. Pallasiana* of Lambert, but rather some other variety of *P. Laricio* less different from the species. There is another tree in the same garden, marked *P. taurica*, which has not borne cones; and, though it differs somewhat in habit from the tree marked there *P. Pallasiana*, being more fastigiata, we have no doubt it will be found, when it comes to produce cones, to be some other slight variation of *P. Laricio*. In rare species, of every kind, it is very natural to take advantage of slight shades of

difference, and to hold them out as varieties, which, in species that are common, would be altogether neglected. For example, there might be many very distinct varieties selected from Scotch pine woods, quite as different from one another as the different varieties and subvarieties of *P. Laricio*; but, as *P. sylvestris* is a very common tree, no cultivator thinks it worth his while to bring its varieties or variations into notice.

Description. "A large tree, about the size of *P. sylvestris*, but much more spreading, sending out numerous large, declining, and horizontal branches from the summit to the base; the lower branches almost equalling the trunk itself in size. Bark cracked, rugged, brown, scaling off. Wood compact, white, brownish red in the centre, resinous, very knotty. Leaves in twos, crowded, erect, rigid, semi-cylindrical, glabrous, somewhat shining, light green; 5 in. long; roughly serrulated on the margin, canaliculate above, furnished at the apex with a sharp cartilaginous mucro; sheaths short, about $\frac{1}{2}$ in. long, round, covered externally with loose scales, membranous, and torn on the margin;



white, having at the base a lanceolate, long-pointed, persistent, indurated scale. Catkins terminal, sessile; bracteated at the base, with numerous lanceolate cuspidate scales; male catkins numerous, simple, cylindrical, $1\frac{1}{2}$ in. long, dense. Stamens monadelphous. Anthers linear, 2-celled, opening below longitudinally. Crest roundish, convex, repand. Pollen granular, sulphur-coloured; female catkins ovate, ternate, furnished at the base with numerous lanceolate, membranaceous, loose scales; green, erect, finally brownish, spreading. Scales short, roundish,



thick, marginate, imbricated backwards; keeled and convex above. Cone generally ternate, ovate-oblong; 5 in. long, sessile, 2 in. in diameter at the base, declinate-pendulous, ash-coloured, somewhat attenuated towards the apex, decurved; scales indurated, woody, dilated at the apex, trapezoidal, depressedly 4-angled; ash-coloured, elevated in the centre from a yellow conical tubercle terminated by a small spine. Seeds obovate; testa convex and crustaceous on both sides; wing slender, membranaceous, hook-shaped, oblong, acute, quite entire." (*Lamb. Pin.*, ed. 2., i. p. 14.) The chief circumstance in which *P. (L.) Pallasiana* differs from *P. Laricio*, judging from the trees at White Knights, is in the length of the cones: the leaves are also larger than those of *P. Laricio*; and, on the whole, the difference may be compared to that which exists between *Tilia europæa* and *T. e grandifolia*, or the pin de Hageneau and the pin de Genève. At the same time, we think it right to observe that there is a tree of *P. Laricio* in the botanic garden at White Knights, which produces both straight and crooked cones, which, though longer than those generally borne by *P. Laricio*, are shorter than those of *P. (L.) Pallasiana*. The rate of growth appears to be the same as in *P. Laricio*. The finest trees in England of *P. (L.) Pallasiana* are, no doubt, those at Boyton, which, Mr. Lambert informs us, are between 60 ft. and 70 ft. high. There are a number of trees at White Knights, which are from 50 ft. to 60 ft. high, with trunks from 14 in. to 18 in. in diameter; but they are drawn up by other trees. They are in some places intermixed with trees of *P. Pinaster*, and the trunks are destitute of branches to the height of 20 ft. or 30 ft., so that the only way of recognising them from below is by observing the tortuous direction of their branches. There are trees at Dropmore, 25 ft. high. Mr. Lambert remarks, in a letter to us, dated July, 1837, that, though his trees produce plenty of cones annually, the seeds have never yet ripened.

Geography, History, &c. *P. Pallasiana* is confined to the central regions of the Crimea, forming considerable forests on the western declivity of the chain of lofty mountains which extend along the coast of the Black Sea. It was first introduced into England by Messrs. Lee and Kennedy of the Hammersmith Nursery, who raised a number of plants from seeds sent to them by Professor Pallas, from the Crimea, about 1790, and it was sold by them as *P. tatárca*. Of these plants, some were planted at Boyton, about 1793, of which a few survive, and form trees between 60 ft. and 70 ft. high, although the soil on which they grow is scarcely 2 in. thick, on a bed of solid chalk. About the same time, from 60 to 70 plants were planted at White Knights, by the Duke of Marlborough, in good loamy soil, 20 or 30 of which still exist, and are from 50 ft. to 60 ft. high; but, being crowded in a wood of indigenous and other free-growing trees, they have not assumed handsome shapes; and, indeed, there are only branches on their upper extremities.

Properties and Uses, Soil, &c. According to Professor Pallas, the wood is very knotty and resinous, and very durable, but difficult to form into good planks, on account of the number of its knots; the largest beams obtained from it being only from 4 to 6 yards in length. The resin is produced in vast quantities, has a pleasant odour, and is employed as incense in Catholic churches, like that of *P. s. pumilio*, procured from Moldavia. As an ornamental tree, *P. Pallasiæna* deserves a place in every collection. "Of all pines," says Mr. Lambert, "this is the best adapted for thin chalky soils, and maritime situations." Plants, in the London nurseries, are 10s. 6d. each; but, as the tree has not yet ripened seeds in this country, they are not common. When a greater demand takes place, seeds may easily be procured through the garden established by the Russian government at Odessa.

‡ 10. *P. (L.) PYRENAÏCA* Lap. The Pyrenean Pine.

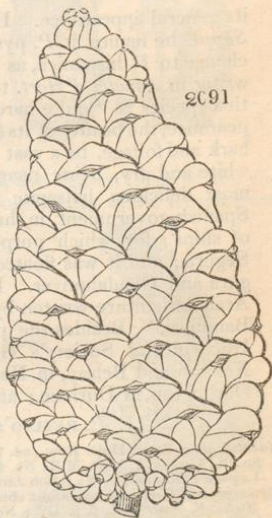
Identification. La Peyrouse Supp. Fl. Pyren.; Bon Jard., ed. 1837, p. 975.; Lawson's Manual, p. 335. *Synonymes.* *P. hispánica* Cook's *Sketches in Spain*, 2, p. 237.; *Pinaster hispánica Roxas di San Clemente*; *P. penicellus* Lap. *Hist. des Pl. des Pyrénées.* *P. halepensis* major *Ann. d'Hort. de Paris*, 13, p. 187; Pin Nazaron, Pin pinceau, Fr. *Engravings.* Our fig. 2091., from a cone received from Captain Cook; fig. 2093., from a cone received from M. Vilmorin; fig. 2090., from a bud of the plant in the Horticultural Society's Garden; all of the natural size: and fig. 2092., to our usual scale, from a tree growing, in 1837, at Woodside, near Hatfield, the residence of John Church, Esq.

Spec. Char., &c. Leaves long, in tufts at the extremities of the shoots; branches

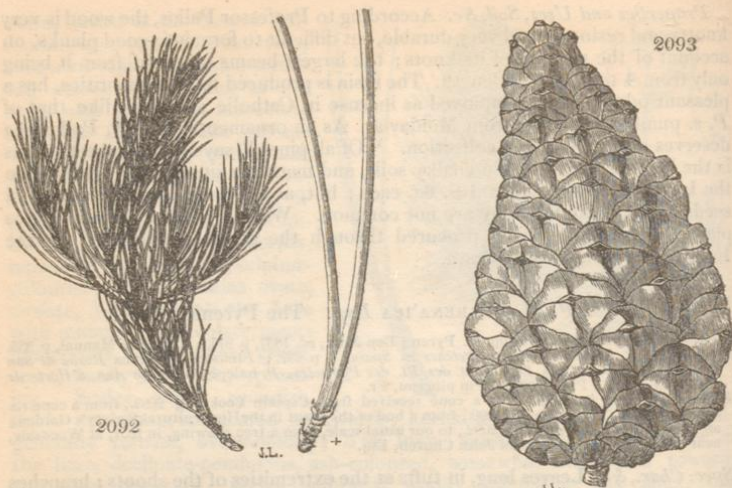


2090

dispersed, naked, scaly when young. Cones conical, smooth, and a little recurved, seeds hard. (*Lap.*) The tree when young somewhat resembles *P. halepensis*, but when older it assumes a much higher stature, and a more pyramidal form. The cones are, like those of *P. halepensis*, on strong foot-stalks; but, instead of pointing downwards, they are always in a horizontal direction. The leaves are long and fine; but strong and upright, and arranged round the branches like the hairs of a camel-hair pencil, whence the name of pin pinceau. They are sometimes three in a sheath, on the young shoots. (*Ann. de la Soc. d'Hort. de Paris*, xiii. p. 186.) Captain Cook, who introduced this species in 1834, found it occupying the highest range of the extensive forests of the Sierra de Segura, in the south of Spain, where it overtops *P. halepensis*; and in a corresponding situation, in the vast forest region of the Sierra de Cuença, on the river Gabriel, in Upper Aragon, where it forms extensive forests; but La Peyrouse appears to have only found it in the Pyrenees. "This majestic pine is concentrated in the Pyrenees, between the river of Lasserre, and that of Cinca, in the valleys of Pl n, de la Pez, and at Campo, where it is known by the name of pin nazaron." It occupies a surface of nearly six square leagues, the greater part of which is in Aragon, and the other part in France. It is neither isolated, nor in masses; but grows mingled with other kinds of pines, in ancient woods, which are almost inaccessible from the elevation at which they grow. Before the revolution, a company bought the wood of Cinca, and had excavated a subterranean road, to facilitate the removal of the trees. The revolution put a stop to this project; but the opening of these works is still to be seen at the Port de la Pez." (*Hist. des Plantes des Pyr.*) M. La Peyrouse at first supposed this pine to be the same as *P. Laricio*, which it greatly resembles in



2091



its general appearance. He afterwards called it *P. penicellus*, but, in his *Suppl.* he names it *P. pyrenæica*, which name Captain Cook proposes to change to *P. hispánica*, as the tree is chiefly found in Spain; and a French writer in *Annales d'Hort.* to *P. halepensis major*. Captain Cook states that this species is "quite hardy, of quick growth, and will, from its noble appearance, the beauty of its form, and the clear transparent colour of both the bark and foliage, be a vast acquisition to our park scenery. The timber is white and dry, being nearly without turpentine; but the cones exude a most delicious balsamic odour. The wood was formerly used by the Spanish government, in the arsenals of Carthage and Cadiz, for the decks of ships; for which purpose regular depots were kept in the Sierra de Segura; and it was floated down to the respective ports by the rivers Segura and Guadalquivir. It is one of the species described in the book of Arab agriculture written by a Moor of Seville, in 1200, and translated by Banqueri." Besides the plants sent by Captain Cook to Woodside, the Horticultural Society's Garden, and Syon, there are also specimens at Newton and Belsay, in Northumberland; at Dropmore; at Carlton, near Darlington, in Durham; at Carclew, in Cornwall; and some other places.

† 11. *P. RESINOSA* Ait. The resinous, or red, Pine.

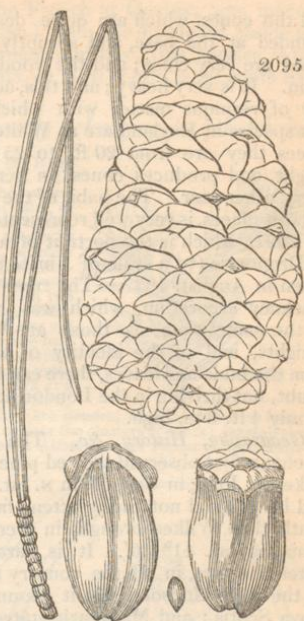
Identification. Ait. Hort. Kew., ed. 1, s. p. 367., ed. 2, s. p. 316.; Lamb. Pin., ed. 2, t. 13.; Willd. Sp. Pl., 4, p. 496.; Mart. Mill., No. 4.; Pursh Fl. Amer. Sept., 2, p. 642.; Hayne Dend., p. 173.; Lawson's Manual, p. 347.; Bon Jard., 1837, p. 975.; Lodd. Cat., ed. 1836.
Synonymes. *P. canadensis bifolia cbnis médiis ovatis Du Ham. Arb.*, 2, p. 125.; *P. rubra Michx. N. Amer. Syl.*, 3, p. 112.; Norway Pine, in Canada; Yellow Pine in Nova Scotia; le Pin rouge de Canada, Fr.
Engravings. Lamb. Pin., ed. 2, 1. t. 13.; Michx. N. Amer. Syl., 3. t. 134.; our fig. 2096., to our usual scale, with a male catkin (*m*) of the natural size; and figs. 2094. and 2095., of the natural size; all from Dropmore and White Knights specimens.

Spec. Char., &c. Bark red. Leaves in pairs, 4 in. or 5 in. long. Cones of a reddish brown, ovate-conical, rounded at the base, and half the length of the leaves; scales dilated in the middle, and unarmed. (*Michx.*) Buds (fig. 2094.), in the White Knights specimen, $1\frac{1}{2}$ in. long, and $\frac{5}{16}$ in broad; ovate, acuminate, concave on the sides, with a long point, as in *P. Laricio*; but reddish brown, and very resinous. Leaves (fig. 2095.) from 5 in. to 6 in. long, straight, stiff, and yellow at the tip; sheath from $\frac{1}{2}$ in. to 1 in. long, white, lacerated, and becoming short and dark with age. Cone 2 in. long, and $1\frac{1}{4}$ in. broad, ovate-conical, brownish red, sessile, or with very



short footstalks; scales $\frac{7}{8}$ in. long, and $\frac{3}{8}$ in. broad. Seeds small; with the wings $\frac{3}{4}$ in. long. The leaves are thickly set, and inclined towards the shoot, and much lighter and more glaucous than in *P. Laricio* and its varieties, in which the foliage is of a darker green than it is in any other species of *Pinus*. The shoots are much more naked, and the whole tree is more open and lighter; and the large and small branches are straighter and more distant than in *P. Laricio*; the plant is also of much less vigorous growth in British gardens. The cones, in Michaux's figure, and also on the trees at White Knights, bear a good deal of resemblance to those of *P. Laricio*; which induced Loiseleur Deslongchamps to consider Michaux's plant as identical with that species; but, we think, if he had seen the cones and trees at White Knights, he would have been of a different opinion. We have sent him a specimen. We acknowledge, however, that both the foliage and the cones, and even the tree altogether, bear a close general resemblance to *P. Laricio*; but the different form and colour of the scales, the lighter tinge of the foliage, and, above all, the much more delicate constitution of the tree, appear sufficient to justify us in retaining it as a distinct species. We are certain that the trees at White Knights are the true *P. rubra* of Michaux; because they were raised by Messrs. Loddiges from seeds of *P. rubra*, sent to them by Bartram of Philadelphia. We have also, since the above was written, received cones and leaves from Mr. M' Nab, jun., which were gathered by him in Upper Canada, in August, 1834, from trees which had been blown down, and which measured upwards of 70 ft. in length.

Description. A tree, according to Michaux, which, in America, rises from 70 ft. to 80 ft., with a trunk about 2 ft. in diameter, and retaining nearly the same bulk for two thirds of its height. The bark is of a clearer red than that of any other pine in the United States; and by this the tree may always readily be distinguished. The leaves are 5 in. or 6 in. long, of a dark green, two in a sheath, and collected in bunches at the extremity of the branches, like those of the pinaster; instead of being distributed regularly over them, like those of *P. inops* and *P. sylvestris*. The female catkins are of a dark blue, when they first appear;



and the cones, which are quite destitute of prickles, are about 2 in. long, rounded at the base, and abruptly pointed. The concentric circles of the wood are very close; and the wood, when wrought, exhibits a fine compact grain. It is very heavy; and this, according to Michaux, arises from the quantity of resinous matter with which it is impregnated. The finest trees of this species in England are at White Knights and Dropmore; at both which places they are from 20 ft. to 25 ft. in height, and produces cones, in general, every other year. The habit of the tree, at both places, is very well represented by *fig. 2097.*, which is the portrait of a tree at Dropmore (to a scale of 1 in. to 8 ft.), taken in August, 1837. The tree in the Hackney arboretum, which was raised at the same time as those at White Knights, and of the identity of which, from the buds and leaves, there can be no doubt, not thriving in the London smoke, is only 4 ft. 3 in. high.

Geography, History, &c. The elder Michaux first observed the red pine near Lake St. John, in Canada, in N. lat. 48°; and his son did not find it extend farther south than Wilkesborough, in Pennsylvania, in lat. 41° 30'. It is rare, the latter observes, in all the country south of the river Hudson; but it abounds in Nova Scotia; and Mackenzie states that he saw it beyond Lake Superior. It is not found in immense forests, but occupies small tracts of a few hundred acres in extent, alone or mingled with the white pine; growing only in dry sandy soils. Mr. M'Nab only found this species in the neighbourhood of Kingston, and on the banks of the Genessee in the state of New York. He was informed, however, that it was abundant in the interior of the country, at a distance from the rivers and lakes. This species is mentioned, in the *Traité des Arbres, &c.*, of Du Hamel, published in 1755, as the pin rouge de Canada; but, as he says he received the description of it from M. Gaultier, who was conseiller au conseil supérieur, et médecin du roi, at Quebec, it is probable that living specimens were not sent to France. It was introduced into Britain by Hugh Duke of Northumberland, in 1756; and Mr. Lambert, writing in 1804, mentions that the greatest number of trees in England were then at Syon House. He also found one at Pain's Hill, and mentions others at Kenwood. The whole of these trees seem to be dead, or cut down; for we could not find one at Pain's Hill, and there are none at Syon or Kenwood. About the end of the last century, Messrs. Loddiges raised nearly 100 plants of *P. resinosa*, from seeds received from Bartram of Philadelphia; and nearly the whole of these were planted by the then Marquess of Blandford (the present Duke of Marlborough) at White Knights, where a number of them still exist, though they have been much injured by other trees; and they have borne cones for several years past.

Properties and Uses. The concentric circles of the wood of this tree, Michaux observes, are small, and it consequently exhibits a fine grain; and, being rendered heavy by the resinous matter with which it is impregnated, it is highly esteemed in Canada for its strength and durability. It is employed to furnish planks for the decks of ships, which are often 40 ft. long, without a single knot; and, stripped of its sap wood, it makes excellent pumps. It has also been used for the masts of ships; and Du Hamel (*Traité des Arbres*), and after him Michaux, mention that the mainmast of the St. Law-



2097

rence, a ship of 50 or 60 guns, built by the French at Quebec, was made of it. The timber of this pine is sent to England, from the district of Maine and the shores of Lake Champlain. As an ornamental tree, this species is well deserving of cultivation. The price of plants, at New York, is 50 cents each.

App. i. *Doubtful Species, apparently belonging to § Laricio.*

P. canadensis bifolia, foliis brevioribus et tenuioribus, Du Ham. Arb., ii. p. 126.; *P. resinosa* N. Du Ham., v. p. 237. t. 77. f. 2.; and our fig. 2098. to our usual scale, and fig. 2099. of the natural size, both from the *Nouveau Du Hamel*. Leaves in pairs, or three in a sheath, slender. Cones conical, erect, in twos, threes, or fours, and sometimes in clusters; not half the length of the leaves; having their scales convex on the back, scarcely angular, depressed and umbilicate at the summit. (*Lois. Deslongchamps*.) There was, in 1812, a tree of this species growing in the garden of the Veterinary School at Alfort, about two leagues from Paris, which *Loiseleur Deslongchamps* states that he had known for more than 30 years, and which was not then more than 12 ft. high. The trunk is divided near the base into three large limbs, which rise obliquely, and are subdivided into numerous small branches, so as to form a large round bush. The trunk and limbs are covered with a rough cracked bark of a reddish brown; while the younger branches have a greyish bark, tolerably smooth. The leaves are in pairs or threes; they are slender, from 3 in. to 6 in. long, and are disposed in tufts at the extremity of the branches, or near the clusters of cones; leaving at least half or two thirds of each branch quite bare. The tree at Alfort does not appear to have borne any

male catkins; but the female ones are numerous: they are oval, reddish, and disposed in groups or clusters, of from 2 or 3 to 6 or 10, or even more, together. The female catkins stand straight out when in flower, and retain the same direction when in fruit. They ripen the second year, but remain on the tree for 4 years or more. They are about 2 in. long, and $1\frac{1}{2}$ in. in diameter at the base, terminating in a sharp point; of a bright cinnamon-red colour; the swollen part of the scales is convex, a little angular, and depressed in the centre, where it is of a greyish colour. The seeds are nearly white, and much larger than those of *P. Laricio*. The wing, which is of the same colour, is $\frac{1}{2}$ in. or more in length. The only specimen of this pine which *Loiseleur Deslongchamps* had met with in France was that above described at Alfort, where it was under the name of *P. halepensis*, though it differed materially from that species in various points, and particularly in having its cones pointing horizontally, instead of downwards. Du Hamel, in his *Traité des Arbres*, &c., published in 1755, gives a description of this species, which he says he received from M. Gaultier of Quebec. He calls it *P. canadensis bifolia, foliis brevioribus et tenuioribus*, le petit pin rouge de Canada; in opposition to *P. canadensis bifolia, cœnis mediis ovatis*, le pin rouge de Canada, also received from M. Gaultier, and which is evidently the same as the *P. rubra* of Michaux, *P. resinosa* Ait.; as Du Hamel expressly mentions that its timber was used for the mainmast of the St. Lawrence; a fact also stated by Michaux. (See p. 2212.) He states that this pine was said to grow near Montreal, on the banks of the St. Lawrence.



2098



2099



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§ iii. *Pinaster.*

Sect. Char. Leaves long, straight, and stiff, comparatively broad. Cones large, with rhomboidal, pyramidal terminations, pointed. Buds blunt-pointed, imbricated, with the scales turned back, woolly, and wholly without resin.

‡ 12. *P. PINASTER* Ait. The Pinaster, or Cluster, Pine.

Identification. Ait. Hort. Kew., ed. 1., 3. p. 367.; Lamb. Pin., 1. t. 9.; Mart. Mill., No. 2.; Lawson's Manual, p. 341.; Lodd. Cat., ed. 1836; Hayne Dend., p. 172.

Synonymes. *P. sylvestris* γ *Lin. Syst. Reich.*, 4. p. 172.; *P. maritima* *átera Du Ham. Arb.*, No. 4. t. 29., *Du Roi Harbk.*, ed. Pott, 2. p. 59.; *P. maritima N. Du Ham.*, 5. p. 240.; *P. sylvica Thore Prom. sur les Cotes de Gascogne.* p. 161.; *Pin de Bordeaux, Pin des Landes.*
Engravings. *Du Ham. Arb.*, No. 4. t. 29.; *Lamb. Pin.*, ed. 2., 1. t. 9.; *N. Du Ham.*, 5. t. 72. and 72. bis f. 1.; our *fig.* 2105., to our usual scale; *figs.* 2100., and 2101., of the natural size, from Dropmore and Pain's Hill specimens; and the plates of this tree in our last Volume.

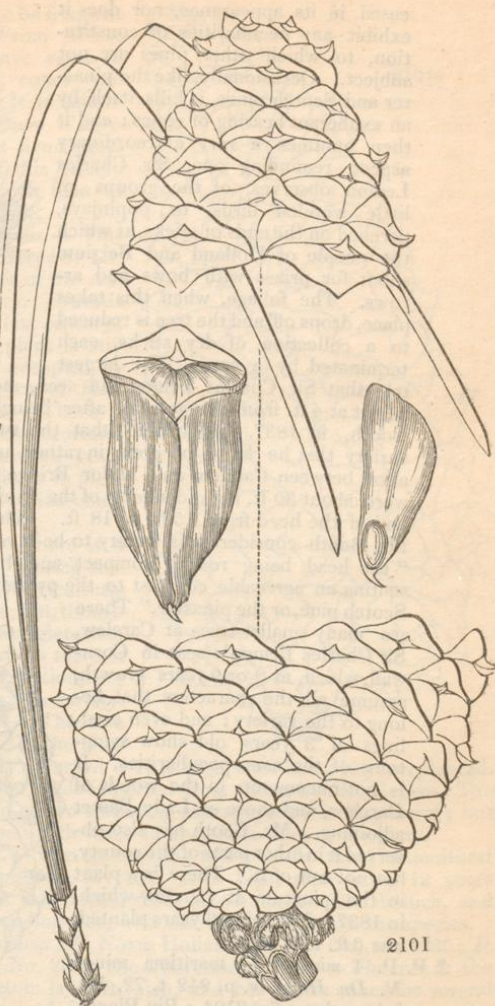
Spec. Char., &c. Leaves in pairs, rigid, very long. Cones conical, placed in whorls of 3, 4, or even as many as 8, together; rarely solitary, much shorter than the leaves; the backs of the scales forming each a rhomboidal pyramid, with two lateral angles, from which proceed ribs, terminating at the summit of the pyramid in a smaller pyramid, which has a hard point, more or less sharp, and of a grey colour. Crest of the anthers rounded. (*N. Du Ham.*, and obs.) Bud (*fig.* 2100.) from $\frac{2}{3}$ in. to $\frac{3}{4}$ in. long; and from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. broad; straight-sided, cylindrical, pointed, imbricated, with the scales turned back; white and woolly, but never resinous; surrounding buds few and small. Leaves (see *fig.* 2101.) from 6 in. or 8 in. to 1 ft. in length, slightly serrated on the margins; sheaths from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length; imbricated, scarcely rigid; pale green or whitish at first, and becoming at last black. Cones from 4 in. to 6 in. in length, and from $1\frac{3}{4}$ in. to $2\frac{1}{2}$ in. wide at the broadest part; light brown, and shining; scales from 1 in. to $1\frac{1}{4}$ in. in length, and from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in breadth at the widest part; terminating in a regular pyramid; rhomboidal at the base. The summit consisting of a smaller rhomboidal pyramid, of an ash-grey colour, very hard, and with a small sharp point, more particularly in the upper part of the cone. Seeds oblong, and measuring, without the wing, upwards of $\frac{3}{8}$ in. in length, and nearly $\frac{1}{4}$ in. in breadth; with the wing above $1\frac{3}{4}$ in. in length; wing nearly $\frac{1}{2}$ in. in breadth. Cotyledons 7 or 8. The tree flowers, near London, in the beginning of June; in the north and west of France, in May; and on the Landes of Bordeaux, in April.



Varieties. The extensive geographical range of this tree has given rise to many varieties, though we have seen but very few that can be considered truly distinct. In the *Nouveau Du Hamel*, only one is mentioned; but it is added, that, in the Landes of Bordeaux, in the sandy downs along the sea coast, where the trees send down their taproots to a great depth, some are to be found which produce clusters of cones from 30 or 40 to 80, or even 100, in a cluster. This is stated by Loiseleur Deslongchamps, on the authority of Dr. Thore of Dax, who adds that this luxuriance of vegetation is not constant; for the same trees which have borne so many cones in one year, are found, in other years, with very few, or none; it cannot, therefore, be considered as a variety. The pinaster appears also to be indigenous to, or to have been introduced into, several ultra-European countries; and plants raised from seeds received from these countries have had names given to them in British gardens, though hardly, as we think, meriting that distinction. We shall, however, give all the varieties of which we have seen plants, and leave the reader to judge for himself.

- 2 *P. P. 2 escarènus*, *P. escarèna Risso.*—The leaves are of a paler green than those of the species, but they are equally long and strong. The cones are shorter, and more ovate. This is the most distinct and handsome variety of pinaster that we have seen: it was first introduced into Britain by the Earl of Aberdeen, in 1825; the tree having been pointed out to His Lordship in that year, by M. Risso, at Nice, as growing, though rather sparingly, in the mountains, about 12 or 15 miles from that city. From seeds brought to England by Lord Aberdeen, plants were raised; and one presented by him to Lord Grenville bore cones in 1836, and is now (1837) 17 ft. high: one presented to the London Horticultural Society, after being 8 years planted, is now 11 ft. high, but has not yet borne cones.

‡ P. P. 3 *Lemoni-
anus*, *P. Lemoni-
ana* Ben-
tham Hort.
Transac., vol.
i., second se-
ries, p. 509.
pl. 20.; and
our fig. 2102.
to our usual
scale, and fig.
2101. to the
natural size.
— This is also
a very distinct
variety, but
quite the op-
posite of the
last; being a
stunted bulky
plant, with
zigzag, close,
and twigggy
branches; and
standing ap-
parently in
the same re-
lation to *P.*
Pinaster that
P. (s.) *pum-
ilio* does to
P. sylvestris.
In a very dis-
tinct account
of this variety
by Sir Charles
Lemon, pub-
lished in the
*Horticultural
Transactions*,
as above re-
ferred to, he
characterises
it as follows :
—“ In foliage,
it is similar to



the pinaster; but it differs in the general habit of the tree, and in the form and position of the cones. In the common pinaster, the cones, of which there are generally 3 or 4 together, are situated behind the shoots of the whorl, and, in the mature state, point backwards. In this obscure species the cone is single, and it universally occupies the place of the leading shoot, the side shoots being behind it. The necessary consequence of this mode of growth is, that the tree can have no regular leader, but each year one of the side shoots strengthens, and continues the growth for the ensuing season; the year following, the same process is repeated in another direction, giving the stem of the tree a zigzag appearance, which it never entirely loses.” The general appearance of the tree is that of a short bushy pinaster; though there is nothing dwarfish or dis-

eased in its appearance, nor does it exhibit any peculiarities of constitution, to which other pines are not subject. Occasionally, like the pinaster and Scotch pines, it kills itself by an exuberant bearing of cones; and it then assumes a very extraordinary aspect, reminding one, Sir Charles Lemon observes, of the groups of little wooden birds, or popinjays, perched on the ends of sticks, at which the people of Holland and Belgium shoot for prizes with bows and arrows. The foliage, when this takes place, drops off, and the tree is reduced to a collection of dry sticks, each terminated by a cone. The largest



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tree that Sir Charles Lemon had seen, measured, in 1833, 44 in. in girth at 4 ft. from the ground, after being planted 35 years. Mr. Booth, in 1837, informed us that the two largest trees of this variety that he knew of, grew in rather an exposed situation between Carclew and Mylor Bridge, and that they were about 30 ft. high, diameter of the trunk about 15 in., and of the head from 15 ft. to 18 ft. When of this size, Mr. Booth considers this variety to be a very graceful tree "the head being round, compact and bushy, and presenting an agreeable contrast to the pyramidal head of the Scotch pine, or the pinaster." There are many smaller trees at Carclew, Sir Charles Lemon's seat in Cornwall, which, at 8 or 9 years' growth, assume all the characters that belong to the variety; and even seedlings of 3 years' old show symptoms of the same peculiarities. It is not uncommon in the woods of Carclew, and those of Lady Basset adjoining. Mr. Booth has also observed it in other parts of the county, but not out of it. There is a plant in the pinetum at Carclew which, in 1837, after being 6 years planted, was 6 ft. 6 in. high.

† *P. P. 4 minor*; *P. maritima minor* *N. Du Ham.*, v. p. 242 t. 72. bis, f. 1., and our fig. 2104.; Pin Pinsot, Pin de Mans, Pin à Trochet. —

This variety, which is chiefly distinguished by the somewhat smaller size of its cones, being from $3\frac{1}{2}$ in. to 4 in. long, and $1\frac{3}{4}$ in. broad, is said by Bosc to be produced by a colder climate, and to abound on the west coast of France, especially on the barren sands in the neighbourhood of Mans; and to be hardier than the species.

It is found in the Landes of Bordeaux, growing along with *P. Pinaster*. There is a specimen of this variety in the Jardin des Plantes, as well as of *P. Pinaster*, known there as *P. maritima major*; and a considerable quantity of *P. maritima minor* has been sown in the Forest of Fontainebleau. Judging from the specimens with cones which have been sent us from different parts of the country, this



+ 2103



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variety appears to be frequent in England. From White Knights, we have received specimens with cones not 3 in. in length. It is said in the *Nouveau Cours d'Agriculture, &c.*, that five faggots of the wood of this variety will burn as much lime as eight faggots of oak.

‡ P. P. 5 *fólius variegátis*.—This variety was discovered by Mr. Cree, the founder of the Adlestone Nursery, towards the end of the last century; and the original plant is still in the grounds occupied by his son, the author of *Hortus Adlestonensis*. There is a tree in the Horticultural Society's Garden, 12 years planted, which is 12 ft. high. It is propagated by inarching on the species.

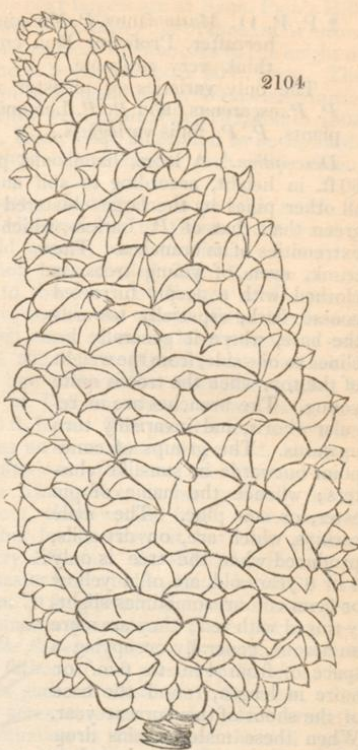
‡ P. P. 6 *marítimus*.—There is a tree, 25 ft. high, bearing this name, in the Horticultural Society's Garden; but, though somewhat more fastigiate than some other pinasters there, it may be a mere variation, not worth recording as a variety.

‡ P. P. 7 *chinénsis*.—The tree bearing this name in the Horticultural Society's Garden is 14 ft. high, after being 10 years planted. It was raised from seeds imported from China by Mr. Reeves. The tree is erect, and not so spreading as the species is in general; but it can scarcely be worth while to keep it distinct as a variety.

‡ P. P. 8 *nepalénsis*.—The tree bearing this name in the Horticultural Society's Garden was, in 1837, 14 ft. high, after being 12 years planted. It was raised from seeds sent home by Dr. Wallich, and is a branchy spreading tree, with narrower cones than the species.

‡ P. P. 9 *nòvus hollándicus*; *P. Nòvæ Hollándiæ Lodd. Cat.*, ed. 1836; *P. nòva zælándica*, No. 28. in the arboretum at Kew.—The tree in the Hackney arboretum is 10 ft. high, and has borne cones for several years. It was raised from seeds received, in 1816, from a gentleman who said he had them from New Zealand, though in this there is, doubtless, some mistake.

‡ P. P. 10 *st. helenicus*.—A plant with this name, imported from St. Helena, and which, in 1837, in the collection at Hendon Rectory, was 6 ft. high in a pot, had leaves full 7 in. long, and $\frac{1}{2}$ in. broad, and remarkably strong and thick, with the leaves of the preceding year pointing downwards, like those of *P. Sabiniána*. If this variety should be the same as the St. Helena pinaster in Loddiges's arboretum, the luxuriance of its foliage will be greatly diminished when the tree grows old; for the last tree in the line of pines in the Hackney arboretum, which was imported from St. Helena in 1816, is now (1837) 25 ft. high, and not distinguishable either in leaves or cones from the common pinaster.



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‡ *P. P. 11. Massoniâna*, *P. Massoniâna* Lamb., 2 ed., 1. t. 8., to be noticed hereafter, Professor Don considers as only *P. Pinâster*, which we think very probable.

The only varieties of pinaster which we think worth cultivating are *P. P. escariënis*; and *P. P. Lemoniânus*, and, for those who like variegated plants, *P. P. fôliis variegâtis*.

Description. A large, handsome, pyramidal tree, varying from 40 ft. to 60 ft. in height, according to soil and situation; readily distinguished from all other pines by the large clustered masses of foliage, of a much lighter green than that of *P. Laricio*, which alternate with naked spaces, on the extremities of its branches. The trunk, even of young trees, is clothed with a deeply furrowed coarse bark, especially towards the base, where it generally inclines to one side, from the weight of the top, when the tree is quite young. The branches are in regular whorls, and invariably turn upwards. The groups of cones point outwards in star-like clusters; whence the name of pin aster, or star pine. The male catkins, which are, on dry soils, produced when the tree is only 6 or 8 years old, are of a yellow or fawn colour, sometimes slightly tinged with red; they are more numerous, generally occupying a space of from 4 in. to 6 in. or more in length, round the base of the shoot of the current year. When these male catkins drop off, the space they occupied is left bare; and hence the alternation already mentioned, of tufts of foliage and bare places, on the extremities of the branches;

and which are so much more conspicuous on this pine than on any other European species, from the greater number of catkins produced, and the greater length of the leaves. The female catkins appear in whorls on the extremities of the shoots of the current year; and are at first purple, but afterwards change to green, and, when they attain maturity, in the autumn of the second year, become of a rich shining brown. The pyramidal termination to the scales of the cones is always much larger, and more prominent, on the upper side of the cone than on the under side, and on that side of the tree which is exposed to the sun, than on that which is in the shade. There is a more decided taproot in this pine than in any other European species; and, where the soil is dry and sandy, it descends perpendicularly into it, like the root of a broad-leaved tree. In proportion as the perpendicular roots are stronger than those of other pines, the horizontal roots are weaker; and hence, in the case of transplanted trees, from the weight of the head, produced by the dense mass of long foliage, the stem is generally inclined to one side; and when, after two or three years, it begins to grow erect, a curvature appears close above the root, which remains visible even in old trees. The rate of growth is very rapid; plants, in 10 years from the seed, attaining the height of 10 ft. or 12 ft., and, in twenty years, the height of 30 ft., in the climate of London. The wood is in thick layers, soft, and not of great duration. The finest pinaster in the neighbourhood of London is



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in the gardens of Fulham Palace; and the next largest are at Syon, Pain's Hill, and Whitton. The tree at Fulham is above 80 ft. high; one of those at Whitton is 60 ft. high, with a trunk 4 ft. in diameter, clear of branches to the height of 40 ft. Several at Pain's Hill, and some at Syon, are above 60 ft. high. The largest pinasters which we have heard of in England are at Westwich House, Norfolk, the seat of J. Peters, Esq. They were planted in 1702, and in 1809 several of them were measured by N. Kent, Esq., and found to be upwards of 80 ft. high, and to contain about eight loads of timber each. (See *Trans. Soc. Arts*, vol. xxviii. p. 42.)

Geography, History, &c. The pinaster is indigenous to the south of Europe, and to both shores of the Mediterranean; to Greece, the west of Asia, the Himalayas, and, as it would appear, even to China. It may be doubted, however, whether it has not been carried from Europe to the latter country. It is not indigenous to the north of France or Germany, and is, perhaps, most abundant in Spain, and on the shores of the Mediterranean. It never thrives, except in deep sand or sandy loam; and it is said to perish when planted in calcareous soil. The pinaster was introduced into England in 1596, by Gerard; and one of the oldest trees still existing is in the gardens of the episcopal palace at Fulham, where, as we have seen above and in p. 43., it was, in 1835, 80 ft. high. The pinaster has since been very extensively planted in Britain, as an ornamental tree; and, in some parts of Hampshire and Norfolk, plantations of it have been formed on a large scale for useful purposes. In Hampshire, it has generally failed, from the soil being peaty, wet at bottom, shallow, and hard, or the subsoil being chalk. In Norfolk, on the other hand, where it has been planted in deep sand, the success has been very different. At Westwich House, in that county, already mentioned, the pinaster began to be planted in 1702; and many trees, still existing there, are from 70 ft. to 80 ft. high, with trunks proportionately thick. An account of the pinaster plantations at this place, taken in 1809, is given in the *Transactions of the Society of Arts*, vol. xxviii., by which it appears that J. B. Peters, Esq., the father of the present proprietor, had raised above 200,000 plants from seeds gathered from his own trees. He had planted altogether upwards of 500 acres, through which he had formed a drive of five miles in length. The situation is bleak, and the soil sand, covered with heath, on a subsoil of coarse hard gravel, or dead yellow sand. Nevertheless, on this soil the plants grow so rapidly, that, in 8 or 9 years after planting, their trunks are from 10 in. to 20 in. round, and some have occasionally made shoots of 5 ft. in length in 2 years. They are planted at 7 ft. apart every way, and remain unthinned and unpruned till they attain a circumference of 2 ft. or 3 ft. Such is the vigour with which these trees grow, that, on the steep side of a hill, the roots have been observed to emerge from the soil, creep along its surface for 2 ft. or 3 ft., and then strike into the soil again. (*Trans. Soc. Arts*, vol. xxviii. p. 42.) In Scotland and Ireland, the pinaster has only been planted as an ornamental tree; and it thrives, in these countries, in low situations, and near the sea. In France, it cannot be cultivated with a view to profit, to the north of Paris; and, even in that latitude, it is sometimes destroyed by severe winters: for example, in 1788, when a severe frost killed some large trees on the estate of Malesherbes. It abounds in Switzerland, where its timber is said to be used in forming shingles; and it is planted as an ornamental tree in Germany, but scarcely thrives north of Hamburg.

The most remarkable fact in the history of this tree is, the great use which has been made of it in France, in covering immense tracts of barren sand. This mode of improvement was first commenced in 1789, by M. Bremonnier, of the Administration of Forests, who published a memoir on the subject in the year 1800, of which we shall make a very brief abridgement. There are very extensive downs in several countries of Europe; and the most remarkable in France are those between Dunkirk and Nieuport, between Calais and Boulogne, and between the rivers Adour and Gironde. Bremonnier com-

menced his operations in the Gulf of Gascony, in 1789. The downs there are composed of drifting sands, covering 300 square miles. Bremontier compares the surface of this immense tract to a sea, which, when agitated to fury by a tempest, had been suddenly fixed, and changed to sand. It offered nothing to the eye, but a monotonous repetition of white wavy mountains, perfectly destitute of vegetation. In times of violent storms of wind, the surface of these downs was entirely changed; what were hills of sand often becoming valleys, and the contrary. The sand, on these occasions, was often carried up into the interior of the country, covering cultivated fields, villages, and even entire forests. This takes place so gradually (by the sand sweeping along the surface, and thus raising it, or falling from the air in a shower of particles, so fine as to be scarcely perceptible), that nothing is destroyed. The sand gradually rises among crops, as if they were inundated with water; and the herbage and the tops of trees appear quite green and healthy, even to the moment of their being overwhelmed with the sand, which is so very fine as to resemble that used in England in hour-glasses. After three chapters of preliminary matter of intense interest, M. Bremontier, in his fourth chapter, gives an account of the manner in which he proceeded, not only to fix this sea of sand, but to render it productive of timber, resin, and other articles. This process is as remarkable for its simplicity as for its complete success. It consists in sowing on the surface seeds of the common broom, mixed with those of *Pinus Pinaster*; commencing on the side next the sea, or on that from which the wind generally prevails, and sowing in narrow zones, in a direction at right angles to that of the wind; the first-sown zone being protected by a line of hurdles, this zone protecting the second, the second the third, and so on, till the whole breadth of the downs in that locality is covered with plantation. From 4 lb. to 5 lb. of broom seed, and from 1 lb. to 2 lb. of pinaster seed, are sown per acre, and immediately covered with branches of pines, or of other trees, with the leaves on, brought from the nearest woods, in order to shelter and protect the seed, and, by the help of the hurdle fence, to retain the sand. These branches are laid down in a regular manner in the direction of the wind, and overlapping one another, so as to produce a sort of thatching to the surface; and, in places very much exposed, rods are laid across them, and firmly hooked down. In a word, wherever seeds are sown, the surface of the downs, as far as the sowing extends, may be said to be carefully thatched; branches of evergreen trees being used instead of straw. In six weeks or two months, the broom seeds have produced plants 6 in. in height, and which attain three or four times that height in the course of the first season. The pines do not rise above 3 in. or 4 in. the first year; and it is 7 or 8 years before they completely overtop the broom, which often attains, in these downs, from 12 ft. to 15 ft. in height. At the age of 10 or 12 years, the pines have, in a great measure, suffocated the broom, and they are then thinned, the branches cut off being used for the purpose of thatching downs not yet recovered, and the trunks and roots cut into pieces and burned, to make tar and charcoal. In about 20 years, the trees are from 20 ft. to 30 ft. in height; and they are now prepared for producing resin, which process is carried on, in the manner hereafter described, for 10 or 12 years; when the trees are cut down, and their branches applied, as before, for thatching, and their trunks and roots for making tar and charcoal; the self-sown seeds having furnished the surface with a progeny to succeed them. In 1811, a commission appointed by the French government made a report on the downs, and announced that about 12,500 acres of downs had been covered with thriving plantations, and that it was found a thatching or covering of any kind of vegetable herbage, such as straw, rushes, reeds, sea-weed, &c., might be used instead of branches, and was even preferable. Another improvement which had been tried, and found very successful, was the substitution of a fence of boards for that of watted hurdles, as more completely excluding the wind. (See *Dict. des Eaux et Forêts*, tom. i. p. 816.) These plantations, and others in the Landes of Bordeaux, and be-

tween that city and Bayonne, which are there called pignadas, constitute the principal riches of the inhabitants, who are almost entirely supported by the preparation of resin and tar from the pinaster forests.

Properties and Uses. Though the wood of the pinaster is soft, and not of long duration, it is employed, in the marine arsenal at Toulon, for the outer cases of all the packages which are put on board vessels, and principally for the piles and props which are used for sustaining the frames of vessels while they are being constructed. In Bordeaux and in Provence, it is employed for the common kinds of carpentry, for packing-boxes, and for fuel; but the most valuable purposes to which the tree is applied in these countries is the production of resin, tar, and lampblack.

Mode of procuring the resinous Products of the Pinaster. These are obtained chiefly in the province of Guienne, from the trees which grow on the immense tract of sandy soil extending along the sea coast from Bayonne to Médoc in one direction, and from the sea to the borders of the river Garonne in the other. When the trees have attained the age of from 25 to 30 years, with trunks about 4 ft. in circumference, they are thought to have acquired sufficient strength to bear the extraction of their sap. The *résinier* (which is the name given to the person who collects the resin) usually tests the tree, by putting his arm round it, and if the trunk is so thick that he cannot see his fingers on the other side, he considers the tree of sufficient size for him to commence his operations. This he does by first stripping off a piece of the outer bark from a space of about 4 in. or 6 in. wide, and from 12 in. to 18 in. long. A hollow is then cut in the lower part of the trunk, with a hatchet slightly curved like a bill-hook, in such a manner as to retain the fluid resin to the extent of about half a pint; or a small trough is attached to the bottom of the channel formed by the removal of the bark. From this reservoir, in a direction upwards, and over the space from which the outer bark was removed, the wood is laid bare to the length of 6 in., and to the width of 4 in., and the resin oozes out from between the bark and the wood, and runs into the reservoir, from which it is taken with wooden or iron ladles, or is conducted by the trough to a vessel proper to receive it. Every week, the person employed to perform the operation has occasion to reopen the wound, and slightly increase its height and breadth, without, however, ever exceeding 18 in. in length in the course of the season. These successive cuts are requisite, because the resinous matter flows more freely from new wounds than old ones; but, as the slightest touch is found sufficient, the operator should be careful not to injure the tree more than is necessary. This work requires activity, as one man is generally expected to be able to manage from 1500 to 2000 trees; and the operation is continued on the same tree by annually removing a portion of the bark, till the part laid bare is from 12 ft. to 15 ft. in height; which takes place, commonly, in 7 or 8 years. At that time, a fresh channel is commenced, so close to the preceding cut, as to leave only an inch or two of bark between them, and it is conducted gradually to the same height as the other. After this, other channels are successively cut, till the operator has completely encircled the tree; by which time, the first wounds are so well healed as to be ready to be cut again, if the operator has done his work properly. When the trees are to be thinned, those destined to be removed are cut into numerous channels all round the tree at once, and three times the height of those usually made, and this is continued for two or three years together; after which the trees are cut down and burned, to extract their tar. This operation is called *tailler à pin perdu*. When the wound is above the height of a man, the operator makes use of a pole cut with slanting notches to receive his feet; by the aid of which he climbs up the tree with great dexterity. When arrived at the necessary height, he twists his left leg round the pole and the tree, thus holding them firmly together, and then resting his right foot in one of the notches, he uses both his hands to cut the tree, as before

mentioned, with just as much ease as though he had a proper ladder leaning against the tree. The *résiniers* always climb with naked feet, and they are so expert, that it takes them only two or three minutes to mount a tree, enlarge the wound, and descend; the *résinier* then takes his pole on his shoulder and runs to the next tree, which he also mounts with such expedition, that a good workman will trim from 200 to 300 trees in a day. The season for cutting the pines is from May to September; and the resinous matter flows most freely in warm weather; it also flows much more freely from those trees which are exposed to the sun, than from those which grow in the shade. Besides the resin which flows from the wounds given to the tree, some drops exude from cracks in the bark, which dry, and form grains, often employed to adulterate the incense used in Catholic churches, by the persons who sell that substance. These natural drops are only produced when the tree is become very old, and when nearly all the resin which it can be made to yield by artificial means has been extracted from it. The resinous matter which exudes from the pinaster is called by several names in France, even in its raw state. That which incrusts on the sides of the wound is called *barras*. It is nearly as white as wax, and is used to mix with that substance for making tapers, to which it gives suppleness and elasticity. The *barras* is collected only once in the year, at the end of the season; and it is scraped off with a kind of iron rake. The principal substance which flows from the tree is called *galipot*, or *résine molle*. This substance, having been collected in the hollow cut in the tree, or in the trough attached to it, is put into large pits or reservoirs, capable of containing 150 or 200 barrels each, which pits are dug in the earth, and lined with planks made of the pine tree, fitted so close together as to prevent the liquid oozing through. It is afterwards melted in large copper caldrons, set in brickwork, to free it from the impurities mixed with it. It is necessary that the caldrons used for this purpose should be set in brickwork, with a proper chimney to convey away the smoke; as, should the smoke be suffered to come in contact with the resin, the whole would probably take fire. It is also necessary to keep continually stirring the resin, to prevent it from burning at the bottom of the caldron. When the resinous matter is to be made into brown resin, some of the *barras* is mixed with it; and, when the mixture is thought to be sufficiently boiled, a little of it is poured on a piece of wood; and if, when it becomes cold, it will crumble between the fingers, the resin is ready. It is then poured through a filter made of straw laid horizontally, and $\frac{1}{2}$ in. or 5 in. thick, and run into barrels, where it is left to harden. In this state it is brown and brittle, and is called by the French *brai sec*, which is the brown resin of the shops.

To make yellow resin, when the resinous matter is boiling, a quantity of cold water is added, a few drops at a time: this makes the resin swell; and a trough having been previously fixed to one side of the caldron, the resinous matter flows through it to a vessel placed to receive it. From this the operator raises it by a ladleful at a time, and puts it back into the caldron; repeating the operation several times, till the resin becomes as yellow and as clear as wax. It is then filtered through straw into moulds hollowed in the sand, where it is formed into the cakes sold in the shops. To make these moulds, a circle is first traced in the sand, with a forked stick, which acts like a pair of compasses; the sand is then hollowed out with a knife, and the bottom and sides of the mould are well beaten with wooden mallets to make them perfectly hard and smooth. The cakes of resin generally weigh from 150 lb. to 200 lb. each. The straw through which the resinous matter was filtered, the pieces of wood through which it ran, and, in short, all the apparently waste materials used in preparing the resin, are carefully preserved, and burnt in a close furnace, in order to make lampblack; or in a tar furnace, to extract from them a resinous matter, which is sold cheap, and called in France *poix noir*, or black pitch.

Mode of preparing Lampblack. When the wood of the pine tree is burned

for tar, lampblack is formed on the cover of the furnace; but a superior kind is made from the straw, &c., used in straining the resin, which is burned for the sole purpose of obtaining this pigment. The apparatus employed for this purpose consists of a furnace, a chimney, and a small chamber, or box, for collecting the soot. The furnace is about 2 ft. 6 in. wide, 3 ft. or 4 ft. long, and 2 ft. 6 in. high; and it is usually set in brick. On each of the long sides, this furnace has an opening near the bottom, which can be shut at pleasure, by means of a little door attached to it. The furnace has a brick chimney, made almost horizontal, to conduct the smoke into the chamber, or box. The chimney is from 14 in. to 16 in. long, and 12 in. or 13 in. broad and high. At the place where the pipe of the chimney terminates, is constructed a chamber, or box, into which the pipe should enter some inches, so as to carry the smoke into its centre: This chamber is generally about 12 ft. square, and 9 ft. high in the roof; there is a door on one side, and in the upper part, or ceiling, there is an opening 5 ft. or 6 ft. square. The walls of the chamber are either lined with thin planks of wood, or plastered very smooth; and the door is fitted closely into a groove. Over the opening in the roof is placed a flannel bag, supported by rods of wood in the form of a pyramid, and composed of four pieces of coarse flannel sewed together. When the lampblack is to be made, a little of the straw through which the resin and tar have been strained, and some of the other refuse, are put into the furnace, and lighted, fresh straw impregnated with tar being strewed over the fire as fast as the other is consumed. The smoke passes into the chamber, and deposits its soot on the walls, and on the flannel bag, from both of which it is detached, after the whole of the straw and refuse has been burned, by striking the outside smartly with a stick. The flannel pyramid acts as a filter to the lighter part of the smoke, retaining the soot, and permitting the heated air to escape into the atmosphere. The door of the chamber is then opened, and the lampblack, being swept out, is packed in small barrels made of the wood of the spruce fir, for sale. In the Landes, the furnace and chimney are in the open air, and only the chamber is covered with a tiled roof; but in Germany the whole apparatus is constructed in a barn-like building, about 24 ft. long, by 12 ft. wide, and 10 ft. high. (See Hartig's *Lehrbuch für Forster*, as quoted by Baudrillart.) In Du Hamel's *Traité des Arbres et Arbustes*, art. Pin, he tells us that lampblack is sometimes made, in Paris and other cities, by burning the black resin in a kind of lamp, with a tin tube attached to serve as a chimney, the end of which tube is fixed in a close box, with an opening in the top, surmounted with a flannel cone, as before described.

Turpentine is rarely made from the pinaster, as it is very inferior to that produced by the silver fir. Oil of turpentine is, however, procured by distilling the galipot, or raw resin, obtained from the tree, with water. The oil ascends with the water, from which it is afterwards separated; and the residue is the colophony, or black resin, of the shops. The tar produced from the pinaster, which is very inferior to that of the Scotch pine, is called in France, *goudron des Landes*, or *goudron de Gaze*. When the trees have yielded all their resin, they are cut down, and the thickest parts of the trunk and roots cut into billets, about 2 ft. long and 2 in. square, which are piled up over an iron grating, and covered with clay at the sides, and burnt much in the same manner as has been already described (p. 2174.) for procuring tar from the *Pinus sylvestris*.

In Britain, it can hardly be considered advisable to plant the pinaster for its timber, in any situation where the Scotch pine or the larch will grow; and, even if it were profitable to employ the tree in the production of resin, our summers are probably not sufficiently warm to produce that secretion in any quantity. As an ornamental pine, the pinaster holds the first rank; and no plantation, where pines are admissible, ought to be without it.

Soil, Situation, Propagation, &c. A deep dry sand, or a sandy loam on a dry bottom, suits this tree best; and, according to Malesherbes and Rosier, and all the French authors who have written on it, it abhors chalk, and every de-

scription of calcareous soil. With respect to elevation, though it will endure the sea breeze, it will not grow, in England, much above the level of the sea. In Hampshire, at Muddiford, near Christchurch, which, in 1830, was one of the handsomest and best kept small places in England, there are some remarkably fine pinasters, growing so near the sea, that the salt water must have access to their roots. It is propagated by seeds, which may be procured in any quantity, and at a moderate price, from Bordeaux. Seeds are also ripened in several parts of England; and many trees, as we have already observed (p. 2219.), have been raised from them. The cones, which ripen in the August or September of the second year, may be gathered in October and November, and spread on a floor, under cover, to the thickness of 2 ft. or 3 ft.; and, during inclement weather in winter, women and children may be employed to take out the seeds. The first process consists in throwing the cones into boiling water for a few seconds, to soften the turpentine which glues the scales together; immediately afterwards, upon their beginning to snap or crackle, they should be taken out, otherwise the water gets to the seed and injures it. Every knob or scale is then separated with the point of a knife, and the seed is easily taken out. The time of sowing the seeds is April, and the covering from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. When it is intended to plant this species on a large scale, the sooner the young plants are moved to where they are finally to remain, the better; but in nurseries, where there is only a demand for them in small quantities, they are best kept in pots.

Statistics. Pinus Pinaster in England. In the Environs of London. At Fulham Palace, 150 years old, it is 80 ft. high, the diameter of the trunk 4 ft., and of the head 30 ft.; the girth of this tree, in 1793, was 10 ft.; and in 1857, 12 ft. (See p. 43) At York House, Twickenham, it is 42 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 35 ft. At Abercorn Priory, Stanmore, it is 60 ft. high; and at Syon are several 60 ft. high.—South of London. In Cornwall, at Carclew, it is 82 ft. high, diameter of the trunk 3 ft. 6 in., and of the head 50 ft. In Hampshire, at Testwood, 70 years planted, it is 55 ft. high. In Surrey, at Onkham, 33 years planted, it is 45 ft. high; at Barwood Park, it is 50 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 60 ft.; at Deepdene, 9 years planted, it is 10 ft. high.—North of London. In Berkshire, at Bear Wood, 14 years planted, it is 26 ft. high; at White Knights, 35 years planted, it is 45 ft. high. In Durham, at Southend, 40 years planted, it is 60 ft. high, with a trunk 3 ft. in diameter. In Leicestershire, at Elvaston Castle, 33 years planted, it is 60 ft. high. In Nottinghamshire, at Clumber Park, it is 60 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 20 ft. In Pembrokeshire, at Stackpole Court, 35 years planted, it is 40 ft. high. In Radnorshire, at Maeslaugh Castle, it is 48 ft. high, with a trunk 1 ft. 10 in. in diameter. In Staffordshire, at Teddesley Park, 8 years planted, it is 16 ft. high; in the Handsworth Nursery, 6 years planted, it is 12 ft. high. In Suffolk, at Finborough Hall, 15 years planted, it is 25 ft. high; at Ampton Hall, 12 years planted, it is 22 ft. high. In Worcestershire, at Hagley, is one with a trunk 4 ft. in diameter; and at Croome, 70 years planted, it is 90 ft. high, the diameter of the trunk 2 ft. 4 in., and of the head 20 ft.

Pinus Pinaster in Scotland. South of Edinburgh. In Berwickshire, at the Hirsell, 20 years planted, it is 25 ft. high. In Haddingtonshire, at Tynninghame, it is 46 ft. high, the diameter of the trunk 2 ft., and of the head 32 ft.—North of Edinburgh. In the Isle of Bute, at Mount Stewart, 10 years planted, it is 17 ft. high. In Ross-shire, at Brahan Castle, it is 35 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 36 ft.

Pinus Pinaster in Ireland. At Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 15 ft. high. In Kilkenny, at Woodstock, 80 years planted, it is 72 ft. high, the diameter of the trunk 2 ft. 9 in., and of the head 18 ft. In Down, at Mount Stewart, 50 years planted, it is 46 ft. high. In Galway, at Coole, it is 46 ft. high.

Pinus Pinaster in Foreign Countries. In France, in the park of Clervaux, 44 years planted, it is 82 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 52 ft. In Bavaria, in the Botanic Garden, Munich, 18 years planted, it is 15 ft. high. In Austria, at Vienna, in Rosenthal's Nursery, 25 years planted, it is 30 ft. high. At Brünn on the Leytha, 40 years planted, it is 80 ft. high. In Italy, at Monza, 24 years planted, it is 45 ft. high.

Commercial Statistics. Seeds, in London, are 3s. per lb; one year's seedling plants are 10s. per thousand, and one year transplanted 25s. per thousand; and plants in pots are 1s. 6d. each. At Bollwyller, plants are 1 franc each; and at New York, 1 dollar.

† 13. *P. PINEA L.* The Stone Pine.

Identification. Lin. Sp. Pl., 1419.; Mill. Dict., No. 2.; Hunt. Evel. Syl., p. 266.; Vill. Dauph., 5. p. 506.; Lamb. Pin., ed. 2., t. 10, 11.; N. Du Ham., 5. p. 2421.; Ait. Hort. Kew., ed. 1., 3. p. 368.; Willd. Berol. Baumz., p. 209.; Michx. N. Amer. Syl., 3. p. 116.; Hayne Dend., p. 341.; Lawson's Manual, p. 341.; Bon Jard., 1837., p. 974.; Lodd. Cat., ed. 1836.

Synonymes. *P. sativa Bauh. Pin.*, p. 491.; *Blackw.*, t. 189.; *Du Ham. Arb.*, 2. p. 125.; *P. domestica Malth. Comm.*, 87.; *Tabern. Ic.*, 936.; Pin Pignon, Pin bon, Pin cultivé, Pin Pinier, Fr.; Gemeis-bere Fichte, Ger.

Engravings. *Blackw.*, t. 189.; *Du Ham. Arb.*, 2. t. 27.; *Tabern. Ic.*, 936.; *Lamb. Pin.*, 1. t. 10, 11.; *N. Du Ham.*, 5. t. 72. f. 3.; *Poit. et Turp.*, t. 125.; *Michx. N. Amer. Syl.*, 3. t. 135.; our fig. 2109., to our usual scale; figs. 2106. to 2108., of the natural size, from Dropmore and White Knights; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves in pairs. Cones ovate, obtuse, nearly as long as the leaves, their scales with recurved deciduous points. Seed bony, with very short wings. Crest of the anthers jagged. (*Smith*) The buds (see *fig. 2106*) resemble those of *Pinaster*, but are smaller in all their dimensions, much less pointed, more woolly, and wholly without resin. The surrounding buds are nearly as large as the central one. The leaves are from 5 in. to 7 in., and sometimes 8 in., long, serrated; sheaths, at first, $\frac{1}{2}$ in. long, afterwards becoming lacerated, shortened to half their length, and ringed with four or five rings. Cone from 5 in. to 6 in. in length; and from $3\frac{1}{2}$ in. to 4 in. in breadth; scales large and woody, from 2 in. to $2\frac{1}{2}$ in. in length, and from 1 in. to $1\frac{1}{4}$ in. in breadth, with the thickened part pyramidal, rhomboidal, and sometimes hexagonal in the plan, resembling those of *P. Pinaster*, but having four ribs from the four angles, instead of two from the lateral angles. The ribs meet in a small rhomboidal pyramid, of a grey colour, which terminates in a broad blunt prickle. The colour of the entire cone is much lighter than that of *P. Pinaster*, and is of a pale wainscot colour. Seeds, without the wing, $\frac{3}{8}$ in. long, and from $\frac{2}{8}$ in. to $\frac{3}{8}$ in. broad; with the wing, 1 in. long. Cotyledons 9 to 11. The tree flowers, in the climate of London, in the latter end of May or the beginning of June.



2106

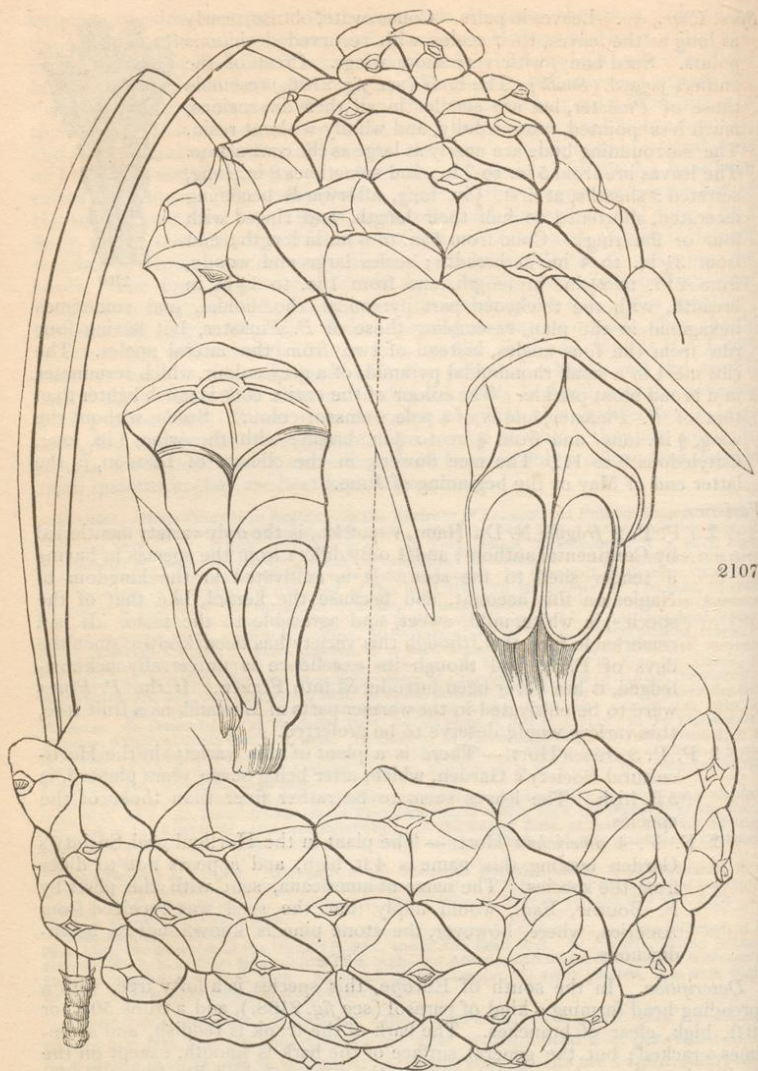
Varieties.

† ? *P. P. 2 fragilis* N. Du Ham., v. p. 242., is the only variety mentioned by Continental authors; and it only differs from the species in having a tender shell to the seed. It is cultivated in the kingdom of Naples on this account, and because the kernel, like that of the species, is white, mild, sweet, and agreeable to the taste. It is a remarkable fact, that, though this variety has been known since the days of Pliny, and though its excellence is universally acknowledged, it has never been introduced into France. If the *P. Pinea* were to be cultivated in the warmer parts of England, as a fruit tree, this variety would deserve to be preferred.

† *P. P. 3 cretica* Hort. — There is a plant of this variety in the Horticultural Society's Garden, which, after being seven years planted, is 5 ft. high. The leaves seem to be rather finer than those of the species.

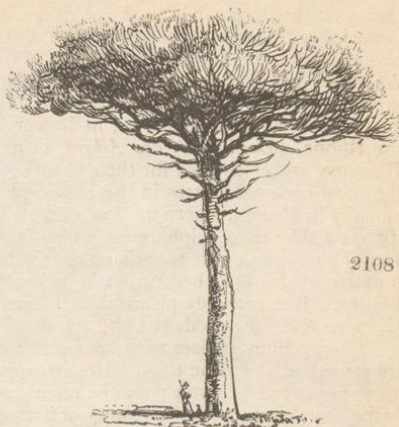
† *P. P. 4 americana* Hort. — The plant in the Horticultural Society's Garden bearing this name is 4 ft. high, and appears not to differ from the species. The name of *americana*, sent with the plant by F. Bourne, Esq., would imply that the seed was received from America, where, however, the stone pine is known not to be indigenous.

Description. In the south of Europe, this species is a lofty tree, with a spreading head forming a kind of parasol (see *fig. 2108.*), and a trunk 50 ft. or 60 ft. high, clear of branches. The bark of the trunk is reddish, and sometimes cracked; but the general surface of the bark is smooth, except on the smaller branches, where it long retains the marks of the fallen leaves, in the shape of bristly scales. The leaves are of a deep green, but not quite so dark as those of the pinaster; they are semicylindrical, 6 in. or 7 in. long, and $\frac{1}{12}$ in. broad, two in a sheath, and disposed in such a manner as to form a triple spiral round the branches. The catkins of the male flowers are yellowish; and, being placed on slender shoots of the current year, near the extremity, 20 or 30 together, they form bunches, surmounted by some scarcely developed leaves. Each catkin is not more than $\frac{1}{2}$ in. long, on a very short peduncle, and with a rounded denticulated crest. The female catkins are whitish, and are situated two or three together, at the extremity of the strongest and most vigorous shoots. Each female catkin has a separate



peduncle, charged with reddish, scarios, lanceolate scales, and is surrounded at its base with a double row of the same scales, which served to envelope it before it expanded; its form is perfectly oval, and its total length about $\frac{1}{2}$ in. The scales, or calyxes, which form the female catkin are of a whitish green; the bractea on the back is slightly reddish on its upper side; and the stigma, which has two points, is of a bright red. After fecundation, the calyxes augment in thickness; and, becoming firmly pressed against each other, they form by their aggregation a fruit, which is three years before it ripens. During the first year, it is scarcely larger than the female catkin; and during the second year it becomes globular, and about the size of a walnut. The third year,

the cones increase rapidly in size; the scales lose their reddish tinge, and become of a beautiful green, the point alone remaining red; and at last, about the end of the third year, they attain maturity. At this period, the cones are about 4 in. long, and 3 in. in diameter, and they have assumed a general reddish hue. The convex part of the scales forms a depressed pyramid, with rounded angles, the summit of which is umbilical. Each scale is hollow at its base; and in its interior are two cavities, each containing a seed much larger than that of any other kind of European pine, but the wing of which is, on the contrary, much shorter. The ligneous shell which envelops the kernel is hard and difficult to break in the common kind, but in the variety *P. P. 2 fragilis* it is tender, and easily broken by the fingers. In both, the kernel is white, sweet, and agreeable to the taste. The taproot of the stone



2108

pine is nearly as strong as that of *P. Pinaster*; and, like that species, the trees, when transplanted, generally lean to one side, from the head not being correctly balanced. Hence, in full-grown trees of the stone pine, there is often a similar curvature at the base of the trunk, to that of the pinaster, which has been already mentioned and accounted for, p. 2218. The palmate form of the cotyledons of the genus *Pinus* is particularly conspicuous in those of *P. Pinea*. When one of the ripe kernels is split two, the cotyledons separate, so as to represent roughly the form of a hand; and this, in some parts of France, the country people call *la main de Dieu*, and believe to be a remedy in cases of intermittent fever, if swallowed in uneven numbers, such as 3, 5, or 7. In Britain, the stone pine is seldom seen in any other character than that of a large bush, though there are specimens between 30 ft. and 40 ft. high. The rate of growth is slow, seldom exceeding 6 ft. or 8 ft. in ten years. The plant in the Horticultural Society's Garden, figured in our last Volume, attained the height of 11 ft. in 10 years; and one at Dropmore, 23 ft. in 22 years. The duration of the tree is much greater than that of the pinaster, and the timber is whiter and somewhat more durable. In the climate of London, trees of from 15 to 20 years' growth produce cones.



2109

Geography. The stone pine is a native of Italy, Spain, Greece, the coast of Barbary, and probably some parts of Asia. Dr. Sibthorp found it abundant in the sandy plains of Elis, whence the nuts are exported for eating, and where the timber is often used for ship-building. It is also found wild in the south of France; but it appears to be rather a doubtful native there, as it never forms forests, and very rarely woods of any considerable extent; and the trees are not only either isolated or thinly scattered, but are also generally

found in the neighbourhood of habitations. It grows with the greatest luxuriance on the deep sandy banks of rivers, or the shores of the sea; and some remarkably fine specimens of it were observed by M. Desfontaines on the shores of the Mediterranean, between Marseilles and St. Tropez; and by M. Audibert, near Saintes, and in the neighbourhood of Hières. The only instance recorded of a wood of the stone pine being found in France is that mentioned by M. Malesherbes, in Lower Languedoc, on the right bank of the Rhone. (*Desf. Hist. des Arbres*, ii. p. 622.) In Italy, the stone pines of Ravenna are celebrated for their beauty; and, indeed, the stone pine forms the most ornamental tree in the landscape scenery of Italy; as well as occasionally in Britain, where its fine dark leaves, copious male blossoms, which diffuse a shower of sulphureous pollen on all the neighbouring plants, and its mossy cones, render it as striking as it is beautiful. Miller thinks the tree not a native of Europe, because it is never found growing but near dwelling-houses. It is certainly plentiful in China, he says, whence he had several times received the seeds. (*Dict.*, ed. 6., 1752.)

History. Pliny praises the stone pine for bearing fruit in three stages of its growth at the same time. He also speaks of the kernels, which, he says, were preserved in honey; and he mentions the variety with tender shells, as being then common in the vicinity of Tarentum. The kernels have been found among the domestic stores, in the pantries of Herculaneum and Pompeii. The stone pine is mentioned by nearly all the writers of travels in the south of Europe, from the beautiful effect it produces in the scenery; but the most remarkable tree recorded of this species is one in the south of France, on the Sablettes, a tongue of land which joins the peninsula of Giens to Provence. This pine is conspicuous for its great beauty and majestic shape. According to M. G. Robert, who measured it on the spot, it has a trunk 12 ft. in circumference, which is clear of branches to the height of 30 ft.; at which point the branches that form the head commence, and extend in height 30 ft. more, and horizontally so as to cover a circle of 100 ft. in diameter. This tree is placed in a most conspicuous and striking situation, it being the only tree existing in the middle of the tongue of land on which it grows, and being close to the Mediterranean. There is, indeed, little doubt but that its roots find their way into that sea, as, when a trench was opened in the immediate vicinity of the tree, it filled instantly with salt water. It is worthy of notice in the history of the stone pine of Sablettes, that, about the year 1770, during the American war, an English and an American ship being engaged in battle in the Mediterranean, an English bullet struck the trunk of this pine, and lodged in it, where it has remained ever since, without, apparently, doing the tree the slightest injury, the wound having closed over, and even the scar having disappeared.

The stone pine was introduced into England before 1548, as it is mentioned in Turner's *Names of Herbes*, &c., published in that year; and, as the seeds are easily procured from Italy, it has been frequently planted in collections. Owing to its slow growth and comparative tenderness, it has, however, been generally choked by other trees, so that good specimens are rarely to be met with in English plantations.

Poetical Allusions. The following description of the stone pines of Ravenna is by Leigh Hunt:—

“ Various the trees and passing foliage there,
Wild pear and oak, and dusky juniper,
With briony between in trails of white,
And ivy, and the suckle's streaky light,
And moss, warm gleaming with a sudden mark,
Like flings of sunshine left upon the bark,
And still the pine, long-haired, and dark, and tall,
In lordly right, predominant o'er all.
Much they admire that old religious tree,
With shaft above the rest up-shooting free,
And shaking, when its dark locks feel the wind,
Its wealthy fruit with rough mosaic rind.”

Properties and Uses. The wood of the stone pine is whitish, moderately

resinous, and very light. It is used, in Italy and the south of France, in carpentry and joinery, and for gutters, pumps, and covering the sides of ships; and Olivier informs us that the Turks use it for masts. The kernel of the fruit has a taste which approaches to that of the hazel nut, and, in France and Italy, is much esteemed for the dessert. Sir George Staunton mentions that the kernels of the stone pine are also much relished by the Chinese. In Italy, they are put into several kinds of *vagoûts*, and they prove excellent in sugarplums, instead of almonds. In Provence, they are extensively consumed along with Corinth raisins, the dried currants of the shops. The kernels require to be kept in the cone till they are about to be used, because they become speedily rancid when taken out and exposed to the air. In the cone, they will preserve their vitality, their freshness, and their taste, five or six years. They may also be preserved in salt; but in this case they lose great part of their flavour. In Pliny's time they were preserved in honey. They were formerly much used in medicine, but this is no longer the case. They are very eagerly sought after by squirrels, rats, and dormice. The squirrels which live in pine forests are chiefly nourished by these kernels; and they contribute towards the dissemination of the seeds, by striking the cones against the rocks to make the scales open. The crossbill (*Lóxia curvirostra*) is the principal bird that lives on the kernels of the stone pine. To get out the kernel, the bird places the under part of its bill under the scale, in order to raise it up, and then separates it with the upper part of its bill. The crossbill is a solitary gloomy bird, which is chiefly found in pine forests, where it makes its nest in the middle of January, in the branches of the largest pines, fixing it there with the resin of the trees, and coating it externally with the same material, in such a manner as to prevent it from being penetrated by either rain or snow. The kernels of the stone pine are occasionally brought to the dessert in England; for which purpose the cones are regularly imported by the fruiterers.

As a tree, the stone pine may be considered very ornamental where it grows freely, or where it has grown up with an erect trunk, and attained considerable age. Gilpin speaks highly in its favour; but we cannot help thinking that he must either allude chiefly to what he has seen in prints or pictures, or to the pinaster, because we have never seen or heard of any stone pine in England of a sufficient size to justify his description: at all events, it is obvious that his ideas were not clear as to these trees; because he speaks of the pinaster, the cluster pine, and the stone pine, as three distinct kinds. From specimens and dimensions that have been sent to us from different parts of the country, we find that the pinaster is very frequently supposed to be the stone pine. Indeed, it may be considered as the stone pine of Britain; and, as Gilpin's observations are almost as applicable to it as to the stone pine, and are, besides, beautiful in themselves, we shall give them at length:—

“After the cedar, the stone pine deserves our notice. It is not indigenous to our soil, but, like the cedar, it is in some degree naturalised; though in England it is rarely more than a puny half-formed resemblance of the Italian pine. The soft clime of Italy alone gives birth to the true picturesque pine. There it always suggests ideas of broken porticos, Ionic pillars, triumphal arches, fragments of old temples, and a variety of classic ruins, which in Italian landscape it commonly adorns. The stone pine promises little, in its infancy, in point of picturesque beauty: it does not, like most of the fir species, give an early indication of its future form. In its youth, it is dwarfish and round-headed, with a short stem, and has rather the shape of a full-grown bush than of an increasing tree. As it grows older, it does not soon deposit its formal shape. It is long a bush, though somewhat more irregular, and with a longer stem; but, as it attains maturity, its picturesque form increases fast. Its lengthening stem assumes, commonly, an easy sweep. It seldom, indeed, deviates much from a straight line; but that gentle deviation is very graceful, and, above all other lines, difficult to imitate. If acci-

dentally either the stem or any of the larger branches take a larger sweep than usual, that sweep seldom fails to be graceful. It is also among the beauties of the stone pine, that, as the lateral branches decay, they leave generally stumps, which, standing out in various parts of the stem, break the continuity of its lines. The bark is smoother than that of any other tree of the pine kind, except the Weymouth; though we do not esteem this among its picturesque beauties. Its hue, however, which is warm and reddish, has a good effect; and it obtains a kind of roughness by peeling off in patches. The foliage of the stone pine is as beautiful as the stem. Its colour is a deep warm green; and its form, instead of breaking into acute angles, like many of the pine race, is moulded into a flowing line by an assemblage of small masses. As age comes on, its round clumpish head becomes more flat, spreading itself into a canopy, which is a form equally becoming; and yet I doubt whether any resinous tree ever attains that picturesque beauty in age which we admire so much in the oak. The oak continues long vigorous in his branches, though his trunk decays; but the resinous tree, I believe, decays more equally through all its parts, and, in age, oftener presents the idea of vegetable decrepitude than that of the stout remains of a vigorous constitution; and yet, in many circumstances, even in this state, it may be an object of picturesque notice. Thus, we see in the form of the stone pine what beauty may result from a tree with a round head, and without lateral branches, which requires, indeed, a good example to prove. When we look on an ash or an elm, from which the lateral branches have been stripped, as is the practice in some countries, we are apt to think that no tree with a head placed on a long stem can be beautiful; yet in Nature's hands, which can mould so many forms of beauty, it may easily be effected. Nature herself, however, does not follow the rules of picturesque beauty in the production of this kind of object. The best specimen of the stone pine I ever saw grew in the Botanical Garden at Oxford; but, for the sake of the ground it occupied (I never heard any other reason suggested), it was lately (1791) cut down." (*Gilp. For. Scen.*, i. p. 83.) Sir Thomas Dick Lauder adds to this passage, that he quite agrees with Gilpin as to the picturesque beauty of the stone pine. "We frequently find it introduced into the landscapes of Claude;" he continues, "the artist availing himself of its heavy deep-toned mass of foliage to give effect to the brilliancy of his sky and distance. It is quite associated in our minds with Italy, and her magnificent remains." (*Laud. Gilp.*, i. p. 169.)

Soil, Situation, Propagation, and Culture. The soil should be deep, sandy, and dry, and the situation sheltered, though the plants should not be crowded. The seeds are procured from foreign cones, which are generally purchased in the autumn, or at the beginning of winter, and the seeds taken out of them by throwing them into hot water, and treating them like those of pinaster. They are frequently sown in pots in the course of the winter, and preserved in a frame, and kept gently moist, till the spring; when most of the seeds will come up, though some will remain in the ground till the second year. Their tardy germination is owing to the thickness of the shell of the seed, which some cultivators break before sowing, though at the risk of injuring the seed. The plants which come up should be transplanted into small pots, after midsummer of the same year, or, at all events, not later than the following spring; and, for two or three years, they should be kept during winter in a frame, quite close to the glass. The plants are very tender for the first two or three years; but in the fourth and fifth years they will endure the open air, in the climates of London and Paris, without any protection. The leaves of this species, as well as of several others, have quite a different appearance for the first two years from what they have ever afterwards: they are very glaucous, ciliated on their margins, very short, and very sharp-pointed. During this period, they are single and without sheaths; but afterwards they come out in pairs, with sheaths, these pairs being what are considered by botanists as abortive shoots, as already mentioned, p. 2108. The nursery treatment of

the stone pine is the same as that recommended for the pinaster; this species having also very long taproots, which render it necessary to be extremely careful in taking them up for removal: indeed, they should generally be grown in pots; and, when they are turned out of the pots to be planted where they are finally to remain, the greatest care should be taken to stretch out the roots, and to spread them carefully in every direction.

Statistics. It is remarkable that there is no record of a stone pine in England which has attained a timber-like size. No specimens are mentioned either by Miller or Dr. Walker; and the one stated by Gilpin to have been growing in the Botanic Garden at Oxford, and another, with a straight stem, free from knots for a considerable height, with a great branching head, at Old Court, in Ireland, described by Hayes, were probably pinasters. There is no tree of this species at Whitton or Pain's Hill: the one at Kew is a mere bush; as is that at Purser's Cross; and Mr. Lambert only mentions one in the garden of H. Cavendish, Esq., at Clapham, but does not state its age or height.

Existing Trees. In England. In Devonshire, at Luscombe, 11 years planted, 16 ft. high. In Berkshire, in a garden on the right hand of the road on entering Reading, a handsome tree, 30 ft. high, with a clear trunk of 15 ft., and a broad spreading head upwards of 30 ft. in diameter. In Surrey, at Bagshot Park, 16 years planted, 18 ft. high; at Oakham, 33 years planted, 26 ft. high; at Barwood Park, 35 ft. high. In Durham, at Southend, 19 years planted, it is 8 ft. high. In Hertfordshire, at Cheshunt, 8 years planted, 6 ft. 6 in. high. In Staffordshire, at Trentham, 26 years planted, it is 16 ft. high; in the Handsworth Nursery, 12 years planted, it is 8 ft. high. In Suffolk, in the Bury Botanic Garden, 8 years planted, it is 8 ft. high; at Finborough Hall, 16 years planted, 18 ft. high; at Ampton Hall, 14 years planted, 9 ft. high.—In Scotland. In Kirkeudbright, at St. Mary's Isle, 14 years planted it is 8 ft. high.—In Ireland. At Dublin, in the Glasnevin Garden, 33 years planted, 20 ft. high. In Cork, at Castle Freke, 38 ft. high. In Down, at Ballyleady, 60 years planted, 45 ft. high.—In France. At Paris, in the Jardin des Plantes, 100 years old, it is 50 ft. high, diameter of the trunk 2 ft., and of the head 42 ft.; at Toulon, in the Botanic Garden, 10 years planted, 12 ft. high; at Avanches, 29 years planted, 20 ft. high.—In the greater part of Germany, it is a green-house plant.

Commercial Statistics. Seeds, in London, are 2s. per lb. Plants, one year's seedlings, 5s. per hundred; in pots, from 1 ft. to 2 ft. high, 1s. and 1s. 6d. each; at New York, one dollar.

§ iv. *Halepenses.*

Sect. Char. Leaves slender. Cones as long as the leaves, stalked, with the terminations of the scales flattened. Buds small, roundish, imbricated, and altogether without resin.

† 14. *P. HALEPENSIS* Ait. The Aleppo Pine.

Identification. Ait. Hort. Kew., 3. p. 367.; Lam. Pin., ed. 2., 1. t. 7.; Desf. Fl. Alt., 2. p. 352.; Mill. Dict., No. 8. t. 208.; N. Du Ham., 5. p. 233.; Hayne Dend., p. 173.; Lawson's Manual, p. 344.; Lodd. Cat., ed. 1836.

Synonymes. *P. hierosolymitana* Du Ham. Arb., 2. p. 126.; *P. maritima prima* Mathiolus; Pin de Jérusalem, Fr.

Engravings. Mill. Dict., No. 8. t. 208.; Lamb. Pin., ed. 2., 1. t. 7. (exclusive of the ripe cone, which is that of *P. Laricio*); our fig. 2113., to our usual scale; and figs. 2110. to 2112.; all from specimens from a tree in the Horticultural Society's Garden.

Spec. Char., &c. Leaves in pairs, very slender. Cones pyramidal, rounded at the base, turned downwards, smooth, solitary or in pairs, stalked.

(*Lois.*, and obs.) Buds (see fig. 2110.) from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. long; and from $\frac{1}{16}$ in. to $\frac{1}{8}$ in. broad; imbricated, roundish, somewhat pointed, wholly without resin; and altogether like those of a pinaster in miniature. Cones (fig. 2111.) from $2\frac{1}{2}$ in. to 3 in. in length; and from $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. in breadth; invariably turned downwards, so as to form an acute angle with the stem. Footstalks of the cones from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length. Scale (fig. 2112. a) from $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. long, and $\frac{3}{4}$ in. broad. Seed, without the wing (c), from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. in length, and $\frac{3}{16}$ in. in breadth; with the wing (b), from 1 in. to $1\frac{1}{4}$ in. in length. Cotyledons about 7. The tree flowers, in the climate of London, about the end of May or the beginning of June.

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Varieties. None of these are very distinct. *P. brütia*, judging from the young plant in the Horticultural Society's Garden, would appear to belong to *P. halepensis*, from the leaves and buds; but, as the cones in Mr. Lambert's figure are sessile, produced in clusters, and stand out horizontally, it seems rather to approach *P. Pinaster*; and we shall therefore give it as a doubtful species in a future page. Two trees of *P. halepensis* in the Horticultural Society's Garden have borne cones, and those of one tree are considerably smaller than those of the other; and this is the only variety of the existence of which we are certain from

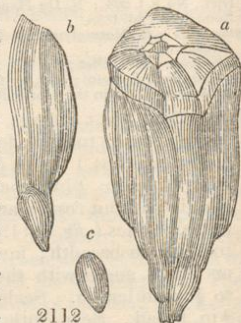
ocular demonstration. One has been introduced from the neighbourhood of Genoa by Captain Cook, of which there is a young plant in the Horticultural Society's Garden; but it has not yet shown any character differing from that of the species; a cone, however, which we possess of this variety is smaller than that of the species; and the raised ends of the scales are more prominent, approaching in a slight degree to the form of those of the cones of *P. Pináster*. Mr. Lambert, in the second edition of his *Genus Pinus*, has figured what appears to be a variety of *P. halepensis* under the name of *P. marítima*; but, as he has given in his figure three cones, of three different shapes, and as no living plant in England is referred to, nothing can be determined definitely respecting it. We shall, however, give the name among those of other varieties, real or conjectural.



2111

† *P. h. 2 minor* has the cones rather smaller than the species. There is a tree in the Horticultural Society's Garden, which, in 1837, after having been 15 years planted, was 20 ft. high, with a spreading branchy habit; but without any other marked difference from the species.

† *P. h. 3 marítima*, *P. marítima* Lamb. *Pin.*, ed. 2., t. 6. — According to Mr. Lambert's figure, the cones of this variety, in the different forms in which he has given it, are all larger than those of the species. The three cones given in Mr. Lambert's plate are, one from the Sherardian herbarium, which points downwards, and only differs from the species in being thicker; one collected in Greece by the Hon. W. F. Strangways, which points upwards; and one from a tree in Syon Gardens, which no longer exists, but which is stated in the text also to point upwards. A tree in the Horticultural Society's Garden, received from Sir Charles Monck, and said to be the true *P. marítima* of Lambert, is nothing more than *P. Pináster*; as is the one at Dropmore, received from Mr. Lambert himself. It is somewhat more fastigiate in habit than that tree is generally, but this appears to us nothing more than a variation. Mr. Lambert has given the following particulars respecting the uses made of this variety in Greece, from Dr. Sibthorp's papers, published in Walpole's *Memoirs*: — "*Peukos*, one of the most useful trees in Greece. It furnishes a resin (*hretine*), tar, and pitch (*pissa*); all of considerable importance for economical purposes. Throughout Attica, the wine is preserved from becoming acid by means of the resin, which is employed in the proportion of an oke and half to 20 okes of wine. The tar and pitch for ship-building are taken



2112

from this tree, and from the *Pitus* (*Pinus Pinea*). The resinous parts of the wood of the *Peukos* are cut into small pieces, and serve for candles, called *dadia*. The cones (*koinoi*) are sometimes put into the wine barrels. The bark is used in tanning hides. The wood is much employed by carpenters in building." (*Lamb. Pin.*, ed. 2., 1. p. 17.)

- † *P. h. genuensis*, *P. genuensis* Cook. — The plant in the Horticultural Society's Garden was raised from cones brought from the coast of Genoa, by Captain Cook, in 1830. It has not yet borne cones in England, and does not appear, in foliage and habit, different from the species. The cone we possess is 3 in. long, and $1\frac{1}{4}$ in. in diameter at the broadest end, and regularly pyramidal. The length of the stalk is $\frac{3}{8}$ in.

Description. A tree, rising generally to the height of 25 ft. or 30 ft., though sometimes to that of 40 ft. or 50 ft., with a trunk acquiring, at the ground, from 4 ft. to 5 ft. of circumference. When young, it has a spreading head, with more slender branches than most other pines. The bark of the trunk and branches is greyish or ash-coloured, and rather smooth, even when the tree is old. The bark of the young branches is greenish, and less scaly than is usual in species of this genus. The old trees have a round head, and are generally, in England at least, broader than they are high. The leaves are of a deep green, 2 in. or 3 in. long, most commonly 2 in a sheath, but sometimes, though rarely, 3; and they are so disposed as to form a double spiral round the branches. They never remain longer than two years on the tree; in consequence of which the branches of old trees have a naked appearance, and the head looks open, straggling, and thin. The male catkins are reddish, from $\frac{1}{2}$ in. to $\frac{3}{10}$ in. in length, on short pedicels, disposed in branches of 30 or 40 together. The crest is large, proportionably to the size of the anthers, and is rounded. The female catkins are not, as is usual, placed at the extremity of the shoot of the year, but come out at the side of the shoot, and towards the middle of it: they point outwards during their flowering, and are of a greenish hue, slightly tinged with red. The cones have very strong peduncles of half an inch or more in length; and, as they advance in size, they take a direction almost perpendicularly downwards. The cones are of a very regular pyramidal form, somewhat rounded at the base; 2 in. or 3 in. long; of a yellowish or fawn colour, but taking a greyish tinge when mature. The extremities of the scales project very slightly: they are scarcely angular, and are somewhat convex. The seeds are oval $1\frac{1}{4}$ in. long, pointed at their lower extremities, and with the wings measuring 1 in. in length. The tree grows rapidly when young, acquiring the height of 15 ft. or 20 ft. in ten years; after which it increases more slowly, and, in England at least, loses much of its beauty, by the head becoming open and straggling. The head, from its rapid growth, generally leans to the side opposite to that from which the prevailing wind of the locality blows the branches, in young trees, generally resting on the ground; so that the trunk is seldom, if ever, erect and straight. The cones are produced at the age of 10 years, but seldom in any great quantity. The finest trees which we have seen of this species are at White Knights and Dropmore; at which places, in 1837, there were trees 17 ft. and 27 ft. high. That in the Horticultural Society's Garden, of which a portrait is given in our last Volume, was, in



2113

1834, after being 12 years planted, 18 ft. high. *P. halepensis* is the most tender of European pines, not even excepting *P. Pinea*.

Geography. The Aleppo pine is indigenous in Syria, in the neighbourhood of Aleppo, in Jerusalem; in Barbary, on the mountains of Atlas; on the hills of Provence, and in the neighbourhood of Toulon and Frejus, in France, where it is called the pin blanc; and throughout great part of Spain. According to Captain Cook, it forms great part of the forests of Upper Catalonia, and in the Aleborca, a district of New Castile, near the Guadaluaxara, but not rising so high on the mountains as the *P. Pinaster*. It is always found in dry, sandy, warm soils, and thrives admirably among rocks, where the roots of few other trees will find subsistence.

History. The Aleppo pine was first cultivated in England in 1683, by Bishop Compton, under the name of *P. hierosolymitana*. (*Ray's Letters*, p. 171.) In 1732, cones of the tree were sent from Aleppo to Miller, who raised plants from them, most of which, however, were destroyed by the severe winter of 1740. As cones are readily procured from France, the species is not rare in British nurseries; but, though one of the most ornamental of the genus, it has not been much planted. In Scotland and Ireland, it is rarely to be met with; it is not common in the neighbourhood of Paris, being destroyed there by very severe winters, such as that of 1788, which killed all the trees in the vicinity of the French capital; and in Germany, and at New York, it is a green-house plant.

Properties and Uses. The wood is white, with a fine grain, which becomes dark in old trees. In Provence, it is much used for joinery, and also for making pumps for vessels. According to Bosc (*Ann. de l'Agr.*, Feb. 1826, as quoted by Delamarre), the Aleppo pine is very common between Marseilles and Antibes, where it rivals in height and thickness the pinaster, and its wood is considered very superior. The chief employment, however, of the tree is for extracting its resinous products, for which it is much preferred to the pinaster. The liquid resin extracted from this tree in Provence, where it is called *le pin blanc*, is often sold for Venice turpentine; and the tar produced by it in the same country is esteemed greatly superior to that of Bordeaux, which is made from the pinaster. The variety *P. h. maritima*, as we have seen, p. 2232., is used for various purposes in Greece, and, among others, the bark is employed for tanning hides. In Britain, *P. halepensis* can only be considered as ornamental; and, when planted singly on a lawn, it forms one of the handsomest species of the genus. According to Bosc, it is the most elegant of European pines.

Statistics. In England. At Fulham Palace, 17 years planted, it is 20 ft. high. In Surrey, at Oakham Park, 14 years planted, it is 13 ft. high. In Berkshire, at White Knights, 38 years planted, it is 57 ft. high. In Hertfordshire, at Cheshunt, 10 years planted, it is 16 ft. high. In Staffordshire, at Trentham, it is 20 ft. high. In Suffolk, at Ampton Hall, 12 years planted, it is 16 ft. high. In Worcestershire, at Croome, 40 years planted, it is 40 ft. high.—In Ireland. In the Glasnevin Botanic Garden, 35 years planted, it is 15 ft. high; at Terenure, 8 years planted, it is 8 ft. high. In Kilkenny, at Woodstock, it is 20 ft. high.—In France, at Paris, in the Jardin des Plantes, 40 years planted, it is 45 ft. high, diameter of the trunk 1 ft., and of the head 20 ft.

Commercial Statistics. Plants, in the London nurseries, are 2s. 6d. each; at Bollwyller, 1 franc 50 cents; and at New York, 75 cents.

‡ 15. *P. BRUTIA* Ten. The Calabrian Pine.

Identification. Ten. Fl. Nap. Prod., p. 69; Synops., ed. alt., p. 66; Syll., p. 477; Lamb. Pin., vol. 3. t. 82; Lawson's Manual, p. 336; Lodd. Cat., ed. 1836.

Synonyme. *P. conglomérata Grajer Pl. Exsic.*, as quoted by Lambert.

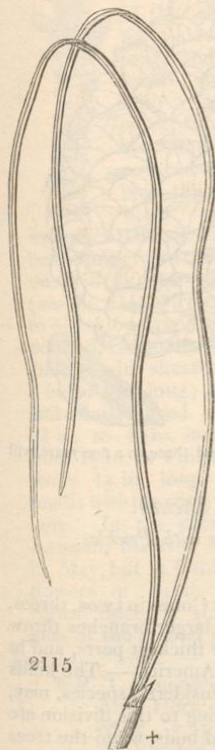
Engravings. Lamb. Pin., vol. 3. t. 82; and our figs. 2115. and 2116., from Lambert, and from a young tree in the Horticultural Society's Garden, sent there by Mr. Lambert.

Spec. Char., &c. Leaves in pairs, very long, slender, wavy. Cones sessile, crowded, ovate, smooth. Scales truncate at the apex, flattish, umbilicate. (*Lamb.*) Buds (see fig. 2114.) $\frac{3}{8}$ in. long, and $\frac{1}{2}$ in. broad; ovate, pointed, whitish, and wholly without resin; centre bud surrounded by three smaller buds. Leaves from $3\frac{1}{2}$ in. to 4 in. long, on the young plant in the Horticultural Society's Garden; but above 6 in. long in Mr. Lambert's figure. Sheaths, in both, less than $\frac{1}{2}$ in. in length.

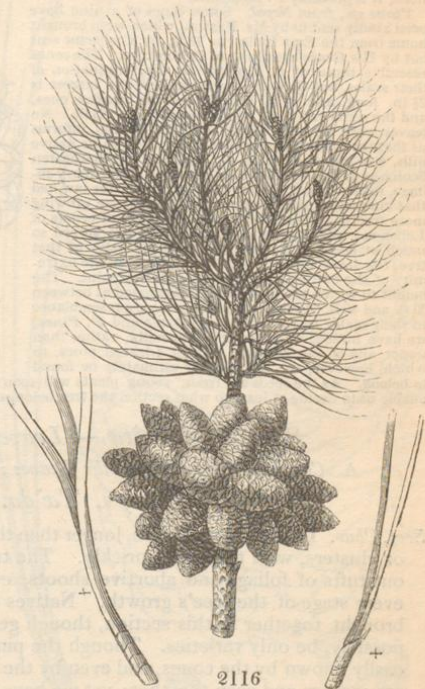
Description. "A middle-sized tree, with many large spreading branches. Bark greyish brown, smooth, not cracked, but covered with depressed tubercles. Leaves in twos, rarely in threes, very long, slender, glabrous, wavy, spreading, about 9 in. long; light green, canaliculate above, convex beneath, serrulate on the margin, terminated by a small conical callous mucro; sheaths about $\frac{1}{2}$ in. long, persistent, of an ash-brown colour, membranaceous, entire round the tops; guarded at bottom with a linear-lanceolate, revolute, bright brown, thread-like, ciliated scale (metamorphosed leaf). Cones sessile, generally in clusters, ovate, smooth, brownish, 2 in. to 3 in. long. Cones truncate at the apex, flattish, trapezoidal, umbilicate, smooth, obsoletely 4-angled; umbilicus dilated, depressed, somewhat hollow, ash-coloured. (*D. Don.*) This species is nearly related to *P. h. maritima*; but it is readily distinguished both from it and *P. halepensis* by its very long wavy leaves, and by its shorter, sessile, clustered cones, with the scales depressed and slightly concave at their apex. The leaves resemble those of *P.*



2114



2115



2116

Laricio; but they are more slender, and rather longer, and both species differ essentially in their cones. Sprengel has referred it to *P. Pinaster*, not even allowing it the rank of a variety; but no two species can be more distinct. The leaves in *P. Pinaster* are twice as stout, straight, and rigid, and disposed in interrupted verticils; and the cones are double the size, with the scales elevated and angular. The tree of *P. brütia* is said to attain a considerable size, and to yield timber of excellent quality." (*Lamb. Pin.*, iii. t. 82.) Mr. Lambert has raised young plants at Boyton, which he has distributed to different public and private establishments, including the Horticultural Society's Garden.

App. i. *Species of Pine having Two Leaves in a Sheath, which we cannot with certainty refer to any of the preceding Sections.*

P. Massoniàna Lamb. *Pin.*, ed. 2, l. t. 8., *N. Du Ham.*, 5. p. 243., *Wüld. Sp. Pl.*, 4. p. 497., *Laus. Man.*, p. 348.; ? *P. nepalensis* Cels. Leaves in pairs, very long, and slender; sheaths short. Crest of the anthers dentate-lacerate. (Lamb.) Bud apparently like that of *P. sinensis*. Leaves 6 in. long, slender; sheaths $\frac{1}{2}$ in. long, white, membranaceous, with brown scales at the base. Male catkins numerous, $\frac{3}{4}$ in. long. A tree, a native of China, and probably identical with *P. sinensis*. Mr. Lambert's plate is from a specimen in the Banksian herbarium, brought by Mr. Francis Masson from the Cape of Good Hope, where it was raised from seeds introduced which had been sent from China. Neither cones, seeds, nor living plants, have yet been introduced under the name of *P. Massoniàna*; but Mr. Lawson observes, "on comparing a plant received from M. Cels, nurseryman, Paris, under the name of *P. nepalensis*, with Mr. Lambert's figure and description of *P. Massoniàna*, there seems little doubt but they are the same. In habit of growth and general appearance it resembles *P. longifolia*, but differs in having only two leaves in each sheath, whereas the latter has three. The plant, however, above referred to, has not attained sufficient size to show whether its leaves will become so pendulous as those of the long-leaved East Indian pine." There is a plant of *P. nepalensis* in the pinetum at Haddo House, of which the Earl of Aberdeen has sent us a specimen, but the leaves are in threes. *P. Massoniàna* Professor Don considers, as we have seen in p. 2218., nothing more than *P. Pinaster*; and, with respect to the *P. nepalensis* received from Lord Aberdeen, it is probably *P. longifolia*.

Pinus sp., from Nepal. Some cones of a pine have been kindly sent us by Mr. Paxton, which were brought home from the East Indies in 1837, by a collector sent out by His Grace the Duke of Devonshire. The cones resemble those of *P. Pinaster* in the termination of their scales, but they are much smaller; the largest is $2\frac{1}{2}$ in. long, and 2 in. broad; and the smaller ones, and the seeds and their wings, resemble fig. 2117. No leaves were brought home; but Mr. Paxton informs us that the general appearance of the tree, on its native hills, was like that of an old, stunted, weatherbeaten Scotch pine; it having, like that tree, dark heavy foliage, rather dense. All the trees the collector saw had that character, except one or two which were growing more freely, and had more the appearance of cedars of Lebanon; only that the branches did not spread so much at bottom; though they had the habit of that tree, the head tapering on every side, from the extremity of the bottom branches upwards to a point. The height to which the tree grows is estimated at between 30 ft. and 40 ft. As the cones bear so close a resemblance in their scales to those of *P. Pinaster* and *P. Pinea*, we have noticed them in this Appendix, rather than under any of the sections of 3 or 4-leaved pines, to which, however, the species may ultimately be found to belong. As the seeds are fresh, young plants will soon be raised; and these, in a few years, will enable us to decide at least to what section the tree belongs.



2117

Sect. ii. *Ternatæ*.—*Leaves 3 in a Sheath.*

A. *Cones hardly so long as the Leaves; the Scales with Prickles.*

§ v. *Tæ'da*.

Sect. Char. Leaves 3 in a sheath, longer than the cones. Cones in twos, threes, or clusters, with the scales prickly. The trunk and larger branches throw out tufts of foliage and abortive shoots, even in the thickest parts, and in every stage of the tree's growth. Natives of North America.—The kinds brought together in this section, though generally considered species, may, possibly, be only varieties. Though the pines belonging to this division are easily known by the cones, and even by the leaves and buds, when the trees are mature and seen together; yet we have found none so difficult to determine by their leaves and buds, when the plants are young. In general, the leaves of *P. Tæ'da* are longer, stronger, and of a more glaucous hue; and its buds are larger than those of any other kind in the section. *P. rigida* has shorter leaves, fewer of them, and they are less glaucous; and the buds are long, cylindrical, and blunt-pointed. *P. serótina* resembles *P. rigida* in the leaves, but these are still fewer, and the cones are egg-shaped. The *P. variabilis* of Lambert, according to his figure, is different from any of these, and in no way resembles the *P. mitis* of Michaux, of which it is said to be a synonyme. The *P. mitis* of Michaux is known with certainty at first sight, by its numerous, thickly set, and slender, short leaves; and, above all, by the

violet-coloured glaucous bloom of the shoots. (See p. 2195.) As *P. mitis* has frequently three leaves, it may possibly belong to this section, but its buds are scaly, and not resinous.

‡ 16. *P. TÆ'DA* L. The Frankincense, or Loblolly, Pine.

Identification. Lin. Sp. Pl. 1419.; Syst., ed. Reich., 4. p. 173.; Ait. Hort. Kew., 3. p. 368.; Michx. N. Amer. Syl., 3. p. 155.; Lamb. Pin., 1. t. 15.; Pursh Fl. Amer. Sept., 2. p. 644.; N. Du Ham., 5. p. 245.; Hayne Dend., p. 174.; Lawson's Manual, p. 351.; Bon Jard., 1837, p. 975.; Lodd. Cat., ed. 1836.

Synonymes. *P. foliis ternis Gron. Virg.*, 152.; *P. virginiana tenuifolia tripilis Pluk. Alm.*, 297.; White Pine, at Petersburg and Richmond, in Virginia; Oldfield Pine, *Amer.*; Pin de l'Encens, *Fr.*
Engravings. Lamb. Pin., ed. 2., 1. t. 15.; N. Du Ham., t. 75. t. 2.; Michx. N. Amer. Syl., t. 143.; our fig. 2121., to our usual scale; and figs. 2118. to 2120., of the natural size, from the Horticultural Society, Dropmore, and Syon specimens.

Spec. Char., &c. Leaves in threes, elongated. Cones often in pairs, shorter than the leaves; oblong, pyramidal, somewhat truncate at the apex; scales with sharp prickles, turned inwards. Crest of the anthers rounded. (Lois.) Buds, on young trees (see

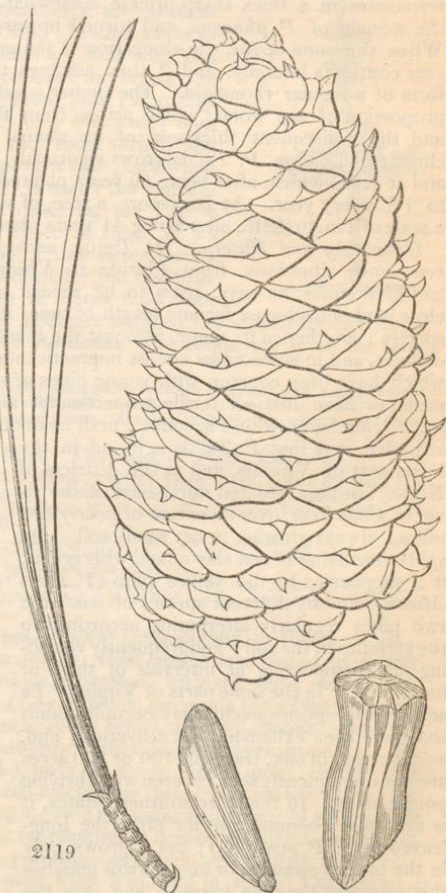


2118

fig. 2118.), $\frac{3}{8}$ in. long, and $\frac{1}{4}$ in. broad; pointed, with straight sides; brownish red, and more covered with resin than any other species, except *P. Banksiana*. Buds on the full-grown tree at Syon, as in fig. 2120. Leaves (see fig. 2119.) from $5\frac{1}{2}$ in. to $5\frac{3}{4}$ in. long, rigid, bluntly pointed, channeled in the middle, with sheaths from $\frac{7}{8}$ in. to 1 in. long; brown, and faintly ringed. Cones $3\frac{1}{2}$ in. to $4\frac{1}{2}$ in. long, and from $1\frac{3}{4}$ in. to 2 in. broad; scales $1\frac{1}{4}$ in. long. Seed small; with the wing, $1\frac{3}{8}$ in. long. In the climate of London, the tree flowers in May, but in Carolina it flowers in April. The cones ripen in the August of the second year.

Variety.

‡ *P. T. 2 alopecuröidea* Ait. Hort. Kew., ed. 2., v. p. 317., the Fox-tail Frankincense Pine, is said to have the leaves spreading, and more squarrose than the species. There is a plant of this name in the Horticultural Society's Garden, which, 8 years planted, is 10 ft. high; but it does not appear different from the species. Pursh is of opinion that this variety



2119

is nothing more than the *P. serótina* of Michaux, but Lambert thinks it a variety of *P. rígida*.

Description. A lofty tree, often, in America, upwards of 80 ft. high, with a trunk sometimes clear of branches to the height of 50 ft., and from 2 ft. to 3 ft. in diameter, with a wide-spreading head. The leaves are broad, pointed, flat on the upper surface, and forming a ridge below; of a fine light green, with a sheath long and whitish at first, but becoming short, thick, and brown when old. The cones are about 4 in. in length; and the scales terminate in processes which have the form of an elongated pyramid, somewhat in the manner of *P. Pinaster*; but the apex of the pyramid terminates in a thick sharp prickle, somewhat in the manner of *P. pungens*, and turned upwards. When the cone opens, the elongation of the process contracts laterally, and it then assumes the form of a regular rhomboid. The timber is said by Michaux to have a large proportion of sap wood, which arises from the rapid growth of the tree, and the consequent thickness of its annual layers. In England, in the climate of London, *P. Tæda* grows vigorously, there being large trees at Syon and at Kew, which, after being 50 years planted, produce shoots of from 9 in. to 1 ft. every year. At Dropmore, a tree, of which *fig. 2122.* is a portrait to a scale of 1 in. to 12 ft., after being 41 years planted, was, in 1837, 37 ft. high.

Geography and History. *P. Tæda*, according to Pursh, is found in barren sandy situations, from Florida to Virginia. All the woods in the southern states, he says, seem to be seeded with it; for, when any piece of clear land is neglected for any length of time, it is speedily covered with this species; and hence its name, amongst the inhabitants, of Oldfield pine. It is difficult, and in some cases almost impracticable, he adds, to recover the lands which have been overrun with young pines of this species, as the ground appears to have lost all fertile properties for any other vegetable than these trees. Michaux, whose account Pursh characterises as very correct and instructive, says that *P. Tæda* is found in the lower part of Virginia, and in the districts of North Carolina situated north-east of the river of Cape Fear, over an extent of nearly 200 miles; always growing in dry sandy soil. On spots consisting of red clay mixed with gravel, it is supplanted by the yellow pine (*P. mitis Michx.*), and by different species of oak; the two pines regularly alternating according to the varieties in the soil; and frequently vanishing and reappearing at intervals of three or four miles. "In the same parts of Virginia," he adds, "this species exclusively occupies lands that have been exhausted by cultivation; and, amid forests of oak, tracts of 100 or 200 acres are not unfrequently seen covered with thriving young pines. In the more southern states, it is the most common species after the long-leaved pine (*P. australis*); but it grows only in the branch swamps, or long narrow marshes that intersect the pine barrens, and near the creeks and rivers, where the soil is of middling fertility, and susceptible of improvement: such is the vicinity of Charleston, in South Caro-



lina, which is covered to the distance of five or six miles with loblolly pines." (*Michx.*) *P. Tæda* was introduced into England before 1713, by Bishop Compton; and there are fine specimens of the tree at Syon, Kew, and more especially at Pain's Hill. Of one of the trees at Syon, and of one of those at Pain's Hill (the latter, doubtless, the handsomest tree of the species in Europe), portraits are given in our last Volume. As seeds are easily procured from New York, the species is not uncommon in the London nurseries; and it is more frequent in collections than most other American pines. It grows freely in the neighbourhood of Paris, and ripens cones there; it also stands the open air in the south of Germany, and as far north as Berlin.

Properties and Uses. The wood, as already observed, is porous, and not very durable; though the fineness of its grain, and consequently its durability, vary according to the soil on which it is grown. In some parts of Virginia, three fourths of the houses are built with logs of this pine; and it is there even used for laying the ground floors, instead of the yellow pine (*P. mitis*). These floors are formed of boards only 4 in. wide; and, though they are strongly nailed, they soon shrink, and become uneven; a result which does not take place when the long-leaved pine (*P. australis*) is used; the concentric circles of which, Michaux observes, are twelve times as numerous in the same space as those of *P. Tæda*. On the whole, the wood of this latter tree is little esteemed in America for its timber; but it affords turpentine in abundance, though in a less fluid state than that of the long-leaved pine. Michaux suggests the idea of trying it along with the pinaster on the plains of Bordeaux, and employing it for the same purposes as that tree.

Statistics. There is a tree at Syon 75 ft. high; one at Kew between 40 ft. and 50 ft. high; some at Whitton, 60 ft. high; and a number at Pain's Hill, 60 ft. to 70 ft. high; at Dropmore, it is 38 ft. high. Price of cones, in London, 1s. per quart; and of plants, 5s. each; at Bollwyller, plants are 2 francs each.

† 17. *P. RIGIDA* Mill. The rigid, or Pitch, Pine.

Identification. Mill. Dict., No. 10; Du Roi Harbk., 2. p. 60; Wang. Beyl., p. 41; Marshall Arb. Amer., p. 101; Lamb. Pin., ed. 2., t. 16, 17; Michx. N. Amer. Syl., 3. p. 150; Pursh Fl. Amer. Sept., 2. p. 643; Hayne Dend., p. 174; Lawson's Manual, p. 352; N. Du Ham., p. 244; Bon Jard., 1837, p. 975; Lodd. Cat., ed. 1836.

Synonymes. *P. Tæda rigida* β *Ait. Hort. Kew.*, 3. p. 368, *Willd. Berol. Baumz.*, p. 210; *P. canadensis trifolia* *Du Ham. Arb.*, 2. p. 126; ? *P. Tæda a Poir. Dict.*, 5. p. 340; ? three-leaved Virginian Pine, Sap Pine, black Pine; Pin hérissé, Pin rude, Fr.

Engravings. Lamb. Pin., ed. 2., t. 1. t. 16, 17; N. Du Ham., 5. t. 74; Michx. N. Amer. Syl., vol. 3. t. 144; our fig. 2126., to our usual scale; and figs. 2123. to 2125., of the natural size, from Dropmore specimens.

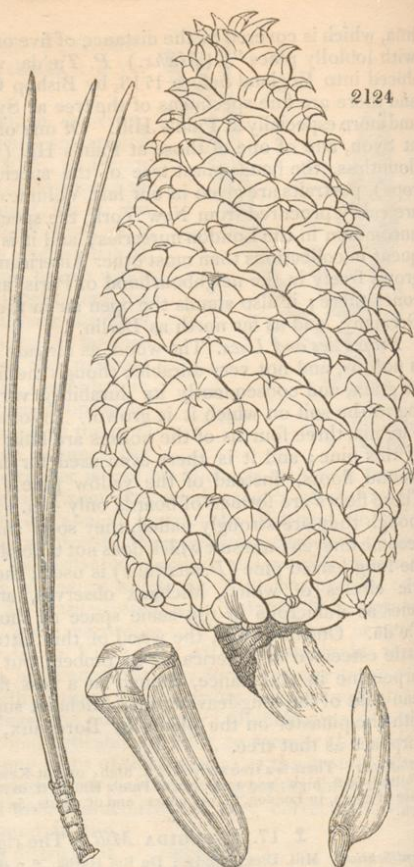
Spec. Char., &c. Leaves in threes. Cones ovate-oblong, in threes or fours, much shorter than the leaves; their scales terminated by a rough thorny point. Male catkins elongated, with the crest of the anthers dilated, and roundish. (*Lois.*) Buds, on young trees (see fig. 2123.), from $\frac{1}{2}$ in. to $\frac{2}{3}$ in. long, $\frac{3}{16}$ in. broad, pointed, brown, and covered with resin; on the full-grown trees at Dropmore as in fig. 2125. Leaves (see fig. 2124.) from $3\frac{1}{2}$ in. to $4\frac{1}{2}$ in. long; sheath $\frac{3}{8}$ in. long, white at first, and afterwards becoming darker, but scarcely black. Cones from $2\frac{1}{2}$ in. to 3 in. long, and from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. broad; scales $1\frac{1}{4}$ in. long, terminating in depressed quadrilateral pyramids, ending in a prickle, pointing outwards. Seed little more than $\frac{1}{8}$ in. long; but, with the wing, from $\frac{6}{8}$ in. to $\frac{7}{8}$ in. long. Cotyledons, ?

Variety. According to Mr. Lambert, *P. T. alopecuróidea* *Ait.* is a variety of *P. rigida*, characterised by its much shorter and stouter leaves, and its ovate-oblong, much narrower, and aggregated cones. (*Lamb. Pin.*, ed. 2., no. 17.)



Description. The pitch pine, in America, Michaux informs us, varies, according to soil and situation, from 12 ft. or 15 ft. to 70 ft. or 80 ft. in height. "The buds are always resinous; and its triple leaves vary in length from $1\frac{1}{2}$ in. to 7 in., according to the degree of moisture in the soil. The male catkins are 1 in. long, straight, and winged, like those of the pond pine (*P. serótina*). The size of the cones depends on the nature of the soil, and varies from less than 1 in. to more than 3 in. in length; they are of a pyramidal shape, and each scale is pointed with an acute prickle of about $\frac{3}{16}$ in. long. Whenever these trees grow in masses, the cones are dispersed singly over the branches; and they shed their seeds the first autumn after they are mature; but, on solitary trees, the cones are collected in groups of four, five, or even a larger number, and will remain on the trees closed for several years." (*Michx.*) This species has a thick, blackish, deeply furrowed bark. It is remarkable for the number of its branches, which occupy two thirds of its trunk, and render its wood extremely knotty. The concentric circles are widely distant; and three fourths of the wood of the larger trees consists of sap wood. On mountains and gravelly lands, the wood is compact, heavy, and surcharged with resin; whence is derived the name of pitch pine. In swamps, on the contrary, it is light, soft, and composed almost wholly of sap wood; whence it is called the sap pine. In British gardens, the tree is of as rapid growth as *P. Tæda* and *P. púngens*; the specimen at Dropmore, after being 41 years planted, being upwards of 31 ft. high.

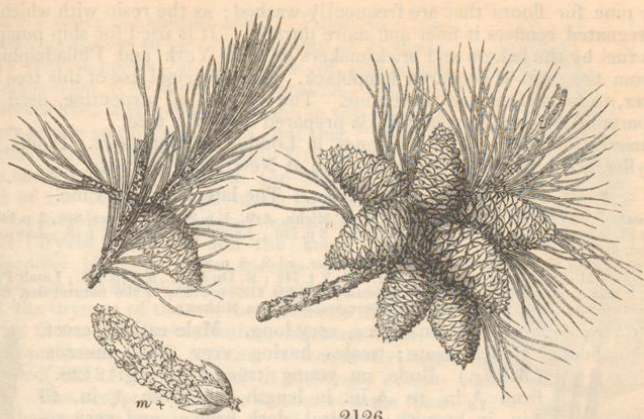
Geography and History. According to Pursh, *P. rígida* is found on the plains from New England to Virginia, growing, in favourable situations, to a very large tree, and either in dry soil, or in very wet low ground. Michaux states that it is found throughout the whole of the United States, with the exception of the maritime part of the Atlantic districts, and the fertile regions west of the Alleghany Mountains; but most abundantly where the soil is meagre. The most northern points at which Michaux observed it were, the vicinity of Brunswick, in the district of Maine; and Bur-



2124



2125



2126

lington, on Lake Champlain, in the state of Vermont. In these places, it grows commonly in light, friable, and sandy soils, which it occupies almost exclusively; not exceeding 12 ft. or 15 ft. in height; and where its slender branches, laden with puny cones, evince the feebleness of its vegetation. In Pennsylvania and Virginia, the ridges of the Alleghanies are sometimes covered with it; particularly the south mountains, on the ridge called Saddle Hill, where the soil is rather richer, and where the tree attains the height of 35 ft. or 40 ft., with a trunk 12 in. or 15 in. in diameter. In the lower parts of New Jersey, Pennsylvania, and Maryland, it is frequently seen, in the large cedar swamps (which are constantly miry, or covered with water), 70 ft. or 80 ft. high, with a trunk from 20 in. to 28 in. in diameter, and exceeding the surrounding trees both in bulk and elevation. It supports a long time the presence of sea water, which, in spring tides, overflows the salt meadows, where it is sometimes found, and where it is the only species of the pine tribe. Messrs. Brown and M'Nab found the summits of the Alleghany Mountains entirely covered by scraggy trees of this species, with dwarf scrub oak (*Quercus Bannisteri*) as underwood. (*Quart. Journ. of Agri.*, v. p. 604.) On dry gravelly soil, Michaux observes, the wood of *P. rigida* is knotty; and, in humid situations, it is of so poor a quality, as to be unfit for works which require strength or durability. This species seems to have formerly abounded in Connecticut, Massachusetts, and New Hampshire; for, from the beginning of the eighteenth century, till 1776, these states furnished Britain with a considerable quantity of tar. About the year 1705, a misunderstanding having taken place between Great Britain and Sweden, from which latter country the British government had principally drawn its supply of tar, Great Britain encouraged this branch of industry in the northern part of America, by a premium of 1*l.* sterling for every barrel of tar made from dead wood, and 2*l.* for every barrel made from green wood; in consequence of which, and of this tree furnishing tar abundantly, its destruction has been so rapid, that it is now rarely found in the northern states. *P. rigida* was cultivated in England by the Duke of Bedford, previously to 1759; and, as the cones are frequently imported, it is not uncommon in collections of the genus. There are old trees at Syon and Pain's Hill, from 40 ft. to 50 ft. high; and one at Dropmore, 40 years planted, which, in 1837, was 31 ft. high. The specimen in the arboretum at Hackney is 10 ft. 6 in. high; and one in the Horticultural Society's Garden, after being 6 years planted, is 5 ft. high.

Properties and Uses. In some parts of the Alleghanies, where this tree abounds, houses are built of it; and the wood, if it is not covered with paint, is readily recognised by its numerous knots. It is thought better than the

yellow pine for floors that are frequently washed; as the resin with which it is impregnated renders it finer and more durable. It is used for ship pumps, and as fuel by the bakers and brick-makers of New York and Philadelphia; and from the roots is procured lampblack. The principal use of this tree is, however, to furnish tar and turpentine. The essence of turpentine, used in most parts of America for painting, is prepared from this tree.

Commercial Statistics. Price of cones, in London, 2s. per quart. Plants, at Bollwyller, are 1 franc 50 cents each; and at New York, 50 cents.

♂ 18. *P. (R.) SEROTINA Michx.* The late, or Pond, Pine.

Identification. Michx. Fl. Amer. Bor., 2. p. 205; Michx. Arb., 1. p. 86; N. Amer. Syl., 3. p. 148; Pursh Fl. Amer. Sept., 2. p. 643; N. Du Ham., 5. p. 246; Lamb. Pin., ed. 2., 1. t. 18; Lawson's Manual, p. 353.

Synonymy. ? *P. Tæda alopecuröidea Ait. Hort. Kew.*, ed. 2., 5. p. 317.
Engravings. Michx. Arb., 1. t. 7; N. Amer. Syl., 3. t. 142; N. Du Ham., 5. t. 75. f. 1.; Lamb. Pin., ed. 2., 1. t. 18; our fig. 2130., to our usual scale; and figs. 2127. to 2129., of the natural size, from the Horticultural Society and Dropmore specimens, and from Michaux.

Spec. Char., &c. Leaves in threes, very long. Male catkins erect, incumbent. Cones ovate; scales having very small mucros.



2127

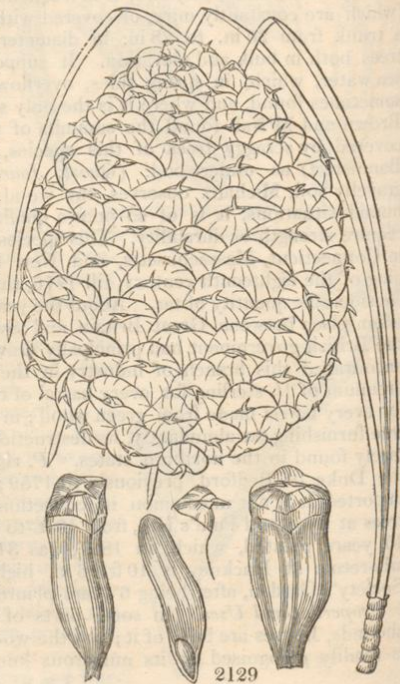
(*Michx.*) Buds, on young trees (see fig. 2128.), from $\frac{3}{16}$ in. to $\frac{5}{16}$ in. in length, and from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. in breadth; conical, dark brown, and very resinous; buds on old trees as in fig. 2127. Leaves (see fig. 2129.), in the Dropmore specimens, from 4 in. to 6 in. long; in Michaux's figure, upwards of 8 in. long. Cones $2\frac{1}{2}$ in. or 3 in. long, and $1\frac{1}{2}$ in. or 2 in. broad; egg-shaped; scales $\frac{7}{8}$ in. long, and $\frac{3}{8}$ in. broad, with the apex depressed, and terminating in a slender prickle. Seed very small; with the wing, from $\frac{3}{4}$ in. to $\frac{7}{8}$ in. in length. Cotyledons, ? The cones and leaves of the trees of this name at Dropmore, and the circumstance of there



2128

being trees at Pain's Hill with cones of different sizes and shapes, but all on three-leaved pines, and all evidently of the *Tæda* family, induce us to believe that *P. rigida* and *P. serotina* are only different forms of the same species.

Description, &c. The pond pine, according to Michaux, rarely exceeds 35 ft. or 40 ft. in height, with a branchy trunk from 15 in. to 18 in. in diameter. The leaves are generally 5 in. or 6 in. long, and sometimes more. The male catkins are straight, and about $\frac{1}{2}$ in. long. The cones are commonly in pairs, and opposite to each other; they are about $2\frac{1}{2}$ in. long, nearly 2 in. in diameter, and egg-shaped; the scales are rounded at their extremities, and armed with fine short prickles, which are easily broken off, so that in some cases no vestiges are left of their existence. The cones arrive at maturity the second year; but they do not shed their seeds till the third or fourth

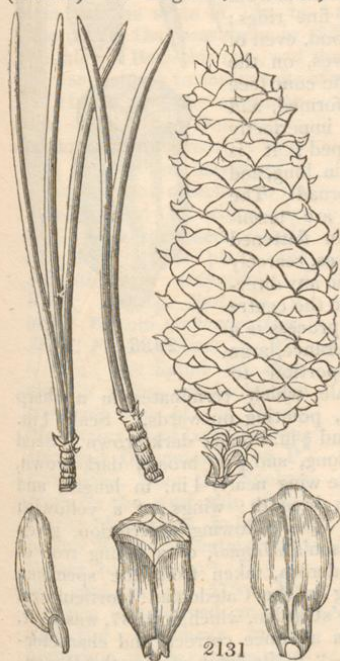


2129

year; whence the specific name. Pursh, who suspects this species to be only a variety of *P. rigida*, says that it grows on the edges of ponds and swamps from New Jersey to Carolina. Michaux observes that it is generally found in the maritime parts of the southern districts; but that "it grows occasionally in other parts of the United States, on the borders of ponds, and in the black and miry soil of the small swamps which form the habitat of the loblolly bay (*Gordonia lasianthus*), the tupelo (*Nyssa bicolor*), and the small magnolia (*Magnolia glauca*). This species is sometimes found, also, in abandoned fields near the swamps; but the dryness of the soil occasions no difference in its form. This observation, Michaux adds, is of importance, as *P. serotina* is frequently confounded with *P. rigida*, which it strikingly resembles. The timber is found to consist of more than one half of sap wood; and for this reason it is useless at home, and deservedly neglected abroad." (*Michx.*) In England, it forms, like the other



kinds of *P. Tæda*, an interesting addition to the pinetum, growing as freely at Syon, Pain's Hill, and Dropmore, as *P. rigida* or *P. Tæda*. The tree at Dropmore (of which a portrait is given in our last Volume) was, in 1837, 32 ft. high, that at Syon was 25 ft. high, and one at Kenwood was 30 ft. high.



P. variabilis Lamb. Pin., ed. 2., 1. t. 14., and our fig. 2131., of the natural size, from Lambert's plate. Mr. Lambert describes this pine as having the leaves in twos and threes, 2 in. long, channeled, the margins and nerves rough, and the apex sub-keelshaped; the sheaths short, straight, and but little wrinkled. The cones solitary, recurved, pendulous, narrow-ovate, mucronate; spines subincurved, with the scales dilated in the middle. He has only seen two trees of this species in England; one at Pain's Hill, and the other at Kew. (*Lamb.*) The one at Kew no longer exists; and the only trees at Pain's Hill, that we could see, with cones resembling those in Mr. Lambert's plate, had three leaves, and appeared to us to belong to *P. Tæda*. The buds in Mr. Lambert's figure appear to be resinous, but those of *P. variabilis* at Dropmore, which we feel confident is the *P. mltis* of Michaux (which Mr. Lambert makes a synonyme of his plant), are scaly, with the scales reflexed, as in fig. 2073. in p. 2195. The young shoots in Mr. Lambert's plate are green, but in the Dropmore plant they are of the same violet glaucous hue as those of *P. inops*; a character so remarkable that it cannot be mistaken, and which, Michaux says, belongs to no other pine of the United States but *P. inops* and *P. mltis*. (*N. Amer. Syl.*, 3. p. 130.) It is found also in *P. Sabiniæna* and *P. Coulteri*; but with these species Michaux was not acquainted.

§ vi. *Ponderosa.*

Sect. Char. Leaves very long, strong, somewhat flexuose.

† 19. *P. PONDEROSA* Doug. The heavy-wooded Pine.

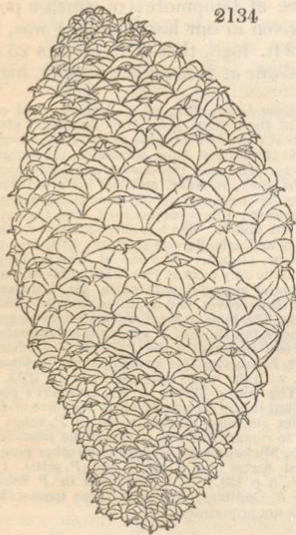
Identification. Douglas's specimens in the Horticultural Society's herbarium; Lawson's Manual, p. 354.; Lodd. Cat., ed. 1836.
Engravings. Our fig. 2135., to our usual scale; and figs. 2132. to 2134., of the natural size; from the tree in the Horticultural Society's Garden, and Douglas's specimens in the Horticultural Society's herbarium.

Spec. Char., &c. Leaves three in a sheath, much longer than the cones, flexible, tortuous, with short sheaths; crest of the anthers rounded, entire.



2132

Cones ovate, reflexed, with the apices of the scales flattened, with a raised process in the middle, terminating in a conical, minute, recurved spine, slightly quadrangular. Buds, in Douglas's specimen, $\frac{7}{8}$ in. long and $\frac{3}{8}$ in. broad; cylindrical, with straight sides, rounded like a dome at the extremity, but with a prominent blunt point; dark brown, and covered with resin. Buds, on the living tree in the Horticultural Society's Garden (see fig. 2132.), from 1 in. to $1\frac{1}{2}$ in. long, and from $\frac{3}{8}$ in. to $1\frac{1}{2}$ in. broad; smooth, cylindrical, with a long point; reddish brown, and covered with a fine white bloom, consisting of fine particles of resin, surrounded by two or more smaller buds. Leaves disposed in parallel spirals; in Douglas's specimen (see fig. 2133.), from 9 in. to 11 in. long; 3 in a sheath, which is from $\frac{1}{2}$ in. to 1 in. in length, with numerous fine rings; scales of the leaves persistent on the wood, even of two years' or three years' growth. Leaves, on the living plant, from 7 in. to 9 in. long. The cone (see fig. 2134.), in Douglas's specimen, is deformed, and



2134

very imperfectly developed; it is only 3 in. long, and $\frac{3}{4}$ in. broad. The scales are terminated in flattened processes, scarcely ribbed in any direction. In the centre of the process is a protuberance, large in proportion to the scale, which terminates in a sharp prickle, pointing outwards. Scale 1 in. long, and $\frac{3}{8}$ in. broad; dark brown. Seed $\frac{5}{16}$ in. long, and $\frac{2}{8}$ in. broad; dark brown, with the wing nearly 1 in. in length, and $\frac{3}{8}$ in. in breadth; wings of a yellowish brown. The following description, given in Lawson's *Manual*, of a young tree of *P. ponderosa*, taken from the specimen growing in the Caledonian Horticultural Society's Garden, which, in 1837, was 15 ft. high, is at once correct and characteristic:—"In its habit of growth, *P. ponderosa* seems to surpass all others of the genus for strength and luxuriance. The branches are few, regularly verticillated, horizontal, and seem inclined to assume a pendulous or drooping habit as the tree becomes old; central or top shoot often more than an inch in diameter, and of proportionable length. Buds large, and free from resin. Leaves thickly set, 9 in. to 1 ft. or 1 ft. 2 in. in length; thick, rigid, and nearly straight; rounded on the exterior, and having a longitudinal prominent rib, together with minute channels, on the in-



2133

derosa seems to surpass all others of the genus for strength and luxuriance. The branches are few, regularly verticillated, horizontal, and seem inclined to assume a pendulous or drooping habit as the tree becomes old; central or top shoot often more than an inch in diameter, and of proportionable length. Buds large, and free from resin. Leaves thickly set, 9 in. to 1 ft. or 1 ft. 2 in. in length; thick, rigid, and nearly straight; rounded on the exterior, and having a longitudinal prominent rib, together with minute channels, on the in-

terior side; smooth, with very indistinctly serrated margins; sheaths short of a dull blackish colour, and lacerated or torn at their extremities." 2135

Lawson's Manual, p. 355.) The timber is said to be so heavy as almost to sink in water. The tree is found to be quite hardy, and of rapid growth, both in the climate of London and of Edinburgh. *P. ponderosa* is a native of the north-west coast of North America, on the banks of the Spokane and Flathead rivers, and on the Kettle Falls of the Columbia, abundantly. It was discovered by Douglas, and sent by him to the Horticultural Society in 1826. A number of plants were raised from seeds in that year, and distributed: the largest of these we believe to be that in the Horticultural Society's Garden, of which *fig. 2136* is a portrait, to the scale of 1 in. to 4 ft. The tree at Dropmore was, in 1837,

9 ft. high. Both this tree, and that in the Horticultural Society's Garden, are very subject to the attacks of the *Hylurgus piniperda*, already described, p. 2141.; and the specimen

sent home by Douglas is remarkable for having a large tuft, among the leaves, of a parasitic plant attached to it; of a portion of which *fig. 2137* is a specimen slightly magnified. This plant, the *Arceuthobium Oxycedri* of Bieb., *Spreng. Syst.*, iii. p. 901.; *Viscum Oxycedri Dec.*, *Hook. Fl. Bor. Amer.*, p. 371. t. 99.; was found by Douglas on *Pinus ponderosa*, on the west side of the Rocky Mountains; and both by Douglas and Drummond "on *P. Banksiana*, from the Spokane river on the west side of the Rocky Mountains, in lat. 47°, to the Rocky Mountains, and thence to Hudson's Bay on the east, in lat. 57°. Mr. Douglas entertained an idea that the specimens in his herbarium of this curious parasite, found on *P. ponderosa*, were different from those found on *P. Banksiana*; but the only

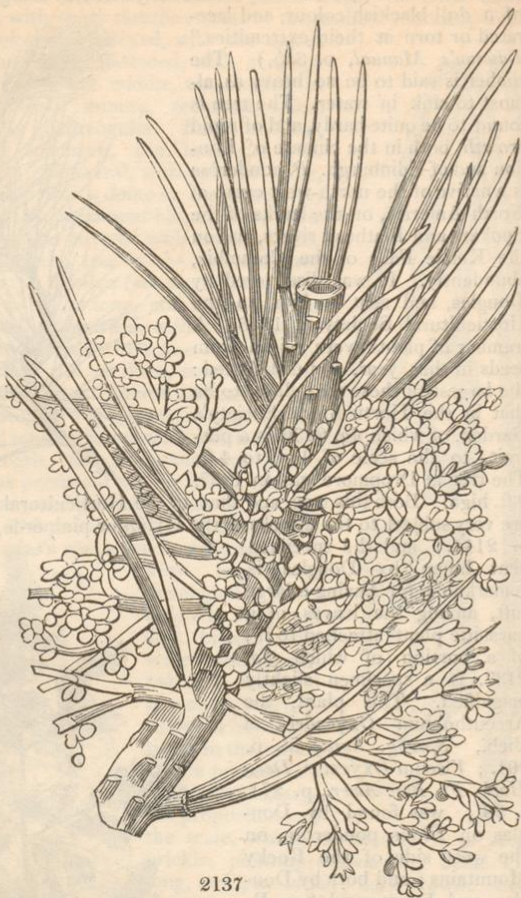
difference consists in the latter being loaded with female, the former with male, flowers, which certainly gives a very different appearance to the extremities of the numerous branches. It is remarkable too, that all Mr. Drummond's specimens (and they were all found upon *P. Banksiana*)



2136



are male plants. These and the plants of Mr. Douglas have been carefully compared with European ones found growing on the *Juniperus Oxýcedrus*, some from the south of France (in Languedoc, gathered by M. Bory de Saint Vincent), and others from Mt. Caucasus, communicated to me by Mr. Prescott, and I must confess, I cannot perceive any specific difference in them whatever. In general, but not always, those from the old world are either greener or blacker when dry; and the American more yellow." (*Hook. Fl. Bor. Amer.*, i. p. 278.) *Pinus ponderosa*, which is, perhaps, more hardy than the pinaster, and is of equally rapid



2137

growth, has a noble appearance, even when a young tree; and, together with *P. Sabiniana* and *P. Coulteri*, equally noble trees, and apparently as hardy and of as rapid growth, well deserves a place in every pinetum. Price of the plants, in the London nurseries, 21s. each.

B. Cones having the Scales hooked.

§ vii. *Sabinianæ*.

Sect. Char. Cones large, with the apex of the scales elongated and hooked.

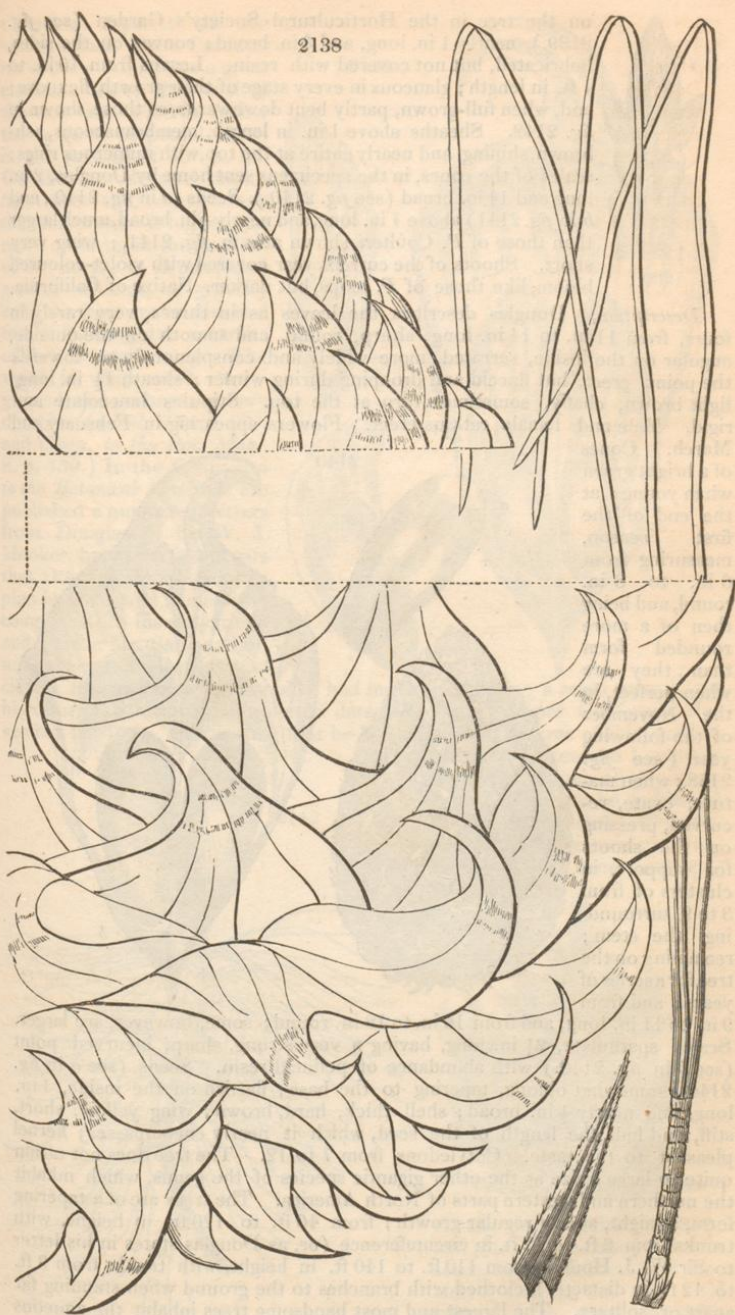
‡ 20. *P. SABINIANA* Douglas. Sabine's, or the great prickly-coned, Pine.

Identification. Lamb. Pin., ed. 2., 2. t. 80.; Lawson's Manual, p. 353.; Lodd. Cat., ed. 1836.

Engravings. Lamb. Pin., ed. 2., 2. t. 80.; our fig. 2142., to our usual scale; and figs. 2138. to 2140., of the natural size, from the tree in the Horticultural Society's Garden, and Lambert.

Spec. Char., &c. Leaves in threes, very long. Cones ovate, echinate, very large. Scales long, awl-shaped, incurved, and spiny at the apex. (*Lamb. Pin.*) Buds,

2138





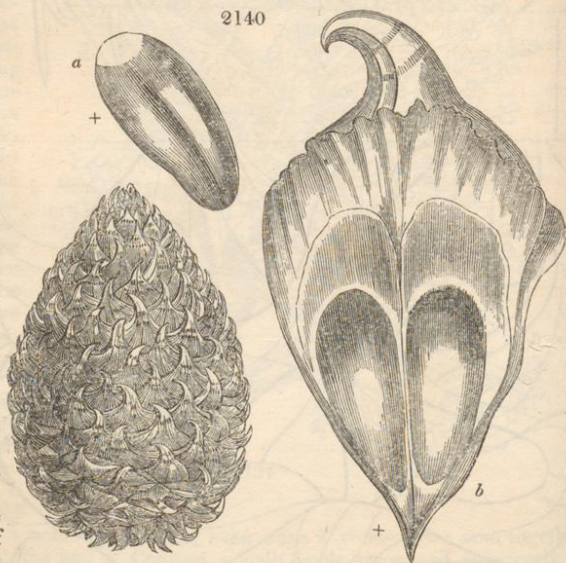
2139

on the tree in the Horticultural Society's Garden (see *fig.* 2139.), nearly 1 in. long, and $\frac{3}{8}$ in. broad; convex on the sides, imbricated, but not covered with resin. Leaves from 10 in. to 1 ft. in length; glaucous in every stage of their growth, flexuose; and, when full-grown, partly bent downwards, as those shown in *fig.* 2142. Sheaths above 1 in. in length, membranaceous, ash-brown, shining, and nearly entire at the top, with numerous rings; scales of the cones, in the specimens sent home by Douglas, 2 in. long and $1\frac{3}{4}$ in. broad (see *fig.* 2140.). Seeds (*a* in *fig.* 2140., and *b* in *fig.* 2141) above 1 in. long, and nearly $\frac{1}{2}$ in. broad, much larger than those of *P. Coulteri* shown at *a* in *fig.* 2141.; wing very short. Shoots of the current year covered with violet-coloured bloom, like those of *P. inops*, but darker. Native of California.

Description. Douglas describes the leaves as in threes, very rarely in fours, from 11 in. to 14 in. long, sharp, round, and smooth on the outside, angular on the inside, serrated, more widely and conspicuously so towards the point, erect, but flaccid and drooping during winter; sheath $1\frac{1}{2}$ in. long, light brown, chaffy, sometimes torn at the top. Stipules lanceolate and rigid. Male and female catkins erect. Flowers appearing in February and

March. Cones of a bright green when young; at the end of the first season, measuring from 6 in. to 8 in. round, and being then of a more rounded form than they are when perfect, in the November of the following year (see *fig.* 2138.: when mature, ovate, recurved, pressing on the shoots for support, in clusters of from 3 to 9, surrounding the stem; remaining on the tree for a series of years; and from

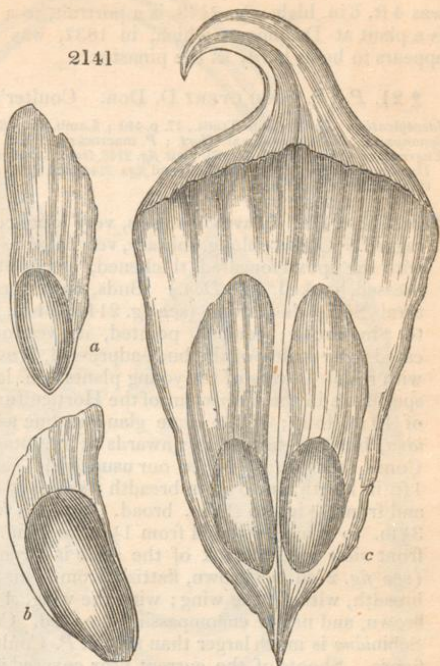
9 in. to 11 in. long, and from 16 in. to 18 in. round; some, however, are larger. Scales spatulate, $2\frac{1}{4}$ in. long, having a very strong, sharp, incurved point (see *b* in *fig.* 2140.) with abundance of pellucid resin. Seeds (see *a* in *fig.* 2140.) somewhat oblong, tapering to the base; flattish on the inside, 1 in. long, and nearly $\frac{1}{2}$ in. broad; shell thick, hard, brown; wing yellow, short, stiff, and half the length of the seed, which it nearly encompasses; kernel pleasant to the taste. Cotyledons from 7 to 12. The tree does not attain quite so large a size as the other gigantic species of the genus, which inhabit the northern and western parts of North America. The trees are of a tapering form, straight, and of regular growth; from 40 ft. to 120 ft. in height, with trunks from 2 ft. to 12 ft. in circumference (or, as Douglas states in his letter to Sir W. J. Hooker, from 110 ft. to 140 ft. in height, with trunks from 3 ft. to 12 ft. in diameter), clothed with branches to the ground when standing far apart or solitary. The largest and most handsome trees inhabit the aqueous



2140

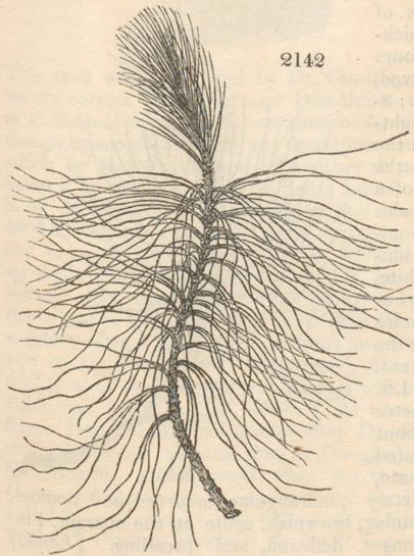
vegetable deposits on the western flank of the Cordilleras of New Albion, at a great elevation above the level of the sea, and 1600 ft. below the verge of perpetual snow, in the parallel of 40° N. lat. On the less elevated mountains near the coast, where the temperature is higher, but more uniform, in the parallel of 31° north, in decomposed granite schistus, or gravelly soils, the trees are smaller and few, inhabiting the summits of the mountains only. The wood is white, soft, even-grained, and perhaps not very durable. (*Lamb. Pin.*, t. 80.; and *Comp. to the Bot. Mag.*, ii. p. 150.) In the *Companion to the Botanical Magazine* are published a number of letters from Douglas to Sir W. J. Hooker, by which it appears that Douglas discovered this pine in 1826, and named it in compliment to his early friend and patron Mr. Sabine; but, unfortunately, he lost his specimens, together with the notes he had made, in crossing a rapid stream, on his return northward. In a letter dated Monterey, Upper California, November 23. 1831, after stating that he had found another tree of this species,

2141



he says, "I sent to London a detailed account of this most beautiful tree, to be published in the *Horticultural Transactions*." This account never arrived; but the cones and spe-

2142



cimens were received in 1832; and plants were raised from the seeds, in the Horticultural Society's Garden, that year. Of one of these, which, in 1837,

2143



cimens were received in 1832; and plants were raised from the seeds, in the Horticultural Society's Garden, that year. Of one of these, which, in 1837,

was 4 ft. 6 in. high, *fig.* 2143. is a portrait, to a scale of 1 in. to 4 ft. There is a plant at Dropmore, which, in 1837, was 5 ft. 6 in. high. The species appears to be as hardy as the pinaster.

† 21. *P.* (S.) COULTERI D. Don. Coulter's, or the great hooked, Pine.

Identification. Don in Lin. Trans., 17. p. 440.; Lamb. Pin., 3. t. 83.

Synonymes. *P. Sabiniana* var. *Hort.*; *P. macrocarpa* Lindl. MS.

Engravings. Lamb. Pin., 3. t. 83.; our *fig.* 2146. from Lambert, *fig.* 2141. from the dried cone in the Horticultural Society's herbarium, and *figs.* 2144. and 2145. from the young plants in the Horticultural Society's Garden.

Spec. Char., &c. Leaves in threes, very long, compressed; sheaths ragged. Cones oblong, solitary, very large; scales wedge-shaped, with the apex elongated, thickened, lanceolate, mucronate, compressed, hooked. (*D. Don.*) Buds, on the tree in the Horticultural Society's Garden (see *fig.* 2144.), 1 in. long, and from $\frac{3}{8}$ in. to $\frac{4}{8}$ in. broad; conical, pointed, convex on the sides, imbricated; the scales of the buds adpressed, brown, and not covered with resin. Leaves of the young plants 9 in. long, and of the dried specimens in the herbarium of the Horticultural Society, upwards of 10 in. long; of the same glaucous hue as those of *P. Sabiniana*, but not turned downwards at any stage of their growth. Cones (see *fig.* 2146., to our usual scale) sent home by Douglas 1 ft. in length, and 6 in. in breadth; scales of the cones 3 in. long, and from $1\frac{1}{4}$ in. to $1\frac{1}{2}$ in. broad. Scales (see *fig.* 2141. c) from $3\frac{1}{2}$ in. to 4 in. long, and from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. broad; in *fig.* 2146., at *a*, a front view of the hook of the scale is given, of the natural size. Seed (see *fig.* 2141. a) brown, flattish, from $\frac{1}{2}$ in. to $\frac{5}{8}$ in. in length, and $\frac{3}{8}$ in. in breadth, without the wing; with the wing, 1 in. in length; wing stiff, light brown, and nearly encompassing the seed. Cotyledons? The seed of *P. Sabiniana* is much larger than that of *P. Coulteri*, as shown at *a* in the same figure. Shoots of the current year covered with a violet-coloured glaucous bloom, like those of *P. inops*, but darker. Native of California, on mountains.

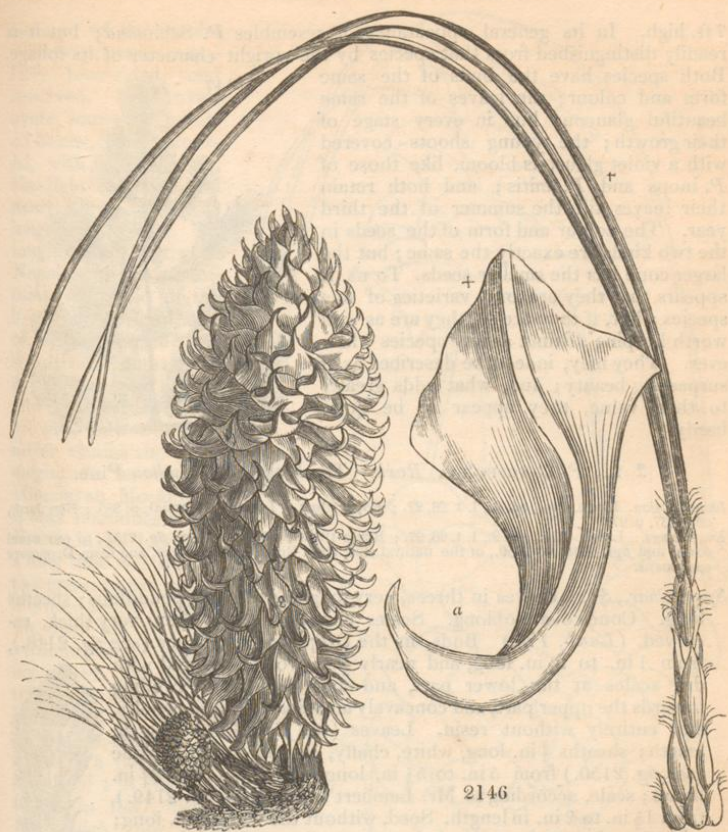


2144

Description. A large strong-growing tree, from 80 ft. to 100 ft. high. Bark brownish. Branches large; top spreading. Branchlets knotted, and tubercled from the callous bases of the stipular scales; about 1 in. in thickness. Leaves in threes, rarely in fours or fives, about 9 in. long, incurved, somewhat compressed, mucronate; 2-furrowed above, flattish beneath, slightly serrated on the margin, and on the elevated line along the middle; sheaths $1\frac{1}{2}$ in. long, about the thickness of a crow-quill, swelling at the tips. Scales of the stipules ovate-lanceolate, acuminate, cartilaginous, bright brown, shining, adpressed; margin scarious, white, thread-like, and torn; with the lower ones shorter, and keel-shaped. Stipules larger, much acuminate, hooded at the base, callous, indurated, and persistent. All the cones large, conical-oblong, 1 ft. and more in length, 6 in. in diameter near the middle, and weighing about 4 lb. Scales wedge-shaped, elongated at the apex, lanceolate, mucronate, compressed on both sides, obsoletely quadrangular, incurved and hooked, very thick, indurated, smooth, shining, brownish, acute at the margin, 1 in. to 3 in. long; the lower ones longer, deflexed, and spreading. (*Lamb.*)



2145



This tree was discovered by Dr. Coulter, in what year is not stated; but, if we are correct (and Professor Don thinks we are) in considering it the same as *P. Sabiniæna* var., seeds and specimens were sent home by Douglas in 1832, though unaccompanied by any description or historical particulars; his papers, which he had despatched by another ship, having been lost. Dr. Coulter found it on the mountains of Santa Lucia, near the mission of San Antonio, in lat. 36° , within sight of the sea, and at an elevation of from 3000 ft. to 4000 ft. above its level. It was growing intermixed with *P. Lambertiana*, and rising to the height of from 80 ft. to 100 ft., with large, permanent, spreading branches, and a trunk 3 ft. or 4 ft. in diameter. Its leaves are broader than those of any other pine; and the cones, which grow singly, are the largest of all, being often more than 1 ft. long, and 6 in. in diameter, and weighing about 4 lb. The spinous processes of the scales of the cone are very strong, hooked, and compressed, 3 in. or 4 in. in length, and about the thickness of one's finger; characters which essentially distinguish it from *P. Sabiniæna*. (*Don in Linn. Trans.*) At the suggestion of Mr. Lambert, Professor Don named this species after Dr. Coulter (who appears to have discovered it about the same time as Douglas), "who is no less distinguished for his scientific acquirements, than for the excellent qualities of his mind." Cones and specimens were sent home by Douglas in 1832, and plants were raised from the seed in the following year; one of these in the Horticultural Society's Garden, of which *fig. 2147.* is a portrait, was, in September, 1837,

7 ft. high. In its general appearance, it resembles *P. Sabiniàna*; but it is readily distinguished from that species by the upright character of its foliage. Both species have the buds of the same form and colour; the leaves of the same beautiful glaucous hue in every stage of their growth; the young shoots covered with a violet glaucous bloom, like those of *P. inops* and *P. mitis*; and both retain their leaves till the summer of the third year. The colour and form of the seeds in the two kinds are exactly the same; but the larger cone has the smaller seeds. To us, it appears that they are only varieties of one species; but, if they are so, they are as well worth keeping distinct as any species whatever. They may, indeed, be described as of surpassing beauty; and, what adds greatly to their value, they appear to be quite hardy.

2147



‡ 22. *P. LONGIFOLIA* Roxb. The long-leaved Indian Pine.

Identification. Lamb. Pin., ed. 2., 1. t. 26, 27.; Royle Illust.; Lawson's Manual, p. 355.; Bon Jard., ed. 1837, p. 976.

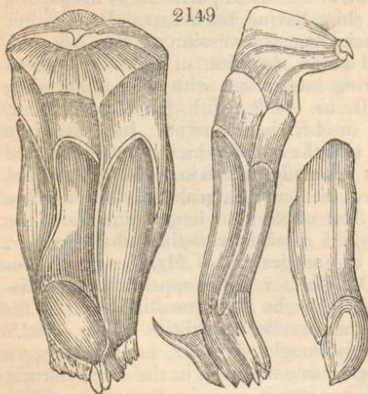
Engravings. Lamb. Pin., ed. 2., 1. t. 26, 27.; Royle Illust., t. 85. f. 2.; our fig. 2151, to our usual scale, and figs. 2148. to 2150., of the natural size, from Royle and Lambert, and from Dropmore specimens.

Spec. Char., &c. Leaves in threes, very long and slender, pendulous; sheaths long. Cones ovate-oblong. Scales elevated at the apex, very thick, recurved. (*Lamb. Pin.*) Buds, in the Dropmore specimens (see fig. 2148.), from 1 in. to $1\frac{1}{4}$ in. long, and nearly $\frac{1}{2}$ in. broad; covered with dry scales at the lower part, and abortive leaves; swelling towards the upper part, and concavely acuminate; white, woolly, and entirely without resin. Leaves (see fig. 2150.) 1 ft. in length; sheaths $\frac{3}{4}$ in. long, white, chaffy, and lacerated. Cone (see fig. 2150.) from 5 in. to $5\frac{1}{2}$ in. long, and $2\frac{1}{2}$ in. to $2\frac{3}{4}$ in. broad; scale, according to Mr. Lambert's plate (see fig. 2149.), from $1\frac{1}{2}$ in. to 2 in. in length. Seed, without the wing, $\frac{1}{2}$ in. long; with the wing, $1\frac{3}{8}$ in. Cotyledons, according to Lawson, about 12. Native of Nepal, and requiring protection in England.

Description, &c. A tree, growing, in Nepal, to the height of 100 ft. or upwards, with few, short, and remotely verticillate



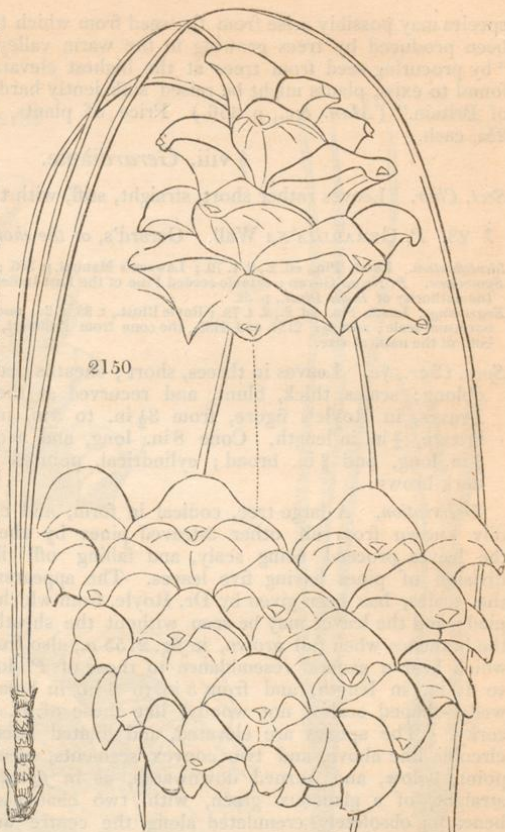
2148



2149

branches. The leaves are of a vivid green, disposed in spiral rows round the young wood; and they vary in length from 9 in. to 18 in.; they are very slender, generally pendulous, and channeled so as to appear triangular in the section. They are serrated on the margins, and imperfectly scabrous throughout. Sheaths less than 1 in. in length, delicate, and lacerated at their margins. Male catkins crowded round the base of the young shoots, pointing upwards; cylindrical, and about 1 in. in length. Young cones globose, with stalks, and erect; mature cones less than one half the length of the leaves; oblong-ovate, and dark brown; outer

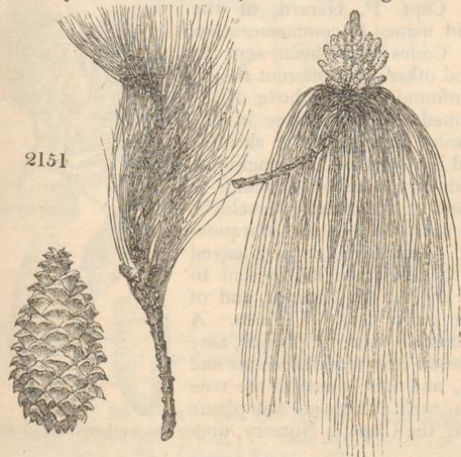
surface of the scales very prominent, irregularly four-sided, and recurved. Seed oval-ovate, somewhat pointed below, light-coloured, with a broad wing, also light-coloured, and nearly three times the length of the seed. *P. longifolia* is a native of Nepal, on the mountains; and also of the lower and warmer parts of India, where the tree is cultivated on account of its beautiful foliage and graceful habit of growth, but where it never attains the same magnitude as on the Himalayan Mountains. It was introduced into Britain in 1801, and for a long time was treated as a green-house plant: it is now found to stand the open air, but not without protection during winter. The largest tree in England is believed to be that at Dropmore, of which *fig.* 2152. is a portrait, to a scale of 1 in. to 8 ft. It was, in 1837, nearly 12 ft. high; but it is



covered every winter with a portable roof of fern, enclosed in mats, and supported by a wooden frame; the sides being closed in with the same materials,

but with two doors opposite each other, to open on fine days, to promote ventilation. Mr. Lawson

2152



2151



suggests that the tenderness which is apparent in some individuals of this

species may possibly arise from the seed from which they were raised having been produced by trees growing in the warm valleys of Nepal; and that, "by procuring seed from trees at the highest elevation at which they are found to exist, plants might be raised sufficiently hardy to stand the climate of Britain." (*Man.*, &c., p. 356.) Price of plants, in Lawson's Nursery, 25s. each.

§ viii. *Gerardiànæ*.

Sect. Char. Leaves rather short, straight, stiff, with the sheaths caducous.

† 23. *P. GERARDI'ANA* Wall. Gerard's, or the short-leaved Nepal, Pine.

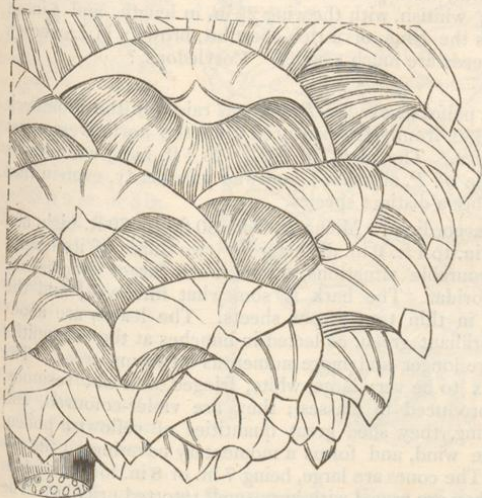
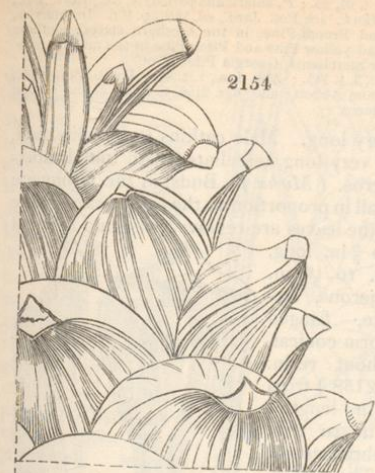
Identification. Lamb. Pin., ed. 2., 2. t. 79.; Lawson's Manual, p. 356.; Lodd. Cat., ed. 1836.
Synonyme. *P. Neösa* Govan; eatable-seeded Pine of the East Indies; ? *Chilghöza Elphinstone*, no the authority of *Royle Illust.*, p. 32.

Engravings. Lamb. Pin., ed. 2., 2. t. 79.; Royle Illust., t. 85. f. 2.; and our fig. 2153., from Royle, to our usual scale; and figs. 2154. and 2155., the cone from Lambert, and the leaves from Royle, both of the natural size.

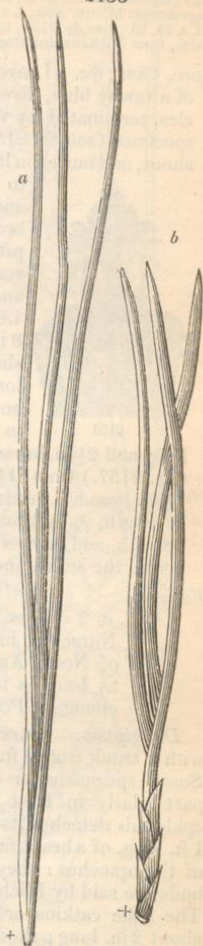
Spec. Char., &c. Leaves in threes, short; sheaths deciduous. Cones ovate-oblong; scales thick, blunt, and recurved at the apex. (*Lamb. Pin.*) Leaves, in Royle's figure, from 3½ in. to 5 in. in length; sheaths imbricate, ¾ in. in length. Cone 8 in. long, and nearly 5 in. broad. Seed ⅞ in. long, and ⅜ in. broad; cylindrical, pointed at both ends, and of a dark brown.

Description. A large tree, conical in form, and compact in habit; readily known from all other 3-leaved pines by the sheaths from which the leaves proceed being scaly, and falling off, like the sheaths of the division of pines having five leaves. The appearance of the leaves, with the scales, has been given by Dr. Royle, from which our fig. 2155 *b.* is copied; and the leaves may be seen without the sheaths, as they appear on the branches when full grown, in fig. 2155 *a.*, also from Royle. The cones, which bear a general resemblance to those of *P. longifolia*, are from 8 in. to 10 in. in length, and from 5 in. to 6 in. in breadth, with thick, broad, wedge-shaped scales, not woody, like those of *P. Sabiniana*, but rather corky. The apexes are elevated, and dilated laterally, forming a semi-circular line above, and two convex segments, meeting in a blunt corky point, below, and turned downwards, as in fig. 2154. The leaves are straight, of a glaucous green, with two channels above, and convex beneath; obsoletely crenulated along the centre and margins. Nothing is said respecting the timber of this tree; but the seeds are eaten by the inhabitants of the lower parts of India, in the southern countries. This species was discovered by Capt. P. Gerard, of the Bengal Native Infantry; and named in commemoration of him by Dr. Wallich. Cones have been sent to England, by Dr. Wallich and others, at different times; though they are often confounded with those of *P. longifolia*. The plant named *P. Gerardiàna* in the Horticultural Society's Garden has persistent sheaths, and long slender leaves, and is, doubtless, *P. longifolia*; and the same may be said of a number of plants at Messrs. Loddiges's. A plant at Sir Oswald Moseley's, said to be raised from seeds sent home by the Marquess of Hastings as those of *P. Gerardiàna*, is a 2-leaved pine; and evidently, from the specimen kindly sent to us by its proprietor, who is an excellent botanist, and of the same opinion, nothing more than *P. Pinea*. A young plant at Dropmore, named there *P. Neösa*, may possibly be true. Mr. Lawson has received cones and seeds from the East Indies, and has plants of the true *P. Gerardiàna* for sale at 35s. each. There are also plants of the true *P. Gerardiàna* in the Clapton Nursery, under its synonyme of *P. Neösa*.





2155



C. Cones long, slightly tubercled.

§ ix. Australes.

Sect. Char. Leaves and cones very long; the latter nearly as long as the leaves; scales of the cones slightly tubercled, nearly flat, with very small caducous prickles.

† 24. *P. AUSTRALIS* Michx. The southern Pine.

Identification Michx. Arb., 1. p. 62.; N. Amer. Syl., 3. p. 133.; N. Du Ham., 5. p. 246.; Dict. des
Eaux et Forêts, 2. p. 592.; Lawson's Manual, p. 350.

Synonymes. *P. palustris* Willd. *Sp. Pl.*, 4. p. 499., *Mill. Dict.*, 14., *Art. Hort. Kew.*, 3. p. 368., *Pursh Fl. Amer. Sept.*, 2. p. 644., *Lamb. Pin.*, ed. 2., 1. t. 24, 25.; *P. americana palustris*, &c., *Hort. Angl.*, p. 88., *Du Ham. Arb.*, 2. p. 126.; *P. serotina* Hort., see Bon Jard., ed. 1837, p. 976. In America, long-leaved Pine, yellow Pine, Pitch Pine, and Broom Pine, in the southern states; southern Pine and red Pine in the northern states; and yellow Pine and Pitch Pine in the middle states. In England and the West Indies, by the timber merchants, Georgia Pitch Pine.

Engravings. Michx. Arb., 1. t. 6.; N. Amer. Syl., 3. t. 141.; Abb. Ins., 1. t. 42.; Lamb. Pin., ed. 2., 1. t. 24, 25.; our fig. 2159., to our usual scale from Abbott; and figs. 2156, to 2158., of the natural size, from Michaux and from Dropmore specimens.

Spec. Char., &c. Leaves in threes, very long. Male catkins long, cylindrical, of a tawny blue, divergent. Cones very long, tessellated with tumid tubercles, terminated by very small mucros. (*Michx.*) Buds, in the Dropmore specimen (see fig. 2156.), rather small in proportion to the termination of the shoot, and buried in leaves. When the leaves are removed, the bud is found



2156

to be from $\frac{3}{8}$ to $\frac{5}{8}$ in. long, and from $\frac{5}{16}$ in. to $\frac{6}{16}$ in. broad, with numerous, far-projecting, white, fringed scales; general form conical, and wholly without resin. Leaves (see fig. 2158.) from 8 in. to 9 in. in length; sheath from $1\frac{1}{4}$ in. to 2 in. long, white, membranaceous, and lacerated. The cones, in Michaux's figure, 8 in.

long, and $2\frac{1}{4}$ in. broad in the widest part. Scale (fig. 2157.) from $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. long, and $1\frac{1}{2}$ in. broad. Seeds oval, from $\frac{3}{8}$ in. to $\frac{1}{2}$ in.

in length, $\frac{3}{8}$ in. broad; whitish, with the wing $2\frac{5}{8}$ in. in length, and $\frac{1}{2}$ in. in breadth, and, as well as the cone, of a rich chestnut brown; in Lambert's figure, the scales and seeds are much smaller. Cotyledons, 2



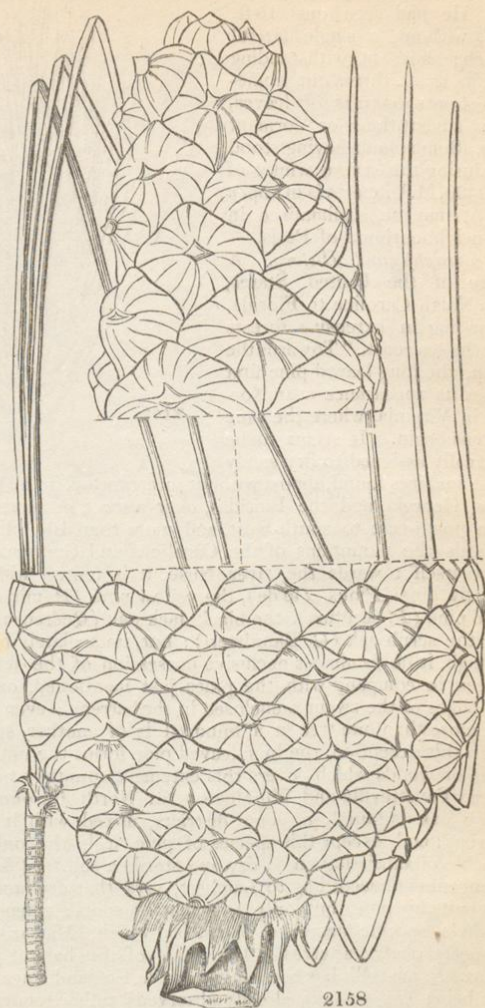
2157

Variety.

♁ *P. a. 2 excelsa*, *P. palustris excelsa* Booth, was raised in the Floetbeck Nurseries, in 1830, from seeds procured from the north-west coast of North America. The plant, in 1837, was 4 ft. high, with leaves as long as those of *P. australis*; and was quite hardy, even in that climate. Possibly a distinct species.

Description. A tree, according to Michaux, from 60 ft. to 70 ft. high, and with a trunk from 1 ft. 3 in. to 1 ft. 6 in. diameter for two thirds of its height. Some specimens, in favourable situations, attain much larger dimensions, particularly in East Florida. The bark is somewhat furrowed, and the epidermis detaches itself in thin transparent sheets. The leaves are about 1 ft. long, of a beautiful brilliant green, collected in bunches at the extremities of the branches: they are longer and more numerous on young trees. The buds are said by Michaux to be very large, white, fringed, and not resinous. The male catkins are produced in masses; they are violet-coloured, and about 2 in. long; in drying, they shed great quantities of yellowish pollen, which is diffused by the wind, and forms a momentary covering on the adjacent land and water. The cones are large, being 7 in. or 8 in. long, and 4 in. thick when open; and they are armed with very small retorted prickles. The tree flowers in April, and the cones ripen about October in the second year, and shed their seeds the same month. The kernel is of an agreeable taste, and is contained in a thin whitish shell, instead of being black, as is the case with every other species of American pine, and it is surmounted by a wing, which is often more than 2 in. in length. The seeds, in some years, are very abundant; but, in others, a forest of 100 miles in extent may be ransacked without finding a single cone; which was probably the occasion, Michaux observes, of the statement made by the French, who, in 1567, attempted to effect a settlement in Florida; viz. "that the woods were filled with superb pines, that never yielded seed." The timber is said to contain but little sap wood. Trunks 1 ft. 3 in.

in diameter, often having 10 in. of perfect wood. The concentric circles, in a trunk fully developed, are close, and at equal distances; and the resinous matter, which is abundant, is more uniformly distributed than in the other species. Hence the wood is stronger, more compact, and more durable: it is, besides, fine-grained, and susceptible of a high polish. These advantages give it a preference, as a timber tree, over every other American pine; but its quality is modified by the nature of the soil in which it grows. In the neighbourhood of the sea, where only a thin layer of mould reposes on the sand, it is more resinous than where the mould is 4 in. or 5 in. thick; and the trees which grow upon the first-mentioned soil are called pitch pines, as if they were distinct species. In certain soils, its wood contracts a reddish hue; and it is, for that reason, known in the dock-yards of the northern



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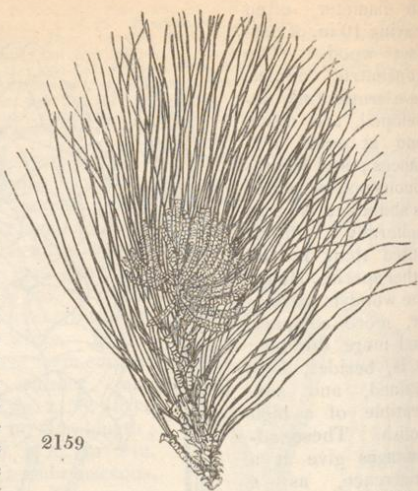
states by the name of the red pine. Wood of this tint is considered the best; and, in the opinion of some shipwrights, it is more durable on the sides of vessels, and less liable to injury from worms, than the oak. In the climate of London, *P. australis* is rather tender. The largest plant that we know of is at Farnham Castle, which, in 1834, after being 35 years planted, was 20 ft. high. There is one at Dropmore, of which *fig.* 2160. is a portrait, to the scale of 1 in. to 8 ft. This tree was planted where it now stands, in September, 1824, when only 4 in. high; and it is now (September, 1837) 16 ft. high, without having, during that period, received the slightest protection. M. Vilmorin states, in the *Bon Jardinier* for 1837, that, in the neighbourhood of Paris, this pine is generally grown in boxes, and taken into

the conservatories during winter. He had seen one 16 ft. high, without a single lateral branch; but, notwithstanding this, its trunk threw out numerous shoots or tufts of leaves, from adventitious or dormant buds. Some plants having stood out during the severe winter of 1829-30, M. Vilmorin is in hopes that it may be acclimatised in the neighbourhood of Paris.

Geography and History. A native of the United States, from North Carolina to Florida, abounding in extensive forests near the sea coast. "Towards the north, the long-leaved pine first makes its appearance near Norfolk in Virginia, where the pine barrens begin. It seems to be especially assigned to dry sandy

soils; and it is found, almost without interruption, in the lower part of the Carolinas, Georgia, and the Floridas, over a tract of more than 600 miles long from north-east to south-west, and more than 100 miles broad from the sea towards the mountains of the Carolinas and Georgia. Where it begins to show itself towards the river Nuse, it is united with the loblolly pine (*Pinus Tæda*), the yellow pine (*P. mitis*), the pond pine (*P. serótina*), the black Jack oak (*Quercus nigra*), and the scrub oak (*Q. Bannisteri*): but, immediately beyond Raleigh, it holds almost exclusive possession of the soil, and is seen in company with the pines just mentioned, only on the edges of the swamps enclosed in the barrens; even there, not more than one tree in a hundred is of another species. With this exception, the long-leaved pine forms the unbroken mass of woods which covers this extensive country; but, between Fayetteville and Wilmington, in North Carolina, the scrub oak is found, in some districts, mixed with it in the barrens; and, except this species of pine, it is the only tree capable of subsisting on so dry and sterile a soil." (*Michx.*) Wangenheim, according to Lambert, says that dry land does not suit this pine, but only low marshy spots; whence Solander's specific name of *palustris*; which, Michaux very properly observes, gives a false idea of the habitat of the plant. *P. australis* has been cultivated in England since 1730; but being (as we have already observed) rather tender, though it will stand the climate of London in the open air without protection, it is not common in collections. M. Michaux recommends it for the south of France, and particularly for the neighbourhood of Bordeaux, in soils and situations where the pinaster flourishes.

Properties and Uses. The timber of the long-leaved pine is applied to a great variety of purposes in the Carolinas, Georgia, and the Floridas. Four fifths of the houses are built of it, except the roof, which is covered with shingles of cypress; though sometimes the shingles also are made of pine, in which case they require to be renewed after 15 or 18 years, owing to the warmth and humidity of the climate. It is generally used for the enclosure of cultivated fields; and, in the southern states, it is preferred before all other pines in naval architecture. No other species is exported from the southern states to the West Indies; and it is also sent in large quantities to Liver-



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pool; where, according to Michaux, it is called the Georgia pitch pine, and is sold at 25 per cent or 30 per cent higher than any other pine imported from the United States. The young trees, which have larger and more numerous leaves than the old ones, are sometimes cut by the negroes for brooms; and hence the name of broom pine. *P. australis* supplies nearly all the resinous matter used in the United States in ship-building. Formerly, tar was made in all the lower parts of the Carolinas and Georgia; but at present this manufacture is confined to the lower districts of North Carolina. The resinous products of this pine are, turpentine, scrapings, spirit of turpentine, resin, tar, and pitch. Of these, turpentine is the raw sap of the tree obtained by making incisions in the trunk. It begins to distil about the middle of March, when the circulation commences, and it flows with increasing abundance as the weather becomes warmer; so that July and August are the most productive months. The sap is collected in what are in America termed boxes: these are incisions, notches, or cavities, cut in the tree, about 3 in. or 4 in. from the ground, generally of a sufficient size to hold about three pints of sap, but proportioned to the size of the tree; the rule being that the cavity shall not exceed one fourth of the diameter of the tree. These cavities are made in January or February, commencing with the south side, which is thought the best, and going round the tree. The next operation is the raking or clearing the ground from leaves and herbage. About the middle of March, a notch is made in the tree, with two oblique gutters, to conduct the sap that flows from the wood into the box, or cavity, below. In about a fortnight, the box becomes full, and a wooden shovel is used to transfer its contents to a pail, by means of which it is conveyed to a large cask placed at a convenient distance. The edges of the wound are chipped every week, and the boxes, after the first, generally fill in about three weeks. The sap thus procured is used as turpentine, without any preparation, and is called pure dripping. The scrapings are the crusts of resin that are formed on the sides of the wounds; and these are often mixed with the turpentine, which, in this state, is used in the manufacture of yellow soap, and is called Boston turpentine. Long-continued rains check the flow of the sap, and even cause the wounds to close; and, for this reason, very little turpentine is procured in cold damp seasons. In five or six years, the tree is abandoned; and the bark never becomes sufficiently healed to allow of the same place being wounded twice.

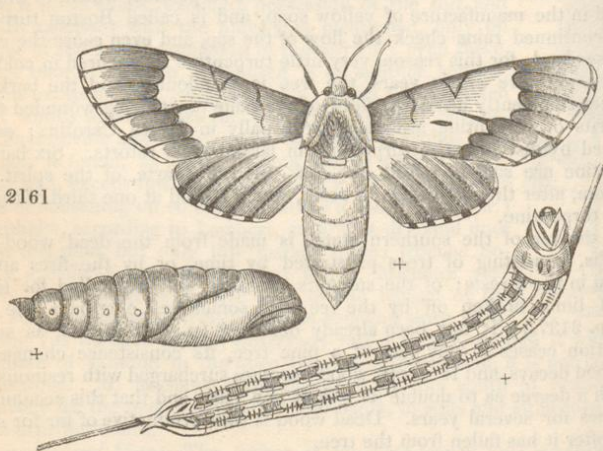
Spirits of turpentine are made principally in North Carolina; and are obtained by distilling the turpentine in large copper retorts. Six barrels of turpentine are said to afford one cask, or 122 quarts, of the spirit. The residuum, after the distillation, is resin, which is sold at one third of the price of the turpentine.

All the tar of the southern states is made from the dead wood of *P. australis*, consisting of trees prostrated by time, or by the fires annually kindled in the forests; of the summits of those that are felled for timber; and of limbs broken off by the ice that sometimes overloads the trees. (See p. 2137.) It has been already observed (p. 2108.), that, as soon as vegetation ceases in any part of a pine tree, its consistence changes: the sap wood decays, and the heart wood becomes surcharged with resinous juice, to such a degree as to double its weight in a year; and that this accumulation increases for several years. Dead wood is thus productive of tar for several years after it has fallen from the tree.

To procure the tar, a kiln is formed in a part of the forest abounding in dead wood: this is first collected, stripped of the sap wood, and cut into billets 2 ft. or 3 ft. long, and about 3 in. thick; a task which is rendered tedious and difficult by the numerous knots with which the wood abounds. The next step is to prepare a place for piling the billets; and for this purpose a circular mound is raised, slightly declining from the circumference to the centre, and surrounded by a shallow ditch. The diameter of the pile is proportioned to the quantity of wood which it is to receive: to obtain 100 barrels of tar, it should be 18 ft. or 20 ft. wide. In the middle is a hole, with a conduit

leading to the ditch; in which is formed a receptacle for the tar as it flows out. Upon the surface of the mound, after it has been beaten hard, and coated with clay, the wood is laid round in a circle, like rays. The pile, when finished, may be compared to a cone truncated at two thirds of its height, and reversed; being 20 ft. in diameter below, 25 ft. or 30 ft. above, and 10 ft. or 12 ft. high. It is then strewed over with pine leaves, covered with earth, and held together at the sides with a slight cincture of wood. This covering is necessary, in order that the fire kindled at the top may penetrate downwards towards the bottom, with a slow and gradual combustion; for, if the whole mass were rapidly inflamed, the operation would fail, and the tar would be consumed instead of being distilled: in fine, the same precautions are exacted in this process as are observed in Europe in making charcoal. A kiln, which is to afford 100 or 130 barrels of tar, is eight or nine days in burning. As the tar flows off into the ditch, it is emptied into casks containing 30 gallons each, which are always made of pine wood. Pitch is tar reduced by evaporation: it should not be diminished more than half its bulk to be of good quality. (*Michx.*)

Accidents, Diseases, &c. Forests of the long-leaved pine are particularly liable to be consumed by fire, on account of the abundance of resin which the trees contain, and the great length of their leaves, which easily take fire, and spread it rapidly. Immense swarms of small insects, Michaux observes, insinuate themselves under the bark of this pine, penetrate into the body of the tree, and cause it to perish in the course of a year. This has been noticed also by Dwight, in his *Travels in New England*; and it appears that this insect is not peculiar to the long-leaved pine, for extensive tracts, according both to Michaux and Dwight, are seen, both in the northern and southern states, covered solely with dead pines. In Abbott and Smith's *Insects of Georgia*, i. t. 42., is the figure of a moth which attacks this pine (*Sphinx confertarum*), of which our fig. 2161. is a copy. "The larva was taken feeding on



the long-leaved pine in August, on the 27th of which month it went into the ground. Another buried itself so late as the 10th of November. The moth was produced on April 8. It is not very common; but may be found occasionally, throughout the summer, in Georgia, sitting on the trunks of pines. It feeds also on the cypress, and is found in Virginia. This species is distinct from the European *S. Pinaster*." (*Sm. and Abb.*)

Statistics. In the neighbourhood of London, at Muswell Hill, 10 years planted, it is 8 ft. high. In Devonshire, at Luscombe, 10 years planted, it is 14 ft. high. In Surrey, at Farnham Castle, 35 years planted, it is 20 ft. high; at Oakham Park, 9 years planted, it is 5 ft. high. In Cheshire, at

Eaton Hall, 6 years planted, it is 6 ft. 6 in. high. In France, at Nantes, in the nursery of M. Nerrières, 10 years planted, it is 18 ft. high.

Commercial Statistics. Plants, in the London nurseries, are 5s. each; and at Bollwyller, 5 francs.

§ x. *Canariënsis.*

Sect. Char. Leaves long, slender. Cones shorter than the leaves, more or less tubercled; the tubercles terminating in blunt points, without spines or hooks.

¶ 25. *P. CANARIËNSIS* C. Smith. The Canary Pine.

Identification. C. Smith in Buch Fl. Can., p. 32. and 34.; Dec. Pl. Rar. Jard. Gen., 1. p. 1.; Lamb. Pin., ed. 2., 1. t. 28.; Lawson's Manual, p. 357.; Bon Jard., 1837, p. 976.

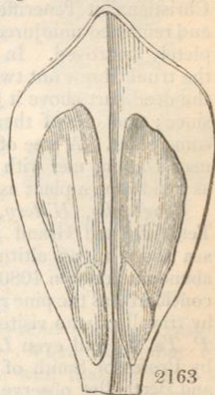
Synonymy. *P. adūca* Bosc, according to Sprengel.

Engravings. Dec. Pl. Rar. Jard. Gen., 1. t. 1, 2.; Lamb. Pin., ed. 2., 1. t. 28.; our fig. 2165., to our usual scale; and figs. 2162. to 2164., of the natural size.

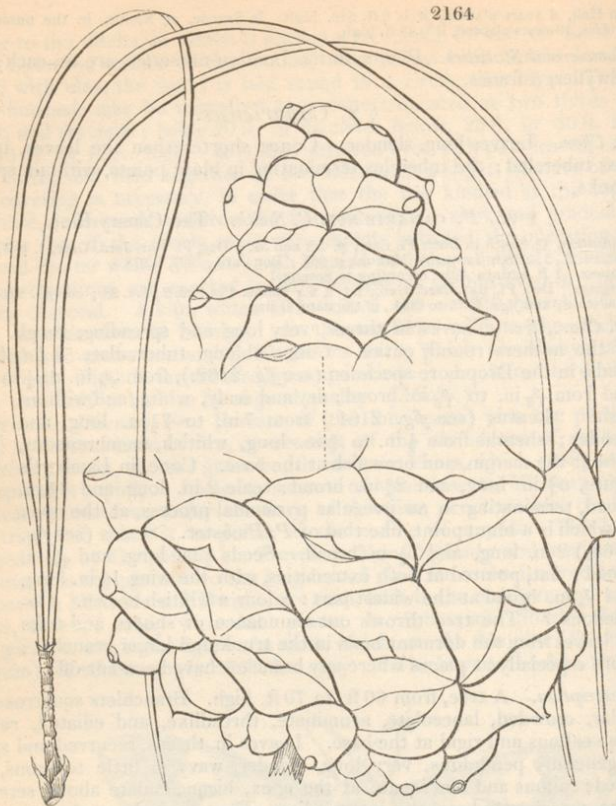
Spec. Char., &c. Leaves in threes, very long and spreading, rough. Crest of the anthers round, entire. Cones oblong, tuberculate. (*Lamb. Pin.*) Buds, in the Dropmore specimen (see fig. 2162.), from $\frac{3}{10}$ in. to $\frac{1}{4}$ in. long, and from $\frac{2}{10}$ in. to $\frac{3}{10}$ in. broad; dry and scaly, white, and without resin. Leaves (see fig. 2164.) from 7 in. to $7\frac{1}{2}$ in. long, and slender; sheaths from $\frac{1}{2}$ in. to $\frac{6}{8}$ in. long, whitish, membranaceous, torn at the margin, and brownish at the base. Cone, in Lambert's figure, $5\frac{3}{4}$ in. long, and $2\frac{3}{4}$ in. broad; scale 2 in. long and $1\frac{1}{8}$ in. broad, terminating in an irregular pyramidal process, at the apex of which is a blunt point, like that of *P. Pināster*. Scales (see fig. 2163.) 2 in. long, and $1\frac{1}{8}$ in. broad. Seeds $\frac{1}{2}$ in. long, and $\frac{3}{16}$ in. broad; flat, pointed at both extremities, with the wing $1\frac{3}{8}$ in. long, and $\frac{7}{16}$ in. broad at the widest part: colour a whitish brown. Cotyledons,? The tree throws out abundance of shoots and tufts of leaves from the dormant buds in the trunk and larger branches; more especially at places where any branches have been cut off.



Description. A tree, from 60 ft. to 70 ft. high. Branchlets squarrose, with stipular, crowded, lanceolate, acuminate, threadlike, and ciliated, revolute scales; callous and rigid at the base. Leaves in threes, recurved and spreading, generally pendulous, very long, slender, wavy, a little tortuous, compressed; callous and mucronate at the apex, bicanaliculate above, serrulated on the margins and on the intermediate elevated angle, scabrous, convex beneath, very smooth, shining, marked with dotted parallel lines; grass green; 7 in. to 1 ft. in length; sheaths cylindrical, loose at the apex, torn, $\frac{1}{2}$ in. long. Male catkins many, clustered, verticillate, cylindrical, obtuse, 1 in. long. Crest of the anthers roundish, membranaceous, entire. Cones ovate-oblong, tubercled, 4 in. to 6 in. long, 2 in. in diameter at the base; scales thick, woody, dilated at the apex, depressed-quadrangular, truncate. Seeds oblong, dark brown; wing membranaceous, striated, obliquely truncated, brownish. (*Lamb.*) This species, *P. longifolia*, and *P. leiophylla* bear a close general resemblance, and are all rather tender; but, when the leaves and buds are examined closely, their specific difference becomes obvious. Lambert states that this species differs from *P. longifolia* chiefly in the much more depressed and straight-pointed tubercles of its cones; those of *P. longifolia* being hooked. The largest specimen of this pine that we know of is at Dropmore, of which fig. 2166. is a portrait, and where, after having been 14 years planted, it was, in 1837, 17 ft. high. It is protected during winter in the same manner as *P. longifolia*, and *P. leiophylla*. "A plant in the Trinity College Botanic Garden, Dublin, raised there about 1815, from seeds collected by the late Dr. Smith of



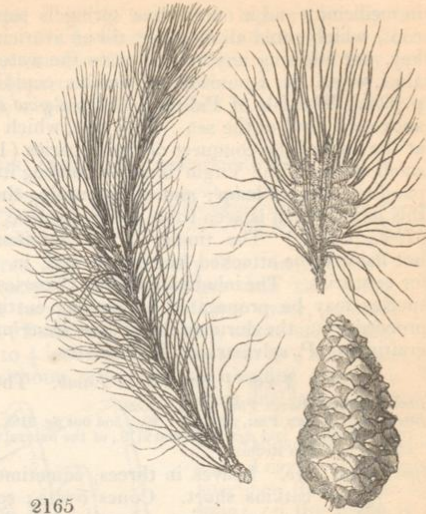
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Christiana, at Teneriffe, attained the height of 15 ft. without any protection, and remained uninjured till the severe spring of 1830, when the top was completely destroyed. In the early part of the summer of that year, however, the trunk threw out two or three shoots, a few inches above the collar, and, the dead part above it being cut off, these shoots have grown vigorously ever since; and one of them, having taken the lead, promises to make a handsome plant. A tree of the same age in Dr. Percival's garden at Annfield, near Dublin, met with a similar fate at the same time; but has now become as handsome a plant as it was before the accident.—*J. T. M. August, 1837.*"

Geography, History, &c. *P. canariensis* is a native of the islands of Teneriffe and Grand Canary; where it forms extensive forests, from the sea shore to an altitude on the mountains of 6700 ft.; though it is most abundant between 4080 ft. and 5900 ft. above the level of the sea, which may be considered as the pine region of these islands. This pine has been long noticed by travellers who visited Teneriffe; but it was confounded with *P. maritima*, *P. Tæ'da*, and even *Larix europæ'a*, till the name of the species was settled by Professor Smith of Christiana. In its general appearance, Messrs. Webb and Berthollet observe, *P. canariensis* resembles the European species; and the first view of a pine forest in the Canaries is very similar to that of a pine forest on the Alps. Under these gigantic trees, the soil is dry and poor; and very few plants grow beneath their shade. The pines grow on the margins of the valleys, and on the steep slopes and rugged precipices which form the sides of the mountains, but not on their summits. (*Hist. Nat. de*

Iles Canaries, Geog. Bot., p. 21.) The forests of pines, in Grand Canary Island, extend from Oratava, near Doma jito, 3198 ft. above the level of the sea, to Portillo de la Villa, at an altitude of nearly 6000 ft. The volcanic nature of the soil, the broken rocks, evidently torn asunder by some tremendous convulsion of nature, the terrific precipices, the yawning chasms, and immense masses of lava, which are found in different directions through this region, convey a most appalling image of desolation; and trees of *P. canariensis*, which appear in some cases merely spreading their roots over the loose rocks, are the only signs of life or vegetation that can be perceived.



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The island is exposed to fearful storms, particularly one from the south-east, called there the wind of Africa, which tears up the pines by the roots. In the *Voyage aux Iles Canaries*, by Father Feuillée, made in 1724, it is stated that the mountain was then entirely covered with pines; and one tree is particularly mentioned, which was called the Pino de la Caravela. This pine, which had been previously seen and described by J. Edens (*Phil. Trans. Soc. Roy. Lond.*, 1714-16), received its name from the extension of its branches, which, at a distance, gave it the appearance of a ship. The same traveller mentions another remarkable tree, Pino de la Merienda, which is still standing, though most of the other pine trees described by these travellers have disappeared. "The Pino de la Caravela no longer exists, but it has bequeathed its name to the rock which served as its base. The Pin du Doma jito has shared the same fate: the storm of 1826 having torn it up by the roots. The trunk of this tree, which was covered with a species of *U'snea*, had acquired an enormous thickness, and was seen from every part of the valley. Viera, in his *Noticias*, mentions another enormous pine which grew in the Canaries, in the district of Teror, at an altitude of about 1600 ft. The trunk of this tree was nearly 30 ft. French (32 ft. 6 in. English) in circumference at the base; closely united to it was the chapel of Neustra Señora del Pino, and one of its arms served as a buttress to support the belfry; but repeated earthquakes in time destroyed this singular chapel and, on April the 3d, 1684, the *pino santo* fell, and crushed the chapel, of which it had so long formed part. Viera adds that the reason of the chapel being placed so near this tree was, that, in 1483, an extraordinary light was perceived to hover round, or rather issue from, the pine. Don Juan de Frios, who was both a bishop and a warrior, alone ventured to ascend the tree, and there found, reposing in a sort of cradle formed by the interlacement of the branches, and lined with the softest and purest moss, an image of the Holy Virgin, in honour of whom the chapel was afterwards built. The fruit of this holy tree is said to have been useful



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in medicine; and a miraculous spring is supposed to have flowed from its root, which cured all diseases, till an avaricious priest put it under lock and key, not allowing any one to taste the water, unless they first gave ample alms, when, as a punishment for his cupidity, the stream dried up. (*Ibid.*, p. 152.) The Isle of Palma has also a *pino santo* which grows about 2727 ft. above the level of the sea. This tree, which is said to have been in existence at the time of the conquest of the Canaries (1483), shows no signs of age. A small statue of the Virgin is placed among its branches, beside which is suspended a kind of lamp; and every evening the woodcutters of the forest light this lamp, which is seen to a great distance glimmering through the trees. (*Ibid.*, p. 154.) The timber of *P. canariensis* is said to be very resinous, not liable to be attacked by insects, and, in favourable situations, to endure for centuries. The inhabitants of the Canaries use the wood for torches. The species may be propagated by making cuttings of the young shoots which proceed from the dormant buds (see *Description* above, and p. 2128.), or by grafting on *P. sylvêstris* or *P. Pinâster*,

‡ 26. *P. SINE'NSIS* Lamb. The Chinese Pine.

Identification. Lamb. Pin., ed. 2. l. t. 29.

Engravings Lamb. Pin., ed. 2., l. t. 29.; and our fig. 2168., to our usual scale, from a specimen of a tree at Redleaf; and figs. 2169. and 2170., of the natural size, the cone and leaves from Lambert, and the bud from Redleaf.

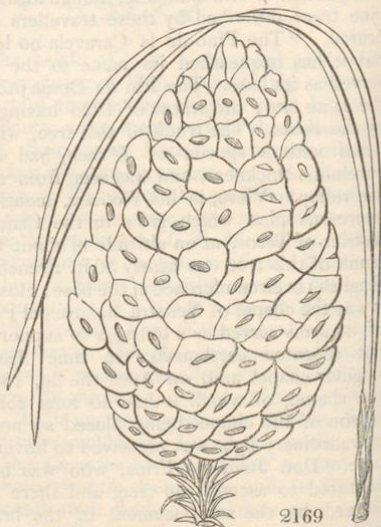
Spec. Char., &c. Leaves in threes, sometimes in twos, very slender. Male catkins short. Cones ovate; scales truncate at the apex, without any point. (*Lamb.*, and obs.) A large tree. Branches tubercled. Leaves squarrose, with stipular scales; twin, or in threes, slender, spreading, semicylindrical, mucronated, serrulated; grass green, 5 in. long; sheaths cylindrical, $\frac{1}{2}$ in. long. Male catkins numerous, somewhat verticillate, $\frac{3}{4}$ in. long. Cones with very short footstalks, ovate, brownish, 2 in. long; scales thick, woody, tetragonal at the apex, flattened, truncate, mutic. (*Lamb.*) Buds, in the Redleaf specimen (see fig. 2167.), from $\frac{1}{8}$ in. to $\frac{5}{16}$ in. in length, and about the same breadth; bluntly pointed, with numerous fine scales, of a brownish colour, and wholly without resin. Leaves from 5 in. to 5 $\frac{1}{2}$ in. in length; three-sided, slender, straight, and about the same colour as those of *P. Pinæa*; sheaths from $\frac{3}{8}$ in. to $\frac{4}{8}$ in.



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long; brownish, slightly membranaceous, and rigid. A native of China. There is a tree at Redleaf, raised by William Wells, Esq., from seeds

received from China in 1829, which is now 16 ft. high, tolerably hardy, and a very handsome plant. Mr. Lambert's figure is taken from a Chinese drawing in the possession of the Horticultural Society, which may be the reason why in his specific character he has described the leaves as two in a sheath: in Mr. Wells's plant, the number in a sheath is for the most part three.

♀ 27. *P. INSIGNIS* Doug. The remarkable Pine.

Identification. Douglas's specimens in the Horticultural Society's herbarium.

Engravings. Our fig. 2172., to our usual scale, and fig. 2171. of the natural size, both from Douglas's specimens in the Horticultural Society's herbarium; and fig. 2170., from the side shoot of a young tree in the Horticultural Society's Garden.

Spec. Char., &c. Leaves three, and occasionally four, in a sheath; much twisted, varying greatly in length, longer than the cones, of a deep grass green, and very numerous. Cones ovate, pointed, with the scales tuberculate. Buds (see fig. 2170.), of the side shoots of young plants, from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long, and from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. broad, brown, and apparently without resin; on the leading shoots a

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great deal larger, and resembling in form, and almost in size, those of *P. Sabini-ana*. Leaves, in Douglas's specimen, from 3 in. to $4\frac{1}{4}$ in. long; on the plant in the



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Horticultural Society's Garden, from 5 in. to 7 in. long. This pine is well named *insignis*; its general appearance being indeed remarkable, and totally differ-

ent from that of every other species that has yet been introduced. The leaves are of a deep grass green, thickly set on the branches, twisted in every direction, and of different lengths. The plant seems of vigorous growth, and as hardy as any of the Californian pines. It was sent home by Douglas in 1833; and the plants in the Horticultural Society's Garden,

and in the Duke of Devonshire's villa at Chiswick, are from 3 ft. to 5 ft. in height. It is needless to say that such a pine ought to be in every collection. Plants, in the London nurseries, are 5*l.* each.

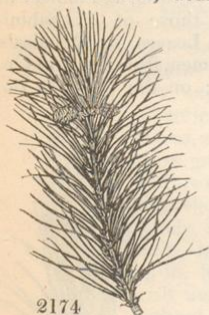
‡ 28. *P. TEOCO' TE* Schiede et Deppe. The Teocote, or twisted-leaved, Pine.

Identification. Schiede et Deppe in Schlecht. *Linnaea*, 5. p. 76.; *Lamb. Pin.*, ed. 2., 1. t. 20.

Engravings. *Lamb. Pin.*, ed. 2., 1. t. 20., from specimens furnished by MM. Schiede and Deppe, the discoverers; and our *figs.* 2173. and 2174., from Lambert's figures, and from a specimen of a living plant at Boyton.

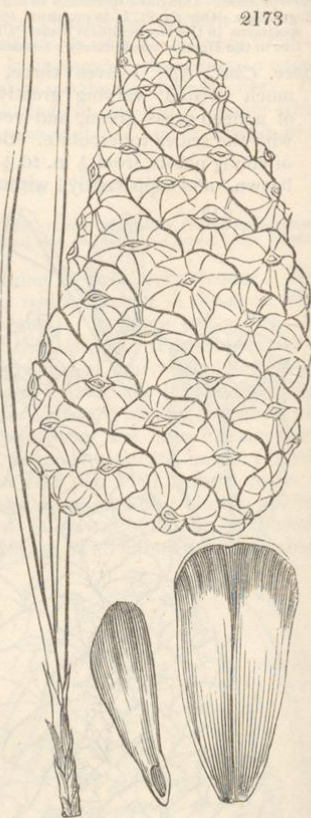
Spec. Char., &c. Leaves in threes, compressed, flexuose, scabrous; sheaths about $\frac{1}{2}$ in. long. Cones ovate, smoothish. (*Lamb. Pin.*) A native of Mount Orizaba, near Vera Cruz, in Mexico. Introduced by A. B. Lambert, Esq., in 1826, or before.

Description. Branchlets very leafy, with a persistent epidermis. Buds imbricated with lanceolate, acuminate, ciliate, and



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torn scales. Leaves in threes, erect, rigid, compressed, acute, tortuous; light green, bicanalicate above, slightly convex beneath, very smooth; the intermediate slightly prominent angle, and the margins, crenulated, scabrous; sheaths cylindrical, about 1 in. in length, persistent, torn on the margin. Cones ovate-oblong, drooping, smoothish, scarcely 3 in. long; scales dilated at the apex, somewhat trapezoidal, much depressed; in the young cones always mutic. (*Lamb.*) This is a very rare species; there being no plants of it either at Dropmore or in the Horticultural Society's Garden. Indeed, so far as we are aware, it exists in no other collection in Britain, than that of Mr. Lambert at Boyton.



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‡ 29. *P. PA'TULA* Schiede et Deppe *MSS.* The spreading-leaved Pine.

Identification. *Lamb. Pin.*, ed. 1., t. 19.

Engravings. *Lamb. Pin.*, ed. 2., 1. t. 19.; and *figs.* 2175. and 2176., from Mr. Lambert's figure.

Spec. Char., &c. Leaves in threes, very slender, 2-channeled, spreading; sheaths about 1 in. long. Cones ovate-oblong, polished. (*Lamb. Pin.*) A native of Mexico, at Malpayo de la Joya, in the cold region, where it was discovered by MM. Schiede and Deppe, and introduced into England by Mr. Lambert.

Description. Branchlets covered with a smooth, ash-lead-coloured, and persistent epidermis. Scales of the bud lanceolate, acuminate, carinate, rigid, thread-like, and ciliate. Leaves in threes, slender, recurved and spreading; soft, light green; deeply bicanalicate above, convex beneath,

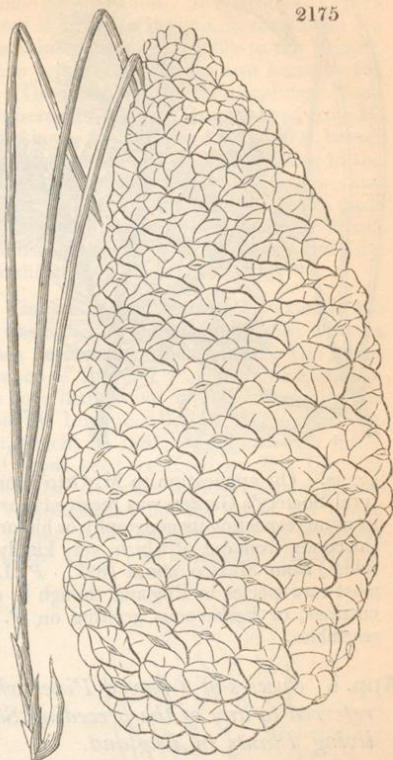
marked with many dotted lines; 6 in. to 9 in. long; the intermediate somewhat prominent angle, and the margins, sharply serrated, scabrous; sheaths cylindrical, 1 in. to 1½ in. long; apex and margin of the scales thread-like and ciliated. Cones ovate-oblong, smooth, about 4 in. long; scales dilated at the apex, much depressed, flattish, somewhat trapezoidal; in the

2175



2176

young cone, mucronulate. (*Lamb.*) Mr. Lambert states that he has figured this species from specimens received from MM. Schiede and Deppe, and that he could add nothing more than that it is abundantly different from every other species of the genus. He has a plant at Boyton, which, in 1837, was 6 ft. high.



§ xi. *Llaveana*.

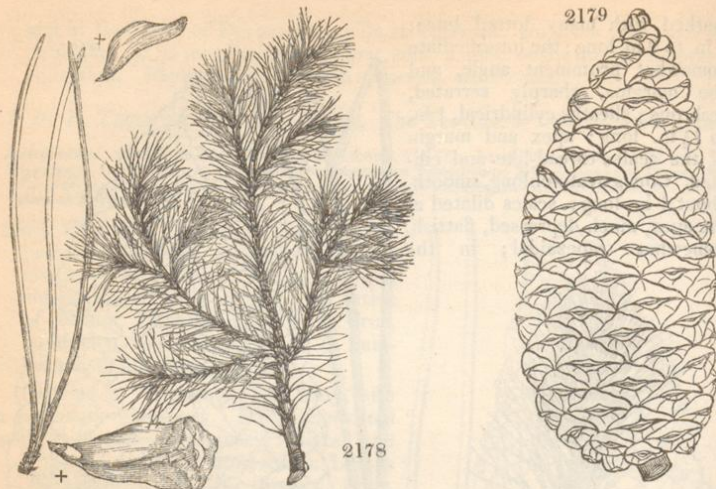
Sect. Char. Sheaths of the leaves caducous. Cones slightly tubercled, without prickles.

‡ 30. *P. LLAVEANA* Otto. La Llave's Pine.

Identification. The name affixed to the plant sent by M. Otto to the Horticultural Society.
Engravings. Our figs. 2180. and 2181., from specimens of the tree in the London Horticultural Society's Garden.

Spec. Char., &c. Leaves short, narrow, triquetrous, slightly twisted, in thickly set tufts on the branches, of a glaucous green. Branches in regular whorls, smooth, of an ash grey, declining towards the stem. Buds exceedingly small, in form, and in every other respect, like those of *P. halepensis*; the buds are scarcely $\frac{1}{8}$ in. long, and from $\frac{1}{10}$ in. to $\frac{1}{2}$ in. broad; roundish, with two or three smaller buds. (See fig. 2177.) Leaves generally in threes, often in twos, and sometimes in fours, varying from $1\frac{3}{4}$ in. to $2\frac{3}{4}$ in. in length; flat on the upper surface, and cylindrical, with a rib below; sheaths short, and caducous. Cones conical, pointed, $2\frac{1}{4}$ in. long, and $1\frac{1}{2}$ in. broad (see fig. 2179); scale $\frac{3}{4}$ in. long, and $\frac{3}{8}$ in. broad; slightly tubercled, and without prickles. Seed,? A very handsome species, a native of 2177 Mexico. The plant in the Horticultural Society's Garden was received from M. Otto of Berlin, about 1830; and, in 1837, was about 4 ft. 6 in. high. It seems quite hardy, and likely to form one of the most elegant species of the





genus. On application to M. Otto (from whom the plant in the Horticultural Society's Garden was received) for further information, he could give us none respecting its geography or history, further than that he had received the cones (from one of which, very kindly sent by him to us, our *fig.* 2179. is taken) from Mexico, about 1827. *P. Llavecana* is, at present, one of the most rare species in England, though it might doubtless be propagated by cuttings, or herbaceous grafting on *P. halepensis*, which it most nearly resembles.

App. i. *Species of 3-leaved Pines which cannot with certainty be referred to any of the preceding Sections, but of which there are living Plants in England.*

‡ 31. *P. CALIFORNIANA* Lois. The Californian Pine.

Identification. Loiseleur Deslongchamps, in the *N. Du Ham.*, 5. p. 243.

Synonyms. *P. montereyensis* Godefroy; *P. adunca* Bosc, as quoted in *Bon Jard.* *P. montheragensis* in the Horticultural Society's Garden; *Pin de Monterey*, *Bon Jard.*, ed. 1837.

Spec. Char., &c. Leaves in twos and threes. Cones much longer than the leaves. (*Lois.*) The following description of this species, written by Professor Thouin, is taken from the *Nouveau Du Hamel*:—"This tree grows in the neighbourhood of Monte-Rey, in California. One of its cones, gathered by Colladon, the gardener belonging to the expedition of La Peyrouse, was sent to the Museum of Natural History in Paris in 1787. The cone was in the form of that of *P. Pinaster*, but one third larger in all its parts. Under each of the scales were found two seeds, of the size of those of *P. Cembra*, and of which the kernel was good to eat. These seeds, sown in the Jardin des Plantes, produced twelve plants; which, cultivated in the orangery, succeeded very well. Most of these plants were afterwards sent to botanic gardens in the south of France. There still remains one specimen in the Jardin des Plantes, which has stood for several years in the open ground; where, without being vigorous, it remains in health." Loiseleur Deslongchamps adds that this specimen, in 1812, was 7 ft. high, with leaves 3 in. long, very slender, and of a deep green. M. Vilmorin informs us that the tree in the nursery of M. Godefroy, from which all the young plants sold by him have

been produced by inarching, is supposed to be the only one still existing, of those raised from the seeds sent home by Colladon. It is protected every winter; while those that were planted in the open ground, in the Jardin des Plantes, are all dead. The species is interesting, especially to the French, as being the only plant that has been preserved, of those sent home by the expedition under La Peyrouse. The plant in the Horticultural Society's Garden, named there *P. montheragensis*, which was received from M. Godefroy about 1829, forms a stunted bush, 3 ft. high, and 4 ft. or 5 ft. broad. It is a grafted plant; and its stunted appearance may be chiefly owing to the scion having swelled to a much greater thickness than the stock, and to the buds having been destroyed by insects for several years past. The buds are small, about $\frac{2}{8}$ in. long, blunt-pointed, about $\frac{3}{16}$ in. broad, brown, and covered with resin. The leaves are chiefly 3 in a sheath, and from 2 in. to 3 in. long, with short black sheaths.

P. Fraseri Lodd. *Cat.*, ed. 1837. There is a tree bearing this name in the Hackney arboretum, which, in 1837, was upwards of 12 ft. high, with 3 leaves in a sheath, and pendulous branches reaching to the ground. The leaves and young shoots have every appearance of those of *P. rigida*; and, though the tree has not yet borne cones, we have little doubt of its belonging to the \S *Tæ'dæ*. The plant was received from the Liverpool Botanic Garden in 1820.

P. timoriensis. A tree at Boyton, which, in 1837, was 16 ft. high, after being 25 years planted, was raised from seed received by Mr. Lambert from Timor, one of the Molucca Islands. It bears a close general resemblance in the foliage and habit to *P. longifolia*; but the leaves (of which there are three in a sheath) are rather more slender, and of a deeper green; they are 8 in. long, and the sheaths about 1 in. in length. Buds $\frac{2}{8}$ in. long, and $\frac{2}{8}$ in. broad, covered with loose whitish scales, without resin, and blunt-pointed. The tree has not yet borne cones, so that nothing with certainty can be determined respecting the group to which it belongs; but, in the mean time, we have, for convenience' sake, given it the name of *P. timoriensis*.

App. ii. *Pines supposed to have 3 Leaves, but of which the Cones only have been seen in Britain. The Cones are hooked or tubercled.*

† 32. *P. MURICA'TA* D. Don. The smaller prickly-coned Pine.

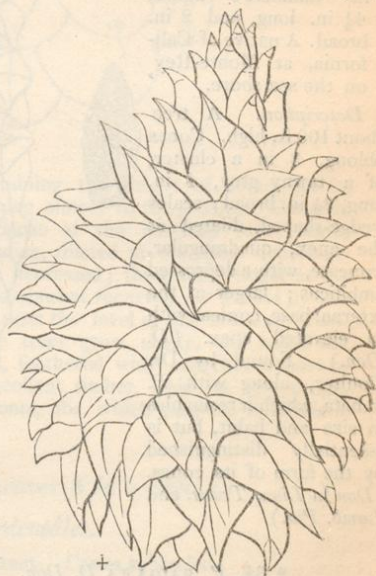
Identification. *Lin. Trans.*, 17. p. 441.; *Lamb. Pin.*, 3. t. 84.

Synonyme. Obispo, *Span.*

Engravings. *Lamb. Pin.*, 3. t. 84.; and our fig. 2180.

Spec. Char., &c. ? Leaves in threes.

Cones ovate, with unequal sides, crowded; scales wedge-shaped, flattened at the apex, mucronate; those at the external base elongated, compressed, recurved, and spreading. (*D. Don.*) Cones, in Lambert's figure, 2 in. long, and 3 in. broad.



Description. A straight middle-sized tree, about 40 ft. high. Cones in clusters (2 or 3), unequally-sided, ovate, about 3 in. long; scales wedge-shaped, very thick; dilated at the apex, obsoletely 4-angled, mucronated with an elevated umbilicus; elongated at the external base, compressed on both sides, callous, rigid, smooth, shining, recurved, and spreading. (*D. Don.*) A native of California, at San Luis, where it is called Obispo (the bishop), growing at the height of 3000 ft. above the level of the sea. Professor Don informs us that the cones grow 2 or 3 together; and adds, that he had not seen the leaves of this, or of *P. tuberculata* and *P. radiata*, but that he thinks it is probable that, like the greater part of the American pines, they grow in threes." (*Lin. Trans.* and *Lamb. Pin.*)

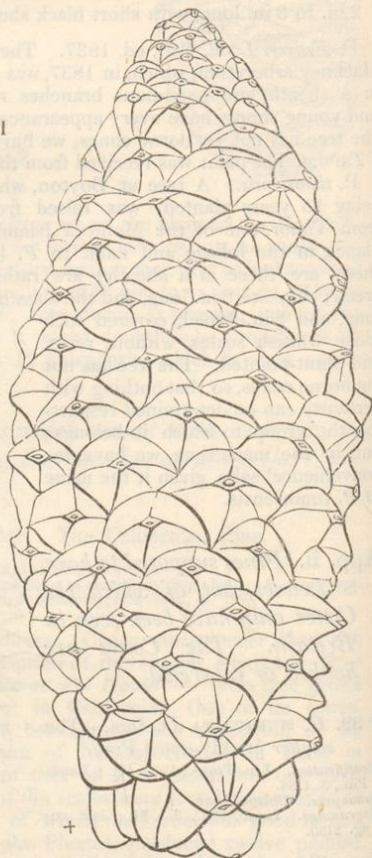
† 33. *P. TUBERCULATA* *D. Don.* The tuberculated Pine.

Identification. *Lin. Trans.*, 17. p. 442.; *Lam. Pin.*, 3.
Engravings. *Lamb. Pin.*, 3. t. 85.; and our fig. 2181.

Spec. Char., &c. ? Leaves in threes. Cones oblong, with unequal sides, crowded. Scales quadrangular, and truncate at the apex, with a depressed umbilicus; those at the exterior base larger, elevated, and conical. (*D. Don.*) Cones, in Lambert's figure, $4\frac{1}{2}$ in. long, and 2 in. broad. A native of California, at Monte-Rey, on the sea shore.

Description. A tree about 100 ft. high. Cones oblong, 3 in a cluster, of a tawny grey, 4 in. long, $2\frac{1}{2}$ in. broad; scales wedge-shaped, dilated at the apex, quadrangular, truncate, with a depressed umbilicus; larger at the external base, conical with an elevated apex. (*D. Don.*) Found by Dr. Coulter, along with *P. radiata*, which it resembles in size and habit, but is essentially distinguished by the form of its cones. (*Don* in *Linn. Trans.* and *Lamb. Pin.*)

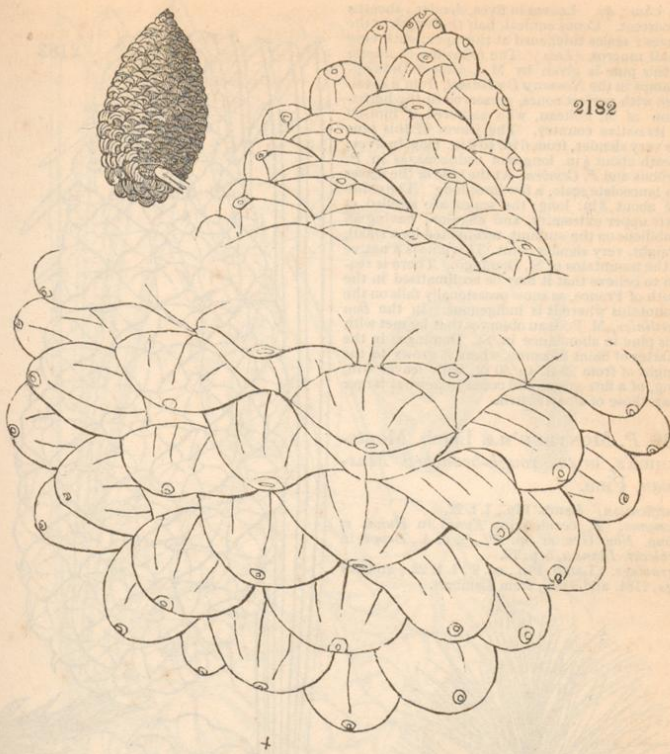
2181



† 34. *P. RADIIATA* *D. Don.* The radiated-scaled Pine.

Identification. *Lin. Trans.*, 17. p. 442.; *Lamb. Pin.*, 3.
Engravings. *Lamb. Pin.*, 3. t. 86.; and our fig. 2182.

Spec. Char., &c. ? Leaves in threes. Cones ovate, with unequal sides. Scales radiately cleft, truncate, with a depressed umbilicus; gibbous, somewhat recurved, and three times as large at their external base. (*D. Don.*) Cones, in Lambert's figure, $5\frac{3}{4}$ in. long, and $3\frac{1}{2}$ in. broad.



Description, &c. An erect tree, attaining the height of about 100 ft., with copious spreading branches, reaching almost to the ground. Cones in clusters, ovate, about 6 in. long, ventricose at the external base; scales wedge-shaped, thick, bright brown, shining, dilated at the apex, depressed, quadrangular, radiately-cleft; umbilicus depressed; three times larger at the external base; apex elevated, gibbous, somewhat recurved. "Found by Dr. Coulter about Monte-Rey, in lat. 36° , near the level of the sea, and growing almost close to the beech. The trees grow singly, and reach the height of 100 ft., with a straight trunk, feathered with branches almost to the ground. This species affords excellent timber, which is very tough, and admirably adapted for building boats, for which purpose it is much used."

Sect. iii. *Quinæ*. — *Leaves 5 in a Sheath.*

§ xii. *Occidentales*.

Sect. Char. Leaves long; sheaths persistent. Cones tubercled.

† 35. *P. OCCIDENTALIS* Swartz. The West-Indian Pine.

Identification. Swartz Prod., 103.; Fl. Ind. Occid., 2. 1230.; N. Du Ham., 5. p. 250.; Lamb. Pin., ed. 2., 1. t. 23.; Mart. Mill., No. 10.; Bon Jard., 1837, p. 977.

Synonymes. *P. foliis quinis*, &c., Plum. Cat., 17., Plant. Amer., 154., Willd. Sp. Pl., 4. p. 501., Poir. Dict. Encyc., 5. p. 342.; *Larix americana* Tourn. Inst., 586.

Engravings. Lamb. Pin., ed. 2., 1. t. 23.; N. Du Ham., 5. t. 72. f. 2.; Plum. Plant. Amer., t. 161.; and our fig. 2183., from the Nouveau Du Hamel.

Spec. Char., &c. Leaves in fives, slender; sheaths persistent. Cones conical, half the length of the leaves; scales thickened at the apex, with very small mucros. (*Lois.*) The following character of this pine is given by M. Loiseleur Deslongchamps in the *Nouveau Du Hamel*, from a specimen with perfect cones, preserved in the herbarium of M. Poiteau, who gathered it himself in its native country. The leaves of this pine are very slender, from 6 in. to 8 in. long, in fives; sheath about $\frac{1}{2}$ in. long, not caducous, as in *P. Ströbus* and *P. Cembra*. At the base of the leaves is a lanceolate scale, a few lines long. The cones are about 3 in. long; the scales are swelled at their upper extremity, and angular; having an umbilicus on the summit, terminated by a small, straight, very slender point. This pine is a native of the mountains of St. Domingo. There is reason to believe that it may be acclimatised in the south of France, as snow occasionally falls on the mountains where it is indigenous. In the *Bon Jardinier*, M. Poiteau observes that he met with this pine in abundance in St. Domingo, in the quarter of Saint Suzanne, where it grows to the height of from 25 ft. to 30 ft., with leaves 6 in. long, of a fine green, and cones somewhat larger than those of *P. sylvestris*.

† 36. *P. MONTEZUMÆ* Lamb. Montezuma's, or the rough-branched Mexican, Pine.

Identification. Lamb. Pin., 1. t. 22.

Synonymy. *P. occidentalis* Kunth in *Humb. et Bonp. Nov. Gen. et Sp. Pl.*, 2. p. 4., Deppé in *Schlecht. Linnæa*, 5. p. 76.

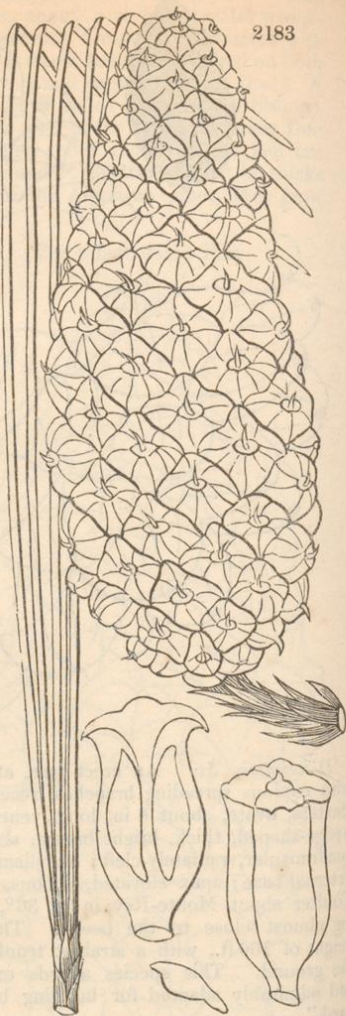
Engravings. Lamb. Pin., ed. 2., 1. t. 22; and our figs. 2184. and 2185., from Lambert.



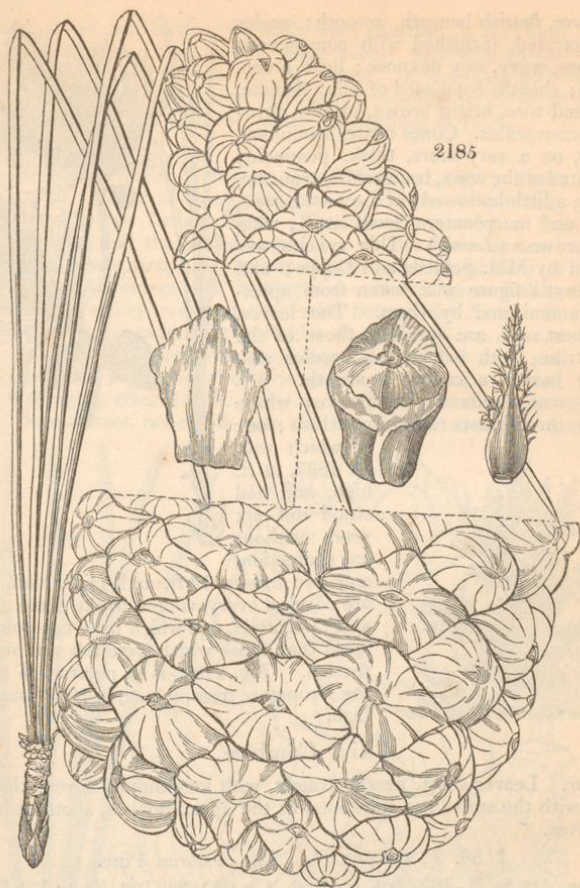
2184

Spec. Char., &c. Leaves in fives, erect, triquetrous; sheaths about 1 in. long, persistent. Cones oblong, about 9 in. long, tuberculate. (*Lamb. Pin.*) A native of Orizaba, and other mountains of Mexico.

Description. A tall tree. Branchlets covered with a thick scabrous bark. Leaves generally in fives, rarely in threes or fours, stipular, persistent, lanceolate, much pointed, with ciliated and torn scales; erect, waved, somewhat rigid, triquetrous, callous and mucronate, glaucous green, marked with many parallel dotted lines; slightly bicanaliculate above, flattish beneath, 6 in. long; angles crenulated, scabrous; sheaths 1 in. to 1½ in. long, persistent; scales amentaceous, ciliate and torn on the margin, bright brown. Male catkins cylindrical, 1 in. long, with many imbricated, oval, ciliated scales at the base. Appendage to the anthers roundish, convex, coriaceous, membranaceous on the margin, torn, and crenulated. Cones oblong, tubercled, bright brown, thicker at the base, a little attenuated towards the apex, about 6 in. long; scales elevated at the apex, bluntly tetragonal, truncate, very thick. (*Lamb.*) Mr. Lambert says: "Baron Humboldt has referred this species to *P. occidentalis* Swartz; but I have ventured to separate it, as the size of the cones, which may, in general, be relied on, as indicating a specific distinction in this genus, differs so much." Those described by Swartz are only 3 in. long, whereas those of *P. Montezumæ* are more than double that length.



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§ xiii. *Leiophyllæ.*

Sect. Char. Leaves long, slender, soft, with caducous sheaths; cones tubercled.

‡ 37. *P. LEIOPHYLLA* Schiede et Deppe MSS. The smooth-leaved Pine.

Identification. Lamb. Pin., ed. 2., 1. t. 21.

Engravings. Lamb. Pin., ed. 2., 1. t. 21.; and our fig. 2186., from Lambert's figure.

Spec. Char., &c. Leaves in fives, very slender; sheaths deciduous. Cones ovate, stalked. Scales depressed, truncate. (*Lamb. Pin.*) Bud closely resembling that of *P. canariensis*. (*fig. 2162.* in p. 2261.) Leaves, in the Dropmore and Boyton specimens, from 5 in. to 6 in. in length, very slender, and pendent, closely set on the branches, and forming large tufts at the extremities of the shoots. The stem and old wood readily emit leaves and shoots from adventitious buds. A native of Mexico, between Cruzblanca and Jalacinga, in the cold region.

Description. Branchlets covered with a deciduous epidermis. Buds imbricated with lanceolate, acuminate, brown scales, scarios, white, and torn on the margin. Leaves in fives, very slender, triquetrous, mucronate; bicanali-

culate above, flattish beneath, smooth; angles slightly serrated, furnished with conspicuous dotted lines, wavy, not flexuose; light green, 4 in. long; sheaths composed of many ligulate, ciliated, and torn, bright brown, loosely obvolute, caducous scales. Cones ovate, pendulous, 2 in. long, on a very short, thick, peduncle; scales dilated at the apex, trapezoidal, truncate, depressed, a little hollowed; in the young cone, elongated and mucronate. Seeds small; wing oblong, brown. (*Lamb.*) This species was discovered by MM. Schiede and Deppe; and Mr. Lambert's figure was taken from specimens communicated by them. The leaves, Mr. Lambert says, are precisely those of the *Stròbus* tribe, with which this species also agrees in having a caducous sheath. Mr. Lambert sent seeds to Dropmore; where there are three plants raised from them; one



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of which was, in 1837, 6 ft. high, and had stood out six years without any protection; and two others, 12 ft. and 14 ft. high, which are covered every winter in the same manner as *P. longifòlia*, and which have been more injured than those which were left without protection. *Fig.* 2187. is a portrait of one of the Dropmore trees, which, in 1837, was 14 ft. high.



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§ xiv. Cembrae.

Sect. Char. Leaves short, nearly straight, with longitudinal silvery channels. Cone, with the scales not thickened at the apex, globose, about as long as the leaves.

† 38. *P. CEMBRA* L. The Cembran Pine.

Identification. Lin. Sp. Pl., 1419., Syst., ed. Reich., 4. p. 173.; Mill. Dict., No. 6.; Pall. Fl. Ross., 1. p. 3.; Vill. Dauph., 3. p. 806.; Ait. Hort. Kew., 3. p. 369.; Willd. Berol. Baumz., p. 212.; Lamb. Pin., ed. 3., 1. t. 30, 31.; N. Du Ham., 5. p. 248.; Hayne Dend., p. 174.; Höss Anleit., p. 11.; Lawson's Manual, p. 358.; Bon Jard., 1837, p. 977.; Lodd. Cat., ed. 1836.

Synonymes. *P. foliis quinis*, &c., *Gmel. Sib.*, 1. p. 179.; *Du Ham. Arb.*, 2. p. 127., *Halb. Helv.*, No. 1659., *Du Roi Harbk.*, ed. Pott., 4. p. 29.; *P. sativa Annm. Ruth.*, p. 178.; *P. sylvestris*, &c., *Bauh. Pin.*, 491.; *P. sylvestris Cembro* Cam. Epit., p. 42.; *Larix sempervirens*, &c., *Breyn. in Act. Nat. Cur. Cent.*, 7, 8.; *Pinaster Aleo*, &c., *Bell. Conifer.*, p. 20. b. 21.; *Ta'da Arbor, Cembro Italorum, Dale Hist.*, 1. p. 47.; *Aphernousli Pine*, five-leaved Pine, the Siberian Stone Pine, the Swiss Stone Pine; *Aroles*, in Savoy; *Alvies*, in Switzerland; *Cembra*, in Dauphiné; *Ceinbrot*, *Enouve*, *Tinier*, *Fr.*; *Zürbelkiefer*, *Ger. Kedr*, *Russ.* (see *Pall. Fl. Ross.*)

Engravings. Pall. Ross., 1. t. 2.; *Gmel. Sib.*, 1. t. 39.; *Du Ham. Arb.*, 2. t. 32.; *Breyn. Obs.*, 2. t. 1. f. 3, 4, 5.; *Lamb. Pin.*, ed. 2., 1. t. 30, 31.; *N. Du Ham.*, 5. t. 77. f. 1.; our *fig.* 2191., to our usual scale; *figs.* 2188. to 2190., of the natural size; all from Dropmore specimens; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves in fives; sheaths deciduous. Cones ovate, erect, about as long as the leaves, and having, when young, the scales pubescent; the wings of the seed obliterated; anthers having a kidney-shaped crest. (*Lois.*) Buds, in the Dropmore specimens, from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. broad; globose, with a long narrow point; white, and without resin; not surrounded by smaller buds (see *fig.* 2188.) Cones about 3 in. long, and $2\frac{1}{4}$ in. broad. Scales 1 in. long, and about the same width in the widest part. Seed larger than that of any other species of *Pinus*, except *P. Pinea*, $\frac{1}{2}$ in. long, and $\frac{5}{16}$ in. broad in the widest part, somewhat triangular, and wedge-shaped;



2188

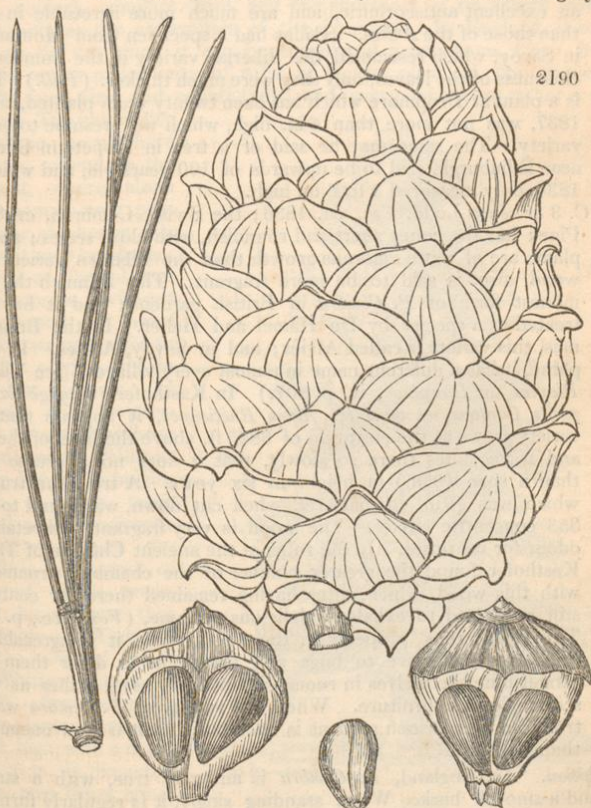
without wings, and having, probably from abortion, a very hard shell, containing an eatable, oily, white kernel, agreeable to the taste. Cotyledons 11 to 13 (see fig. 2189.). A native of Switzerland and Siberia; flowering in May, and ripening its cones in the November of the following year. Introduced in 1746.

Varieties.

‡ *P. C. 1 sibirica*; *P. Cembra* Lodd. Cat., ed. 1837; *Kedr*, *Pall.*; Cedar of some authors; the Siberian Stone Pine, or Siberian Cedar, *Hort.*—The cones are said to be longer, and the scales larger, than in the Swiss variety; the leaves are, also, rather shorter; and the plant is of much slower growth in England. According to Pallas, this is a lofty tree, and not found beyond the Lena. In general appearance, it resembles *P. sylvestris*, but is more tufted, from the branches being thinner, and from the number and length of the persistent leaves. Trunk straight, often 120 ft. high, and 3 ft. in diameter near the base; in old trees, naked till near the top. Bark smoother, greyer, and



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more resinous than in *P. sylvestris*. Branches commonly disposed 3 or 4 in a whorl, sometimes scattered, more slender and spreading than in the Scotch pine; covered with a greyish ash-coloured furrowed bark, marked by the cicatrices of the fallen leaves. Leaves

in fives, rarely in fours or threes; at first sheathed, afterwards naked, very long, sharply triquetrous; the 2 angles rough, canaliculate, sharp at the point. The wood of the cembra is light, soft, white, resinous, loose in the fibres, not tough. The resin, which may be collected in quantities, is somewhat of the odour of citron, and is pellucid, yellowish, and hard. (*Pall.*)

- † *P. C. 2 pygmæ'a*; *P. C. pumila* *Pall. Ross.*; *Slanez, Russ.*—According to Pallas, the trunk of this variety does not exceed 2 in. in thickness, and it is rarely above 6 ft. in height; the branches being not more than 1 in. in diameter. Some specimens are much lower in height, prostrate, and shrubby. The branches of this variety are more slender, the bark rougher and yellow, and the leaves more crowded, and shorter, than those of the species. The cones are scarcely larger than those of *P. sylvestris*; and the scales and seeds less than those of *P. C. sibirica*. In the east of Siberia, this variety is found covering rocky mountains, which are so barren, that herbage of no kind will grow on them; and also in valleys, where, however, it never attains the size of a tree. Those found on the mountains are much more resinous and balsamic. The young shoots are reckoned an excellent antiscorbutic, and are much more agreeable in taste than those of the *Abies*. Pallas had a specimen from Montanvert, in Savoy, which resembled the Siberian variety in the number and closeness of the leaves, only they were much thicker. (*Pall.*) There is a plant at Dropmore which has been twenty years planted, and, in 1837, was not more than 6 in. high, which we presume to be this variety. The same may be said of a tree in Hopetoun Gardens, near Edinburgh, said to be upwards of 100 years old, and which, in 1836, only measured 5 ft. 6 in. high.

- ‡ *P. C. 3 helvética* *Lodd. Cat., ed. 1836*; the Swiss, Cembran, or Stone Pine; has the cones short and roundish, with close scales; and the plants are of more vigorous growth than the Siberian variety; the wood, also, is said to be more fragrant. This is much the commonest form of *P. Cembra* in British gardens; and it has been treated as a species by Du Hamel and Haller. In the Briançonnais, this variety is called *Alviès*; and in Savoy, Aroles. In Dauphiné, it has a different name in almost every village. (See *Villars's Plantes du Dauphiné*, iv. p. 807.) In *Kasthofer's Voyage dans les petits Cantons, et dans les Alpes Rhétiennes*, it appears that this variety grows at the elevation of 6825 ft. above the level of the sea; and it vegetates there so slowly, that it does not increase more than a span (9 in.) in height in six years. A tree, the trunk of which was 19 in. in diameter, when cut down, was found to have 353 concentric circles. The wood is very fragrant, and retains its odour for centuries. In the ruins of the ancient Château of Tarasp, *Kasthofer* found the greater number of the chambers ornamented with this wood, which, after having remained there for centuries, still continued to exhale its delicious perfume. (*Voy., &c.*, p. 196.) This odoriferous property in the wood, while it is agreeable to man, is so offensive to bugs and moths, as to deter them from establishing themselves in rooms where it is used, either as wainscoting, or as furniture. When this variety of *P. Cembra* was introduced into British gardens is uncertain, but it is now common in the nurseries.

Description. In England, *P. Cembra* is an erect tree, with a straight trunk, and a smooth bark. When standing singly, it is regularly furnished to the summit with whorls of branches, which are more persistent than the branches of most other species of *Abietinæ*. The leaves are from 3 to 5 in a sheath, three-ribbed; the ribs serrated, one of them green and shining, and the other two white and opaque. In most species of pine,

it has been observed that the leaves incline more towards the shoots which produce them during winter than in summer, as if to prevent the snow from lodging on them; and this is said to be much more conspicuously the case with the leaves of *P. Cembra* than with those of any other species. The male catkins are red, and appear at the base of the young shoots. According to Lambert, the flowers have a more beautiful appearance than in any other species of pine, being of a bright purple; and the unripe full-grown cones, he says, have a bloom upon them like that of a ripe Orleans plum. The tree is of remarkably slow growth in every stage of its progress, more especially when young; seldom advancing more, even in rich soils, than 1 ft. in a year (though, in the neighbourhood of Edinburgh, as will be hereafter noticed, it grows much faster); but it grows quicker when it becomes older. It is readily known from all the other species of pines by its narrow, conical, compact form, and the shortness of its silvery leaves, which form tufts at the extremities of the branches.



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In England, it is a formal, and we do not think it can be considered a handsome, tree: it presents to the eye a multiplicity of tufts of leaves, piled up one above another, of the same size, and equidistant; and every where of rather a dull green colour. The uniformity of shape is nowhere broken, except at the summit, where alone the cones are produced; and hence, as a mass, it may be characterised as formal and monotonous, without being grand.

In proof of this, we may refer to a plate of this tree in our last Volume. In Siberia and Switzerland, trees such as those mentioned by Pallas as being 120 ft. in height, have a much more grand and picturesque appearance; and *fig.* 2192. is a portrait of one of these trees. The largest tree that we know of in England is the original plant at Whitton, which, in 1837, after being 91 years planted, was only 50 ft. high, with a trunk 1 ft. 6 in. in diameter. This tree bears cones and ripens seeds every



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year; and, though it appears to have suffered from the soil round it having been raised above a foot in height, yet it still continues to grow with vigour,

retaining its branches from the ground upwards. The tree at Dropmore is nearly as high, though not planted above forty years.

Geography, History, &c. *P. Cembra* is indigenous to the alps of Siberia, to Tartary, Switzerland, Italy, and to Dauphiné and other parts of France. According to Kasthofer, it is found to a greater height on the Swiss mountains, than any other species of pine or fir. (*Voy., &c.*, p. 150.) Villars found it, in Dauphiné, on high mountains, growing with different varieties of *P. sylvestris*, but rare. According to Höss, it grows on the alps of Hungary and Austria; and, according to Pallas, as we have seen above, it has a very extensive geographical range in Siberia. It was introduced into England by Archibald Duke of Argyll, in 1746; but whether from Siberia or Switzerland is uncertain, though, in all probability, from the former country; as the cones of the original tree, still existing at Whitton, answer better to the description of those of *P. C. helvética* than to those of *P. C. sibrica*. The Swiss variety was strongly recommended by the Rev. J. Harte, in his *Essays on Husbandry*, published in 1746; and it is not improbable that it was he who communicated the seeds to the Duke of Argyll, though we have no positive evidence on the subject. Mr. Lambert states that a great many seeds were brought from Switzerland about the end of the last century; and that more than 2000 plants, raised from part of them, were planted at Walcot Hall, the residence of Lord Clive, in Shropshire. These plantations are still in a healthy state, many of the trees having attained the height of 40 ft. or 50 ft., and producing cones. Several trees were also planted, at the same time, at Gledhow, near Leeds, where some of them still exist, and whence arose the name of Gledhow pine, which is often applied to this tree. In 1828, Mr. Lawson of Edinburgh imported a quantity of seeds of *P. Cembra* from Switzerland; and dispersed them throughout Scotland for experiment; raising, also, a great many plants in his own nursery. (*Quart. Journ. of Agric.*, i. p. 813.) In 1836, the plants sown in 1828 had, in several places in the neighbourhood of Edinburgh, attained the height of from 8 ft. to 12 ft. From this, Mr. Lawson very properly concludes that, though some varieties of *P. Cembra* grow remarkably slowly, yet *P. C. helvética*, after three or four years' growth, will make annual shoots from 1 ft. to 18 in., or even 2 ft., annually in length. There can therefore be no doubt, he says, but that this variety, from the high altitude at which it naturally grows, is well adapted to clothe the tops of many hitherto almost barren mountains in Scotland, not only with fresh and luxuriant vegetation, but with valuable timber. (*Man.*, p. 359.) The finest trees in the neighbourhood of London are at Whitton, Kew, Dropmore, and Mill Hill, at all which places they bear cones. The Gledhow pines were examined for us, in October, 1837, by Mr. Murray, nurseryman, Leeds. He found in the plantations at Gledhow several trees, most of which were of small dimensions, and going fast to decay; particularly those in exposed situations. The largest and best tree which he found was 35 ft. high, with a trunk 3 ft. 2 in. in circumference, at 3 ft. from the ground, after being planted from 45 to 50 years. It stands on a lawn sheltered from the north, east, and west, and exposed to the south. The tree is now abundant in the nurseries, and, being remarkably hardy, is likely to be soon generally distributed; but, owing to its very slow growth, it will be liable to be choked by the trees among which it is planted, unless greater attention be paid to thinning and pruning than is generally the case in ornamental plantations.

Properties and Uses. The wood of *P. Cembra* is very soft; and its grain is so fine, that it is scarcely perceptible. According to the *Nouveau Du Hamel*, it is very resinous, which is the cause of its agreeable fragrance. It is not commonly large enough to be used in carpentry; but in joinery it is of great value, as it is remarkably easy to be worked, and is of great durability. In Switzerland, it is very much used by turners; and the shepherds of the Swiss Cantons, and of the Tyrol, occupy their leisure hours

in carving out of it numerous curious little figures of men and animals, which they sell in the towns, and which have found their way all over Europe. The wood is much used for wainscoting; having not only an agreeable light brown appearance, but retaining its odour, according to Kasthofer, for centuries. The kernel of the seed, in Dauphiné, Villars informs us, is eagerly sought after by a species of crow (*Córvus Caryocatáctes L.*), which shows an almost incredible degree of skill in breaking the hardest shells. In Switzerland, the seeds are used in some places as food, and in others as an article of luxury; and the shell being very hard, and requiring some time and skill to separate it from the kernel, the doing so forms an amusement for young persons in the long winter evenings; who, Kasthofer observes, show a degree of skill in it that might vie with that of the squirrel. In some places in the Tyrol, the seeds are bruised, and an oil obtained from them by expression. So abundant is this oil in comparison with that produced by other seeds, that, while a pound of flax seed yields only $2\frac{1}{2}$ oz., 1 lb. of cembra seed yields 5 oz. Cembra oil is used both as food, and for burning in lamps; but, as the breaking of the seeds requires a long time, it is generally dearer than most other oils: it has a very agreeable flavour when newly made, but very soon becomes rancid. The shells of the kernels, steeped in any kind of spirits, yield a fine red colour. In Siberia, the seeds of the cembra are sometimes produced in immense quantities; but in other seasons there is scarcely any crop. In abundant years, they form, according to Gmelin, almost the sole winter food of the peasantry. The seeds, both in Siberia and Switzerland, are employed medicinally; and Gmelin relates a story of two captains of vessels, who were suffering dreadfully from the scurvy, and whose crews had almost all died of the same disease, being cured in a few days by eating abundantly of these seeds. In Britain, *P. Cembra* can only be considered as an ornamental tree; and, though we hold it to be scarcely possible for a pine to be otherwise than ornamental (if it were for no other reason than its being an evergreen), yet we cannot help, as we have already observed, considering the Cembran pine, when compared with other species, as rather monotonous, both in form and colour. The summit of the tree, however, and its purple cones, we acknowledge to be truly beautiful. That we may not run the slightest risk of injuring this tree, we may mention that Mr. Lambert, so far from entertaining the same opinions as we do respecting it, looks upon it as "one of the handsomest trees of the whole genus." (*Pin.*, ed. 2., i. p. 49.)

Soil, Situation, &c. Though the Cembran pine, as we have seen, will grow in the poorest soils, and in the most elevated and exposed situations, where no other pine or fir will exist, yet it will not grow rapidly, except in a free soil, somewhat deep, and with a dry subsoil. This is rendered evident from the trees at Dropmore, which, though they cannot have been planted above half the time of the trees at Whitton and at Kew, are above 40 ft. high, with trunks from 1 ft. to 14 in. in diameter. The tree at Whitton is on very moist soil, and that at Kew on very dry poor soil. The soil at Dropmore is also dry, but it is not so much exhausted by the roots of other trees as the soil in the arboretum at Kew. All the varieties are propagated from imported seeds, which may be sown in the same autumn in which they are received; or, perhaps, kept in a rot heap for a year, as they lie two winters and one summer in the ground before germinating. The plants grow exceedingly slowly for 4 or 5 years, seldom attaining in that period a greater height than from 1 ft. to 2 ft. When they are to be removed to any distance, they are best kept in pots; but, the roots being small and numerous, large plants of *P. Cembra* transplant better (when they are not to be carried to too great a distance) than most other species of *Pinus*.

Statistics. Pinus Cembra in England. At Syon, it is 30 ft. high; in the Mile End Nursery, it is 14 ft. high; at Walton on Thames, it is 35 ft. high. In Surrey, at Farnham Castle, 35 years planted,

it is 20 ft. high; at Claremont, it is 34 ft. high, the diameter of the trunk 1 ft. 8 in., and of the head 27 ft. In Bedfordshire, at Woburn Abbey, 25 years planted, it is 22 ft. high. In Berkshire, at Ditton Park, 35 years planted, it is 30 ft. high. In Buckinghamshire, at Temple House, 40 years planted, it is 20 ft. high. In Cheshire, at Eaton Hall, 8 years planted, it is 6 ft. high. In Hertfordshire, at Cashiobury, 30 years planted, it is 20 ft. high; at Cheshunt, 10 years planted, it is 14 ft. high. In Oxfordshire, in the Oxford Botanic Garden, 30 years planted, it is 18 ft. high. In Staffordshire, at Trentham, 26 years planted, it is 23 ft. high. In Worcestershire, at Croome, 30 years planted, it is 45 ft. high. In Yorkshire, at Gledhow, 35 ft. high.

Pinus Cembra in Scotland. In Berwickshire, at the Hirsell, 5 years planted, it is 3 ft. 6 in. high. In Fifeshire, at Balcarras, it is 30 ft. high, and ripened seed in 1833, from which young plants have been raised.

Pinus Cembra in Ireland. At Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 16 ft. high; at Terenure, 15 years planted, it is 9 ft. high. In Antrim, at Cranmore, it is 24 ft. high. In Louth, at Oriel Temple, 30 years planted, it is 34 ft. high.

Pinus Cembra in Foreign Countries. In France, near Paris, at Sceaux, 10 years planted, it is 18 ft. high. In Hanover, at Schwöbber, it is 50 ft. high; in the Göttingen Botanic Garden, 10 years planted, it is 10 ft. high. In Saxony, at Wörlitz, 50 years planted, it is 50 ft. high. In Cassel, at Wilhelmshoe, 60 years old, it has a trunk 1 ft. 6 in. in diameter. In Prussia, at Berlin, at Sans Souci, 30 years planted, it is 20 ft. high.

Commercial Statistics. Plants, in the London nurseries, are 2s. 6d. each; at Bollwyller, 2 francs each; and at New York, 2 dollars.

§ xv. *Strobi.*

Sect. Char. Leaves rather longer than in *Cembra*. Cones with the scales not thickened at the apex, pendulous, and much longer than the leaves.

‡ 39. *P. STROBUS* L. The Strobis, or Weymouth, Pine.

Identification. Lin. Sp. Pl., 1419, Syst., ed. Reich., 4. p. 174; Mill. Dict., No. 13; Hunt. Evel. Syl., p. 263; Wang. Beyt., 1. t. 1.; Ait. Hort. Kew., 3. p. 369; Du Roi Harbk., ed. Pott., 2. p. 78; Marsh. Arb. Amer., p. 101; Poir. Dict., 5. p. 341; Lamb. Pin., ed. 2, 1. t. 32; N. Du Ham., 5. p. 249; Pursh Fl. Amer. Sept., 2. p. 644; Hayne Dend., p. 176; Lawson's Manual, p. 360; Bon Jard., p. 977; Lodd. Cat., ed. 1836.

Synonymes. *P. foliis quinis*, &c. *Gron. Virg.*, 2. p. 152; *P. canadensis quinquefolia* Du Ham. Arb., 2. p. 127; *P. virginiana Pluk. Alm.*, p. 297; *Larix canadensis Tourn. Inst.*, p. 586; New England Pine, white Pine, Pumpkin Pine, Apple Pine, Sapling Pine, Amer.; Pin du Lord, Pin du Lord Weymouth, Fr.

Engravings. Wang. Beyt., 1. t. 1. f. 1.; Lam. Illustr., t. 786. f. 3.; Lamb. Pin., ed. 2, 1. t. 32; Michx. N. Amer. Syl., 3. t. 145; N. Du Ham., 5. t. 76; our figs. 2193. to 2195., from specimens from Whitton, and the plate of the tree in our last Volume.

Spec. Char., &c. Leaves slender, without sheaths. Male catkins small. Cone cylindrical, long, and pendulous. (*Michx.*) Buds from $\frac{3}{16}$ in. to $\frac{1}{4}$ in. long, and from $\frac{2}{16}$ in. to $\frac{3}{16}$ in. broad; ovate, pointed, and slightly resinous; surrounded by one or two small buds. (See fig. 2193.) Leaves from 3 in. to 3½ in. long. Cone (see fig. 2195.) from 5 in. to 6 in. long, and from 1½ in. to 1¾ in. broad, on a peduncle $\frac{3}{8}$ in. long; scales (see fig. 2194.) 1½ in. long, and from $\frac{5}{16}$ in. to $\frac{6}{16}$ in. broad. Seed $\frac{3}{16}$ in. long, and $\frac{1}{16}$ in. broad; obovate, pointed below, with a wing which, including the seed, is about 1 in. long, and $\frac{1}{4}$ in. broad, in the widest part. Cotyledons 6 to 10. A native of North America. Introduced in 1705; and flowering in April.



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Varieties.

‡ *P. S.* 2 *alba* Hort. has the leaves and bark much whiter than the species. There is a plant in the Horticultural Society's Garden, which, in 1837, after being 12 years planted, was 20 ft. high.

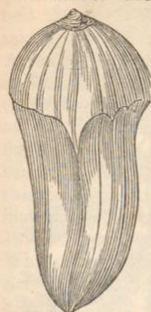
‡ *P. S.* 3 *brevifolia* Hort. has shorter leaves.

‡ *P. S.* 4 *compressa* Booth; *P. S.* nova Lodd. Cat., ed. 1836; Floetbeck Weymouth Pine.— Also much shorter in the leaf, and probably the same as *P. S.* *brevifolia*.

Description. A tall tree, which, in America, according to Michaux, varies in height from 100 ft. to 180 ft., with a straight trunk, from about 4 ft. to 6 ft. or 7 ft. in diameter. The trunk is generally free from branches for two thirds or three fourths of its height; the branches are short, and in whorls, or disposed in stages one above another, nearly to the top, which consists of three or four upright branches, forming a small conical head. In rich strong loams, the tree does not grow so high, and assumes a more spreading shape; but it is still taller and more vigorous than most of the trees by which it is surrounded. The bark, on young trees, is smooth, and even polished; but,

as the tree advances in age, it splits, and becomes rugged and grey, but does not fall off in scales like that of the other pines.

The leaves are from 3 in. to 4 in. long, straight, upright, slender, soft, triquetrous, of a fine light bluish green, marked with silvery longitudinal channels; scabrous and inconspicuously serrated on the margin; spreading in summer, but in winter contracted, and lying close to the branches. Sheaths and stipules none, or deciduous. Male catkins short, elliptic; pale purple, mixed with yellow, turning red before they fall; on long foot-



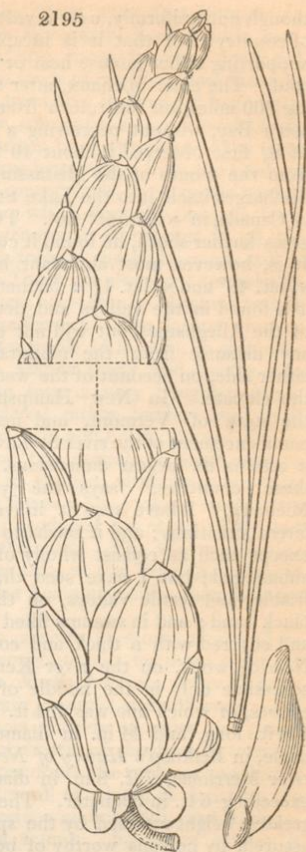
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stalks, and arranged like those of *P. australis*. Crest of the anthers very small, and composed of two erect very short bristles. Female catkins ovate-cylindrical; erect, on short peduncles when young, but when full grown pendulous, and from 4 in. to 6 in. long, slightly curved, and composed of thin smooth scales, rounded at the base, and partly covered with white resin, particularly on the tips of the scales; apex of the scales thickened. Seeds ovate, of a dull grey. The cone opens, to shed the seeds, in October of the second year; and in America, according to Michaux, part of the seeds are generally left adhering to the turpentine which exudes from the scales. The wood is soft, light, free from knots, and easily wrought; it is also durable, and not very liable to split when exposed to the sun: but it has little strength, gives a feeble hold to nails,

and sometimes swells from the humidity of the atmosphere; while, from the very great diminution of the trunk from the base to the summit, it is difficult to procure planks of great length and uniform diameter. The proportion of sap wood is very small; and, according to Michaux, a trunk 12 in. in diameter generally contains 11 in. of perfect wood. The wood of this tree is remarkably white when newly sawn into planks; whence the common American name for it of white pine. The rate of growth of this tree in Britain is, except in very favourable situations, slower than that of most European pines. Nevertheless, in the climate of London, it will attain the height of 12 ft. or 13 ft. in 10 years from the seed. When planted singly, like most other pines, it forms a branchy head; but, when drawn up among other trees of the same species, it has as clear a trunk in Britain as in America. The general appearance of the tree, when standing singly in English parks and pleasure-grounds, is well represented by *fig.* 2196., which is the portrait, to a scale of 24 ft. to 1 in., of a Weymouth pine in Studley Park, which, in 1836, was 60 ft. 6 in. high, with a trunk about 8 ft. in circumference, at 1 ft. from the ground.

Geography. According to Pursh, the white, or Weymouth, pine grows in fertile soil, on the sides of hills, from Canada to Virginia; attaining the largest size in the state of Vermont. Michaux informs us that the tree is diffused,

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though not uniformly, over a vast extent of country; but that it is incapable of supporting either intense heat or intense cold. The elder Michaux, after traversing 300 miles, on his return from Hudson's Bay, without perceiving a vestige of it, first observed it about 40 leagues from the mouth of the Mistassin, which discharges itself into the Lake St. John, in Canada, in N. lat. $48^{\circ} 50'$. Two degrees farther south, he found it common. It is, however, most abundant between N. lat. 43° and N. lat. 47° : farther south, it is found in the valleys and declivities of the Alleghanies, but will not grow at any distance from the mountains on either side, on account of the warmth of the climate. In New Hampshire, in the state of Vermont, and near the commencement of the river St. Lawrence, it attains its largest dimensions. "In these countries," says the younger Michaux, "I have seen it in very different situations; and it seems to accommodate itself to all varieties of soil,

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except such as consist wholly of sand, and such as are almost constantly submerged; but I have seen the largest specimens in the bottom of soft, friable, and fertile valleys, on the banks of rivers composed of deep, cool, black sand; and in swamps filled with the white cedar (*Cupressus thyoides*), and covered with a thick and constantly humid carpet of *Sphagnum*. Near Norridgewock, on the river Kennebeck, in one of these swamps which is accessible only in the middle of summer, I measured two trunks felled for canoes, of which one was 154 ft. long, and 54 in. in diameter, and the other 142 ft. long, and 44 in. in diameter, at 3 ft. from the ground. Mention is made, in Belknap's *History of New Hampshire*, of a white pine felled near the river Merrimac, 7 ft. 8 in. in diameter; and near Hollowell, I saw a stump exceeding 6 ft. in diameter. These enormous trees had probably reached the greatest height attained by the species, which is about 180 ft. I have been assured, by persons worthy of belief, that, in a few instances, they had felled individual trees of nearly this stature." (*Michx. North Amer. Syl.*, iii. p. 161.) Michaux adds that he has "always observed the influence of soil to be greater on resinous than on broad-leaved trees." The qualities of the white pine, in particular, are strikingly affected by it. In loose, deep, humid soils, it unites in the highest degree all the valuable properties by which it is characterised, especially lightness and fineness of texture, so that it may be smoothly cut in every direction; and hence, perhaps, is derived the name of pumpkin pine. On dry elevated lands, its wood is firmer and more resinous, with a coarser grain and more distant concentric circles, and it is then called sapling pine. In the district of Maine, and the province of Nova Scotia, the white pine has been observed to be the first to take possession of barren deserted lands, and the most hardy in resisting the impetuous gales from the ocean.

History. *Pinus Strobus* received its name from Linnæus, and was first cultivated in England by the Duchess of Beaufort, at Badmington, in 1705. Great quantities were soon afterwards planted at Longleat, in Wiltshire, the seat of Lord Weymouth, where the trees prospered amazingly, and whence the species received the name of the Weymouth pine. Several were also planted at Mersham Hatch, in Kent; and a number at Whitton, by the Duke of Argyll. These plants began to bear cones with perfect seeds about 1720; and the species has been since extensively raised by nurserymen, from the seeds produced at these places; and the plants have been thus distributed

throughout the island. Miller says that the seeds were first brought to London for sale from Mer sham Hatch, Sir Wyndham Knatchbull's seat, near Ashford, in Kent, in 1726. There were also cones, he says, produced at Longleat; "but it has been chiefly from the seeds of Sir Wyndham Knatchbull that the much greater number of these trees now in England have been raised; for, although there has annually been some of the seed brought from America, yet those have been few in comparison to the produce of the trees in Kent; and many of the trees which have been raised from the seeds of those trees now produce plenty of good seed, particularly those in the garden of His Grace the Duke of Argyll, at Whitton, which annually produce large quantities of cones, which His Grace most generously distributes to all the curious." (*Dict.*, ed. 7., 1759.) Many of the trees in these places are still in existence, and are from 70 ft. to 80 ft. high. There are also some remarkably fine specimens at Strathfieldsaye: some of them, according to Mitchell, had, in 1827, trunks 100 ft. high, and 10 ft. in circumference. The largest tree at Whitton was, in 1835, 81 ft. 6 in. high, with a trunk 11 ft. 3 in. in circumference at 2 ft. from the ground. This tree stands singly, and divides into a great many large woody limbs, so as to form a very irregular head. In Scotland, the Weymouth pine is considered rather tender; and, as it requires a better soil than most other species, it is not much planted for its timber. Sang observes that it is a plant of too delicate a habit ever to become a large or valuable tree in Scotland, in exposed situations; but that, where it is sheltered and properly treated, it forms a fine-looking single tree. In Ireland, according to Hayes, it was not introduced till about 1770; but there are trees of it in various places above 50 ft. high. The Weymouth pine is not very common in France; but there are trees at the Trianon, which, in 1834, were between 40 ft. and 50 ft. high, after being about the same number of years planted.

Properties and Uses. The wood of this species is more employed in America than that of any other pine. Throughout the northern states, at the time the younger Michaux published his *North American Sylva* (1819), seven tenths of the houses, except in the larger capitals, were of wood; and about three quarters of these were built almost entirely of white pine; and, even in the cities, the beams and principal woodwork of the houses were of this wood. "The ornamental work of the outer doors, the cornices and friezes of apartments, and the mouldings of fireplaces, all of which, in America, are elegantly wrought, are of this wood. It receives gilding well, and is, therefore, selected for looking-glass and picture frames. Sculptors employ it exclusively for the images that adorn the bows of vessels, for which they prefer the kind called the pumpkin pine. At Boston, and in other towns of the northern states, the inside of mahogany furniture and of trunks, the bottoms of Windsor chairs of an inferior quality, water pails, a great part of the boxes used for packing goods, the shelves of shops, and an endless variety of other objects, are made of white pine. In the district of Maine, it is employed for barrels to contain salted fish, especially the kind called the sapling pine, which is of a stronger consistence. For the magnificent wooden bridges over the Schuylkill at Philadelphia, and the Delaware at Trenton; and for those which unite Cambridge and Charleston with Boston, of which the first is 1500 ft., and the second 3000 ft., in length; the white pine has been chosen for its durability. It serves exclusively for the masts of the numerous vessels constructed in the northern and middle states; and for this purpose it would be difficult to replace it in North America. The principal superiority of white pine masts over those brought from Riga is their lightness; but they have less strength, and are said to decay more rapidly between decks, and at the point of intersection of the yards. This renders the long-leaved pine (*P. austrâlis*) superior to the white pine, in the opinion of the greater part of the American shipbuilders; but some of them assert that the white pine would be equally durable, if the top were carefully protected from the weather. With this view, an experiment has been suggested, of a hole, several feet deep,

made in the top of the mast, filled with oil, and hermetically sealed; the oil is said to be absorbed in a few months. The bowsprits and yards of ships of war are of this species. The wood is not resinous enough to furnish turpentine for commerce." (*Michx.*) Before the American war, England is said to have furnished herself with masts from the United States; and she still completes from America the demand which cannot be supplied from the north of Europe. The finest timber of this species is brought from Maine, and particularly from the river Kennebeck. Soon after the establishment of the American colonies, England became sensible of the value of this resource, and solicitous for its preservation. In 1711 and 1721, severe ordinances were enacted, prohibiting the cutting of any trees proper for masts on the possessions of the crown. The order had reference to the vast countries bounded on the south by New Jersey, and on the north by the upper limit of Nova Scotia. "I am unable to say," adds Michaux, "with what degree of rigour it was enforced before the American revolution; but, for a space of 600 miles, from Philadelphia to a distance beyond Boston, I did not observe a single tree of the white pine large enough for the mast of a vessel of 600 tons." (*Michx.*) The white pine is also used extensively in America for clap-boards and shingles. The clap-boards are of an indeterminate length, 6 in wide, $\frac{1}{4}$ in. thick at one edge, and much thinner at the other; they form the exterior covering of the walls of the wooden houses, and are placed horizontally, lapping one over the other, so that the thinner edge is covered. The shingles are commonly 18 in. long, from 3 in. to 6 in. wide, $\frac{1}{4}$ in. thick at one end, and 1 line thick at the other: they should be free from knots, and made only of the perfect wood. These shingles are used instead of tiles to almost all the houses east of the river Hudson; but they only last 12 or 15 years. They are exported in great quantities to the West Indies. The timber of the Weymouth pine continues to be imported into Britain in immense quantities; but it is considered as very inferior to some of the other American pines, and to the pine timber of the north of Europe. In M'Culloch's *Dictionary of Commerce*, speaking of the white pine of America, as compared with the Baltic pine, an extract is given from the evidence of Mr. Copland, an extensive builder and timber-merchant, when examined before parliament as to the comparative value of European and American Timber. "The American pine is much inferior in quality, much softer in its nature, not so durable, and very liable to dry rot: indeed, it is not allowed by any professional man under government to be used; nor is it ever employed in the best buildings in London: it is only speculators that are induced to use it, from the price of it being much lower (in consequence of its exemption from duty) than the Baltic timber. If you were to lay two planks of American timber upon each other, in the course of a twelvemonth they would have the dry rot, almost invariably, to a certain extent." M'Culloch adds that "many passages to the same effect might be produced from the evidence of persons of the greatest experience in ship-building." (*M'Culloch's Com. Dict.*, art. Timber Trade.) The wood of Weymouth pines grown in England has been used for floors, and by cabinet-makers; but, as the species is generally valued as an ornamental tree, it is seldom cut down for timber. Its picturesque beauty, according to Gilpin, is not great. "It is admired," he says, "for its polished bark, though the painter's eye pays little attention to so trivial a circumstance, even when the tree is considered as a single object: nay, its polished bark rather depreciates its value, for the picturesque eye dwells with more pleasure on rough surfaces than on smooth: it sees more richness in them and more variety. But we object chiefly to the Weymouth pine on account of the regularity of its stem and the meagreness of its foliage. Its stem rises with perpendicular exactness; it rarely varies; and its branches issue with equal formality from its sides. Its foliage, too, is thin, and wants both richness and effect. If I were speaking, indeed, of this tree in composition, I might add that it may often appear to great advantage in a plantation. Contrast, we know, produces beauty, even from deformity itself. Opposed, therefore, to the wildness of other trees, the regularity of the Wey-

mouth pine may have its beauty : its formality may be concealed. A few of its branches, hanging from a mass of heavier foliage, may appear light and feathery, while its spiry head may often form an agreeable apex to a clump." (*For. Scen.*, i. p. 87.)

Soil, Situation, &c. We have already observed that the soil and situation for this tree ought to be better than for most other species of pines. Seeds are procured in abundance; and the plants, when sown in spring, come up the first year, and may be treated like those of the Scotch pine.

Statistics. In the Environs of London. At Whitton Place, there are many trees, the tallest of which is 81 ft. 6 in. high, and the diameter of the trunk 4 ft.; at York House, Twickenham, it is 48 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 18 ft.; at Chiswick Villa, there are various trees, from 50 ft. to 60 ft. high; at Abercorn Priory, near Stanmore, it is 53 ft. high, diameter of the trunk 1 ft. 9 in., and of the head 30 ft. — South of London. In Dorsetshire, at Melbury Park, 40 years old, it is 36 ft. high; at Compton House, 60 years old, it is 80 ft. high, with a trunk 3 ft. in diameter. In Hampshire, at Alesford, 41 years planted, it is 53 ft. high; at Strathfieldsaye, it is 95 ft. high, with a trunk 4 ft. 6 in. in diameter. In Somersetshire, at Kingston, it is 95 ft. high, with a trunk 3 ft. in diameter. In Surrey, at Claremont, it is 60 ft. high, the diameter of the trunk 2 ft., and of the head 36 ft.; at Deepdene, 10 years planted, it is 22 ft. high. In Wiltshire, at Wardour Castle, 50 years planted, it is 60 ft. high, the diameter of the trunk 3 ft. 9 in., and of the head 57 ft. — North of London. In Bedfordshire, at Southhill, it is 45 ft. high, with a trunk 2 ft. 6 in. in diameter. In Berkshire, at Bear Wood, 14 years planted, it is 30 ft. high. In Buckinghamshire, at Temple House, 40 years planted, it is 50 ft. high. In Durham, at Southend, 40 years planted, it is 60 ft. high; at Stanwick Park is one with a trunk 2 ft. in diameter. In Leicestershire, at Elvaston Castle, 33 years planted, it is 42 ft. high. In Nottinghamshire, at Clumber Park, it is 54 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 44 ft.; at Wakefield Lodge, 12 years planted, it is 25 ft. high. In Shropshire, at Willey Park, 18 years planted, it is 28 ft. high. In Staffordshire, at Trentham, it is 50 ft. high. In Suffolk, at Finborough Hall, 70 years planted, it is 70 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 50 ft. In Warwickshire, at Coombe Abbey, 60 years planted, it is 60 ft. high; the diameter of the trunk 3 ft., and of the head 33 ft. In Yorkshire, at Grimston, 12 years planted, it is 32 ft. high.

Pinus Strôbus in Scotland. In the Environs of Edinburgh. At Hopetoun House, it is 50 ft. high, the diameter of the trunk 2 ft. 10 in., and of the head 40 ft. — South of Edinburgh. In Ayrshire, at Dalquharran, 55 years planted, it is 68 ft. high, the diameter of the trunk 2 ft. In Berwickshire, at the Hirsell, 20 years planted, it is 20 ft. high. In Renfrewshire, at Erskine House, it is 55 ft. high, with a trunk 2 ft. 4 in. in diameter. — North of Edinburgh. In Argyllshire, at Toward Castle, 13 years planted, it is 20 ft. high. In Banffshire, at Gordon Castle, it is 48 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 36 ft. In Clackmannanshire, in the garden of the Dollar Institution, 12 years planted, it is 20 ft. high. In Forfarshire, at Kinnaird Castle, 45 years planted, it is 45 ft. high, the diameter of the trunk 1 ft. 6 in.; at Courtachy Castle, 14 years planted, it is 15 ft. high. In Inverness-shire, at Cowan, 30 years planted, it is 35 ft. high, the diameter of the trunk 1 ft., and of the head 25 ft. In Stirlingshire, at Blair Drummond, 120 years old, it is 73 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 42 ft.; at Brucefield, it is 60 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 30 ft.; at Callendar Park, 39 years planted, it is 45 ft. high.

Pinus Strôbus in Ireland. In Down, at Ballylead, 60 years planted, it is 46 ft. high. In Fermanagh, at Florence Court, 30 years planted, it is 55 ft. high. In Galway, at Coole, it is 40 ft. high, the diameter of the trunk 2 ft.

Pinus Strôbus in Foreign Countries. In France, near Paris, at Beauvais, 30 years planted, it is 80 ft. high, the diameter of the trunk 3 ft., and of the head 30 ft.; at Colombey, near Metz, 70 years planted, it is 60 ft. high, the diameter of the trunk 2 ft.; at M. Angot's, 29 years planted, it is 40 ft. high; in the Park at Clerveaux, 32 years planted, it is 71 ft. high. In Hanover, at Harbecke, 10 years planted, it is 16 ft. high; at Schwöbber, 80 years planted, it is 100 ft. high, the diameter of the trunk 3 ft. In Saxony, at Wörlitz, 60 years planted, it is 80 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 40 ft. In Cassel, at Wilhelmsheue, 60 years old, it has a trunk 4 ft. in diameter. In Bavaria, in the Botanic Garden at Munich, 18 years planted, it is 20 ft. high; in the English Garden, 25 years planted, it is 30 ft. high. In Austria, at Vienna, at Luxemburg, 30 years planted, it is 25 ft. high; in Rosenthal's Nursery, 60 years planted, it is 40 ft. high; at Hadersdorf, 50 years planted, it is 40 ft. high; at Brück on the Leytha, 30 years planted, it is 40 ft. high. In Prussia, at Berlin, at Sans Souci, 45 years planted, it is 40 ft. high; in the Pfauen Insel, 40 years planted, it is 50 ft. high. In Italy, at Desio, near Monza, it is 70 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 30 ft.

Commercial Statistics. Plants, in the London nurseries, are, per thousand, 1 year's seedlings, 8s.; 2 years' seedlings, 12s.; 1 year's transplanted, 20s.; and transplanted plants from 9 in. to 12 in. high, 50s. At Bollwyller, plants are from 1 franc to 2 francs each; or, per hundred, 4 years old and transplanted, 30s. At New York, plants are from 50 cents to 75 cents, and as high as 1 dollar each, according to their size.

‡ 40. *P. (S.) EXCELSA Wallich.* The lofty, or *Bhotan*, Pine.

Identification. Wall. Pl. As. Rar., t. 201; Lamb. Pin., 1. t. 33; Royle Illust.; Lawson's Manual, p. 363. *Synonymes.* *P. Dicksonii* Hort.; Chilla, or Chylla, *Himalayas*; Kuel, *Sirmone* and *Gurhwal*; Lemshing, *Bhoten*, *Rassula*, or King of the Firs, *Hindustan*. *Engravings.* Wall. Pl. As. Rar., t. 201; Lamb. Pin., 1. t. 33; our fig. 2199., to our usual scale; and figs. 2197. and 2198., of the natural size, from Wallich, Lambert, and from living specimens.

Spec. Char., &c. Leaves in fives, very long, and slender, loose. Crest of the anthers roundish, truncate; simple, lacerated. Cones cylindrical, smooth, pendulous, longer than the leaves. (*Wall.*) Buds, on the tree in the Hor-



2197

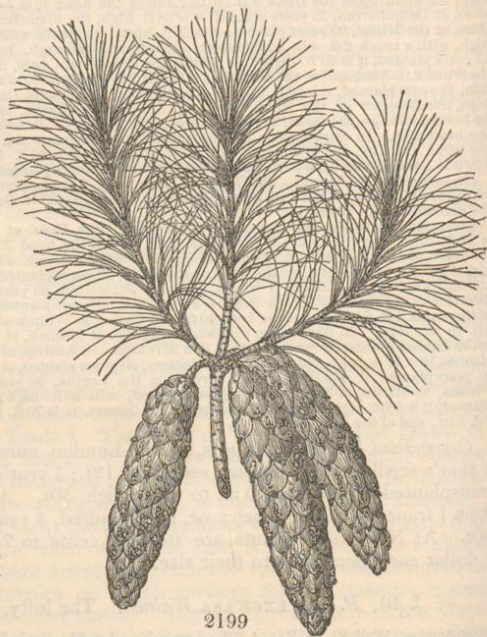
ticultural Society's Garden, $\frac{1}{4}$ in. long and $\frac{3}{16}$ in. broad; conical, with straight sides, and pointed. (Fig. 2197.) Leaves rather more than 6 in. long. Cone 9 in. long, and 2 in. broad, with a footstalk 1 in. long; scale $1\frac{3}{8}$ in. long, and $1\frac{1}{2}$ in. broad. Seeds $\frac{5}{16}$ in. long, and $\frac{3}{8}$ in. broad; with the wing, $1\frac{1}{4}$ in. long, and $\frac{3}{8}$ in. broad. A native of Nepal, on mountains. Introduced in 1823.

Description. A tall, handsome, pyramidal tree, attaining the height of from 90 ft. to 120 ft. Branches numerous, ascending, divided, disposed in whorls. Bark entire, smooth, soft, pale grey. Wood white, abounding in a liquid resin. Leaves in fives, very long, slender, triquetrous, loose; glaucous green, pliable; 5 in. to 7 in. long, roughish on the angles from small teeth; furnished at the apex with a small callous mucro, crowded on the branches, particularly towards the apex; bicanaliculate above, flat beneath; sheaths about $\frac{1}{2}$ in. long, caducous, imbricated with numerous, linear-oblong, brown, membranaceous scales. Catkins terminal, with numerous membranaceous brown scales at the base; male ovate, short, obtuse, sessile, dense, collected into a head about 3 lines long, and 1 in. thick. Stamens monadelphous. Anthers very short

2198



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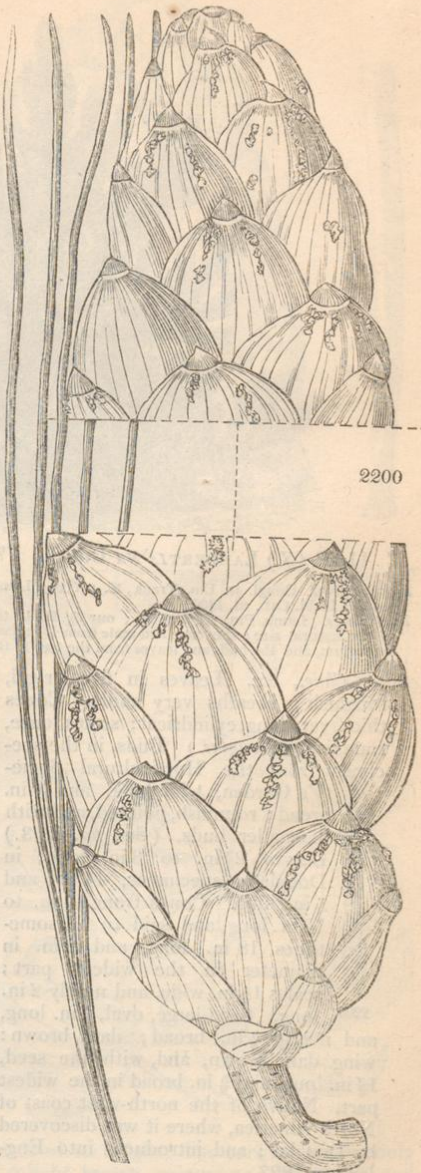


2199

roundish, opening below longitudinally, filled with sulphur-coloured pollen; crest small, roundish, simple, membranaceous; dark-brown, fringed and torn on the margin; female oblong, cylindrical, in threes or fours, erect, when young pedunculate; scales broad, roundish, imbricated inwards, coriaceous, thick, margined, smooth. Cones 3 or 4 together, cylindrical, pedunculate, naked, smooth; $6\frac{1}{2}$ in. long, pendulous when ripe, 2 in. in diameter, somewhat attenuated towards the apex; scales broad, wedge-shaped, coriaceous, thick, closely imbricated, smooth; light brown; apiculate above, with a short, thick, obtuse, dark brown mucro. Seeds ovate, compressed on both sides; testa bony, black, marked with grey spots; wing oblong-obtuse, membranaceous, ferruginous, somewhat cimeter-shaped, reticulate. (Lamb.) *P. excelsa*, Mr. Lambert observes, approaches so near in habit, and in the shape of its cones, to *P. Ströbus*, that, were it not for the simple, round, membranaceous crest of the anthers, it would be almost impossible to distinguish them specifically. The leaves are longer than in *P. Ströbus*, and the cones are thicker. Dr.

Royle makes a similar remark as to the resemblance of this tree to *P. Stròbus*, and adds "that it is remarkable for its drooping branches, whence it is frequently called the "weeping fir," by travellers in the Himalayas. It is found in company with the deodar cedar at Narainhetty, in Nepal, and at Simla, Theog, &c., and in the Bhotea Pergunnahs of Kamaon. Dr. Wallich mentions a variety, if not a species, still nearer to *P. Stròbus*, at Bainpa and Toka, in Nepal. (*Royle Illust.*) The rate of growth of this tree, in the climate of London, appears to be nearly the same as that of *P. Stròbus*. A plant in the Horticultural Society's Garden, of which *fig. 2202.* is a portrait, 8 years planted, was, in 1837, 12 ft. high; one at Dropmore, of which *fig. 2201.* is a portrait, the same age and 10 ft. high, has produced a cone; and one in the Kinnoul Nursery, in the neighbourhood of Perth, was, in 1836, 15 ft. high. *P. excelsa* is frequent both in Upper Nepal and Bothsam. In the latter country, its timber is preferred by the inhabitants to that of every other pine. It yields in great quantities a

2201



2200

pure and limpid turpentine, by the slightest incision. The scales of the cone also exhibit turpentine, see *fig. 2200.* to the natural size. The species was introduced into England by Dr. Wallich about 1827; and several plants were raised by Mr. Lambert at Boyton, and in the Horticultural Society's Garden, in that year. Some appear, according to Mr. Lawson, to have been raised, also, in the Glasgow Botanic Garden. Plants, which are rather rare in the London nurseries, are 21s. each.

2202



‡ 41. *P. (S.) LAMBERTIANA* Dougl. *The gigantic, or Lambert's, Pine.*

Identification. Dougl. in *Lin. Trans.*, 15. p. 500.; *Lamb. Pin.*, ed. 2, 1. t. 34.; *Lawson's Manual*, p. 361.; *Lodd. Cat.*, ed. 1836.

Engravings. *Lamb. Pin.*, ed. 2, t. 34.; our fig. 2206., to our usual scale; and figs. 2203. to 2205., of the natural size; the cone and scale from Douglas's specimens in the Horticultural Society's herbarium, and the buds and leaves from the tree in the Horticultural Society's Garden.

Spec. Char., &c. Leaves in fives, rigid, roughish; sheaths very short. Cones thick, very long, cylindrical; scales loose, roundish. (*Douglas.*) Buds, in the specimen from the Horticultural Society's Garden, $\frac{1}{8}$ in. long, and $\frac{1}{8}$ in. broad; roundish, pointed, and with 3 smaller buds. (See fig. 2203.)

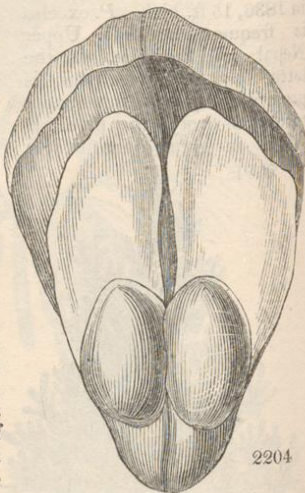
Leaves $2\frac{3}{4}$ in. to 3 in. long; in Douglas's specimens, $4\frac{1}{2}$ in. and 5 in. long. Cones from 14 in. to 16 in. long, and said to be sometimes 18 in. long, and 4 in. in diameter in the widest part; scales $1\frac{1}{2}$ in. wide, and nearly 2 in.

long. Seed large, oval, $\frac{7}{8}$ in. long, and nearly $\frac{3}{8}$ in. broad; dark brown; wing dark brown, and, with the seed, $1\frac{3}{4}$ in. long, and $\frac{5}{8}$ in. broad in the widest part. Native of the north-west coast of North America, where it was discovered by Douglas; and introduced into England in 1827.

Description. According to Douglas, "the trunk of *P. Lambertiana* grows from 150 ft. to above 200 ft. in height, varying from 20 ft. to near 60 ft. in circumference. One specimen, which had been blown down by the wind, and which was certainly not the largest, was of the following dimensions:— Its entire length was 215 ft.; its circumference, at 3 ft. from the ground, was 57 ft. 9 in., and at 134 ft. from the ground, 17 ft. 5 in. The trunk is unusually straight, and

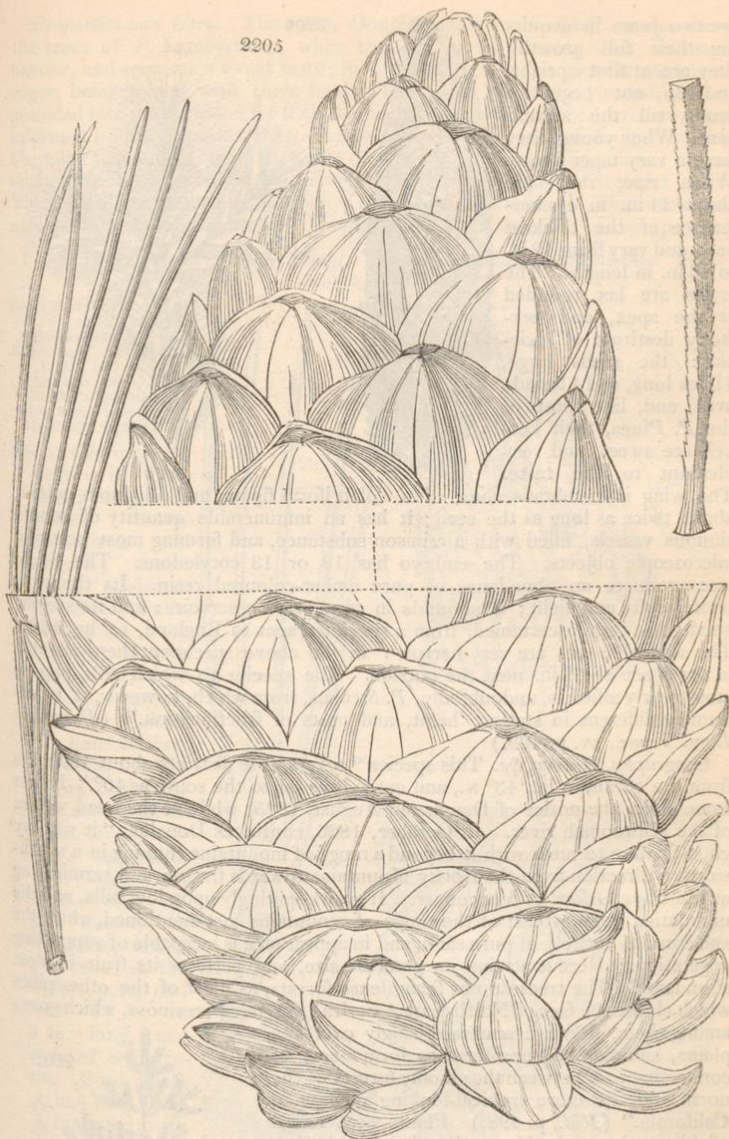


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2205



destitute of branches about two thirds of its height. The bark is uncommonly smooth for such large timber, of a light brown colour on the south, and bleached on the north, side. The branches are pendulous, and form an open pyramidal head, with that appearance which is peculiar to the *Abies* tribe. The leaves are between 4 in. and 5 in. long, and grow in fives, with short deciduous sheaths, like those of *P. Strobus*: they are rigid, of a bright green colour, but not glossy, and, from minute denticulations of the margin, are scabrous to the touch. The cones are pendulous from the extremities of the branches:

are two years in acquiring their full growth; they are at first upright, and do not begin to droop till the second year. When young, they have a very taper figure. When ripe, they are about 11 in. in circumference at the thickest part, and vary from 12 in. to 16 in. in length. The scales are lax, rounded at the apex, and perfectly destitute of prickles: the seeds large, 8 lines long, and 4 broad; oval; and, like those of the *P. Pinea*, their kernels are sweet, and very pleasant to the taste.



2206



The wing is membranaceous, of a dolabriform figure, and fuliginous colour, about twice as long as the seed; it has an innumerable quantity of minute sinuous vessels, filled with a crimson substance, and forming most beautiful microscopic objects. The embryo has 12 or 13 cotyledons. The whole tree produces an abundance of pure amber-coloured resin. Its timber is white, soft, and light; it abounds in turpentine reservoirs; and its specific gravity has been ascertained, from a specimen sent to England, to be 0.463. The annual layers are very narrow: in the above specimen, there were 56 in the space of $4\frac{1}{2}$ in. next the outside. The species to which this pine is most nearly allied is, undoubtedly, *P. Ströbus*, from which, however, it is extremely different in station, habit, and parts of fructification." (*Dougl. in Linn. Trans.*, xv. p. 499.)

Geography, History, &c. This species "covers large districts about 100 miles from the ocean, in lat. 43° N., and extends as far to the south as 40° ." It first came under the notice of Douglas in August, 1825, while at the head waters of the Multnomah river. In October, 1826, continues Douglas, "it was my good fortune to meet with it beyond a range of mountains running in a south-western direction from the Rocky Mountains towards the sea, and terminating at the Cape Orford of Vancouver. It grows sparingly upon low hills, and the undulating country east of the range of mountains just mentioned, where the soil consists entirely of pure sand, and in appearance is incapable of supporting vegetation. Here it attains its greatest size, and perfects its fruit in most abundance. The trees do not form dense forests, as most of the other pines which clothe the face of North-west America; but, like *P. resinosa*, which grows among them, they are scattered singly over the plains, and may be considered to form a sort of connecting link between the gloomy forests of the north and the more tropical-looking verdure of California." (*Ibid.*, p. 498.) Plants were raised of this species in the Horticultural Society's Garden in 1827, and distributed in the following year; but it is remarkable that the greater part of them have since died, generally when they were about 4 ft. or 5 ft. in height. Notwithstanding this, the species does not appear to be much more tender than *P. Ströbus*. The largest existing plant that we know of is in the garden of William Wells, Esq., at Redleaf, where, having been sown in 1829, it is 10 ft. 2 in. high. One in the Chiswick Garden, sown the same year, and of which *fig. 2207.* is a portrait, is only 6 ft. 6 in. high.

2207



Properties and Uses. The resin, Douglas observes, "which exudes from the trees of *P. Lambertiana*, when they are partly burned, loses its usual flavour, and acquires a sweet taste; in which state it is used by the natives as sugar, being mixed with their food. The seeds are eaten roasted, or are pounded into coarse cakes for their winter store. I have, since my return, been informed by Mr. Menzies, that, when he was on the coast of California with Captain Vancouver, in 1793, seeds of a large pine, resembling those of the stone pine, were served at the dessert by the Spanish priests resident there. These were, no doubt, the produce of the species now noticed. The vernacular name of it in the language of the Umptqua Indians, is *nât-cleh*." (*Ibid.*, p. 499.)

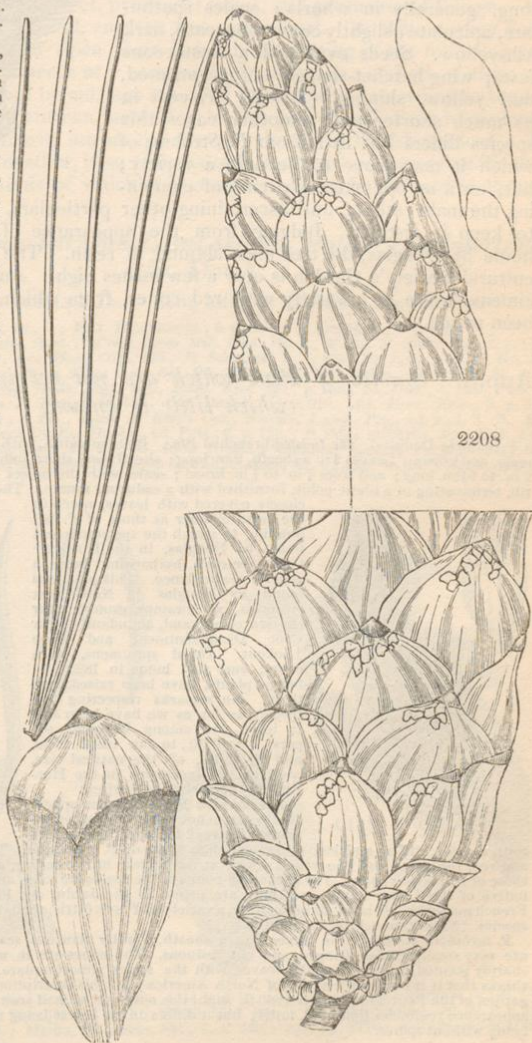
‡ 42. *P. (S.) MONTICOLA* Dougl. The Mountain, or short-leaved Weymouth, Pine.

Identification. Lamb. Pin. ed. 2., vol. 2., after *P. Sabiniâna*, 3. t. 87.

Engravings. Lamb. Pin., 3. t. 87., and our figs. 2208. and 2209., from Douglas's specimens in the herbarium of the Horticultural Society.

Spec. Charac., &c.

Leaves in fives, short, smoothish, obtuse. Cones cylindrical, and smooth; scales loose, pointed. (*D. Don.*) Buds, in the plant in the London Horticultural Society's Garden, small, resembling those of *P. Lambertiana*. Leaves from $3\frac{1}{2}$ in. to 4 in. long, without the sheaths. Cone, from Douglas's specimen, 7 in. long, and $1\frac{3}{4}$ in. broad; rather obtuse at the point; scales $\frac{3}{4}$ in. broad at the widest part, and from $1\frac{3}{4}$ in. to 2 in. long, and covered with resin. Seed small, $\frac{3}{8}$ in. long, and $\frac{1}{8}$ in. broad; with the wing, $1\frac{1}{2}$ in. long, and $\frac{1}{4}$ in. broad. Cotyledons? A native of the high mountains, at the Grand Rapids of the Columbia; and in California, on the



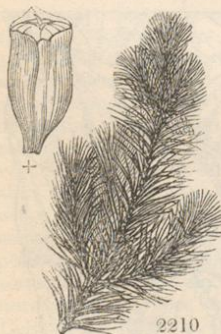
rocky banks of the Spokane river. Discovered by Douglas, and introduced in 1831.

Description, &c. A resinous tree, with brownish-coloured bark. Leaves in fives, triquetrous, obtuse; bicanaliculate above, carinate below, with a blunt elevated line; obsolete crenulated on the margin; smoothish, glaucous green; $1\frac{1}{2}$ in. to 3 in. long. Sheaths imbricated with elliptic-oblong, obtuse, thinly membranaceous, loose, bright brown scales, quickly falling off. Cones cylindrical, smooth, 6 in. to 8 in. long, generally in whorls; scales spathulate, apiculate; slightly convex beneath, dark ash-yellow. Seeds oval, with a crustaceous testa; wing hatchet-shaped, obtuse, striated, dull yellow, shining. (*Lamb.*) Except in its much shorter and smoother leaves, this species differs but little from *P. Ströbus*, of which it may prove to be only a variety; but, until an opportunity occurs of examining the male catkins, and ascertaining other particulars, it is considered best to keep it distinct. Judging from the appearance of the specimens sent home by Douglas, the tree must abound in resin. The plant in the Horticultural Society's Garden is only a few inches high. Among Douglas's specimens, there is a variety with red cones, from which no plants have yet been raised.

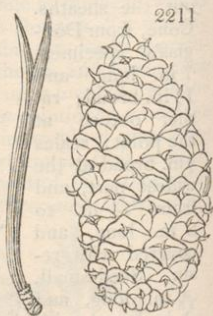


App. i. *Species of Pine which are not yet introduced, and of which little is known.*

P. contorta Douglas! *The twisted-branched Pine.* Buds roundish, with a blunt point, covered with resin, and brown. Leaves 2 in a sheath, 2 in. long; sheath very short, imbricated, black. Cones from 2 in. to 2½ in. long; and from ¾ in. to 1 in. broad; scales with the apices having a depressed lateral rib, terminating in a blunt point, furnished with a caducous mucro. The shoots are regularly and



close covered with leaves, much in the same manner as those of *P. (s.) pumilio*, to which the specimen sent home by Douglas, in the Horticultural Society's herbarium, bears a general resemblance. This pine was found by Douglas in North-west America, on swampy ground near the sea coast; and, abundantly, near Cape Disappointment and Cape Lookout. Dried specimens, with cones, were sent home in 1825-6-7; but no plants, have been raised from them. No remarks respecting this species, as far as we have been able to learn, are among Douglas's papers. *Fig. 2210*, to our usual scale, are from the specimens in the Horticultural Society's herbarium.



P. squamisæ Bosc does not appear to have been noticed by any other botanist. Leaves 2 in a sheath, less glaucous, shorter, stiffer, and less numerous, than those of *P. sylvestris*. The buds are large, obtuse, and very resinous; and the cones, which are of a clear brown colour, are shorter and smaller than those of *P. s. genevensis*. The pyramidal points of the scales are long, and bent backwards. It is a French nurseries. It is, in all probability, a variety of *P. sylvestris*, though Bosc considers it a distinct species. (*Nouv. Cours d'Agric.*, art. Pin.)

P. turbinata Bosc has the leaves 2 in a sheath, slightly glaucous, scarcely 1 in. long. The buds are very small, reddish, fringed, and not resinous. The cones are in whorls from 2 to 5 together, sharply pointed, longer than the leaves, with the scales almost square, and not pyramidal. Bosc thinks that it is probably a native of North America; but his description is taken from a tree in the garden of the Petit Trianon, about 40 ft. high, the only one he had seen. He adds that its general appearance resembles that of *P. mitis*; but it differs in its leaves being much shorter, and its cones being without spines.

GENUS II.



ABIES D. Don. THE SPRUCE FIR. *Lin. Syst. Monœ'cia* Monadélphia.

Identification. D. Don in *Lamb. Pin.*, vol. iii.

Synonymes. *Pinus* of Lin. and others, in part; *Picea Link* in *Abhand. König. Akad. Wissens. Berlin*, p. 179, for 1827; *Abies* of Tourn., Mill., and others, in part; *Picea* of the Ancients; *Sapin* *épicea*, *Fr.*; *Fichtenbaum*, *Ger.*; *Abiete*, *Ital.*; *Abieto*, *Span.*

Derivation. From *abeo*, to rise; alluding to the aspiring habit of growth of the tree; or, according to some, from *apios*, a pear tree; in allusion to the form of the fruit.

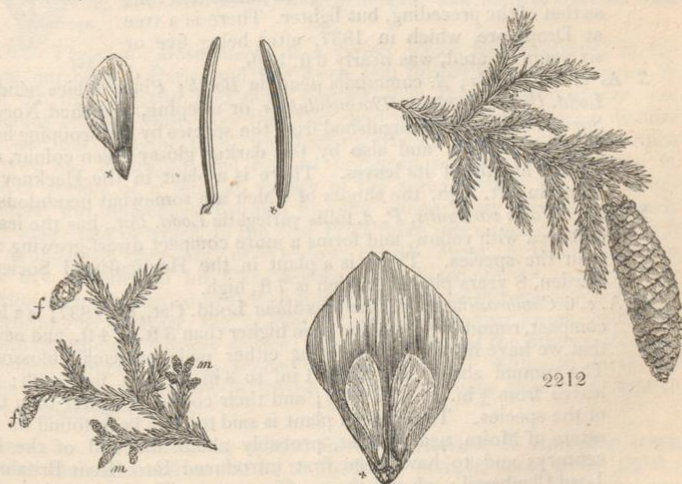
Description. Evergreen trees; natives of Europe, Asia, and America; remarkable for their tall, erect, pyramidal forms, and profusion of foliage. One or more species are useful, and the rest ornamental. In Britain, they flower in May and June, and ripen their cones in the spring of the following year. All the species bear seeds at a comparatively early age; and all of them may be readily propagated by cuttings taken off in the spring, according to Dumont De Courset; or in autumn, according to the practice of British gardeners. All the species hitherto introduced are quite hardy in British gardens. The genus, taking it altogether, is so truly natural, that, without any great violence, all the different kinds of which it is composed might be reduced to three or four species.

Sect. i. *Leaves tetragonal, awl-shaped, scattered in Insertion.*
(D. Don.)

† 1. *A. EXCÆLSA* Dec. The lofty, or Norway, Spruce Fir.

Identification. Dec. *Fl. Fr.*, 3.; *Poir. Dict. Encyc.*, 6. p. 518.; *N. Du Ham.*, 6. p. 289.

Synonymes. *A. communis* *Hort.*; *Abies Picea* *Mill. Dict.*, No. 2., *Michx. N. Amer. Syl.*, 3. p. 172.; *A. foliis solitariis*, &c., *Lin. Hort. Cliff.*, 449., *Fl. Succ.*, ed. 1., p. 879., *Fl. Lapp.*, ed. 1., No. 347., *Gmel. Sib.*, 1. p. 175.; *Pinus Abies* *Lin. Sp. Pl.*, 1421., *Syst.*, ed. Reich., 4. p. 177., *Fl. Succ.*, No. 875., *Lapp.*, No. 347., *Huds. Angl.*, 424., *Hunt. Evcl. Syl.*, p. 266., *Fl. Dan.*, t. 193., *Pall. Fl. Ross.*, 1. p. 6., *Allion. Fl. Ped.*, 2. p. 180., *Vill. Dauph.*, 3. p. 810., *Art. Hort. Kew.*, 3. p. 371., *Willd. Berol. Baumz.*, p. 221., *Smith in Rees's Cyc.*, No. 20., *Lamb. Pin.*, ed. 2., 1. t. 35., *Hörs. Anleit.*, p. 21.; *P. Picea Du Roi Harbk.*, ed. Pott., 2. p. 156.; *P. foliis solitariis*, &c., *Hall. Herb.*, No. 1656.; *P. excelsa* *Lam. Fl. Fr.*, ed. 1., 2. p. 202.; common Spruce, Prussian Fir; faux Sapin, *E'picea*, *Sapin-Pesse*, *Serente*, *Sapin gentil*, *Pinesse*, *Fr.*; *Lafie*, in the *Vosges*; *gemeine rothe Tanne*, *Ger.*



Engravings. *Nov. Act. Ac. N. Cur.*, 3., *App.*, t. 14. f. 5. 10., and t. 16. f. 1. 10.; *Blackw.*, t. 198.; *Fl. Dan.*, t. 193.; *Pall. Fl. Ross.*, 1. t. 1. f. G.; *Wood. Med. Bot.*, t. 208.; *Lamb. Pin.*, ed. 2., 1. t. 35.; *N. Du Ham.*, 6. t. 80.; *Michx. N. Amer. Syl.*, 3. t. 146.; our *fig.* 2212.; and the plates of this tree in our last Volume.

Spec. Char., &c. Leaves scattered, quadrangular. Cones cylindrical, terminal, pendent; scales naked, truncate at the summit, flat. Crest of the anthers rounded. (*Lois.*) Cone from 5 in. to 7 in. long, and from 1½ in. to 2 in. broad; scale from 1 in. to 1½ in. long, and from ½ in. to ¾ in. broad. Seed very small, scarcely ⅓ in. long, and ⅕ in. broad; with the wing, ¾ in. long, and ¼ in. broad. Cotyledons 7 to 9. Indigenous to the north of Europe, more particularly to Norway; and in cultivation in Britain since 1548.

Varieties.

† *A. e. 1 communis.* *The common Spruce, or White Fir of Norway.*—The foliage is shorter, more slender, and lighter-coloured, than in the following form; though the difference may be in part owing to soil and situation. In Norway, as we are informed by Mr. White, the inhabitants make a distinction between the white and the red spruce: the former grows on light poor soils, and in elevated situations, and has a lighter foliage, and white wood; the latter grows in more substantial soils, in the valleys, and has a darker stronger foliage, and red wood, which is more resinous, and of much greater strength and durability.

‡ *A. e. 2 nigra.* *The black-leaved Spruce, or Red Fir of Norway.*—There is a tree in Studley Park, known there as the black spruce, of which a portrait is given in our last Volume. In the foliage, it answers to the description given of the red fir of Norway; its leaves being very thick, strong, and dark-coloured; its bark red; and its cones longer than those of the common spruce. The leaves, in the specimen sent to us, are 1¼ in. in length; and the cones from 5½ in. to 6 in. long, and from 1¼ in. to 1½ in. broad. The scales (see *fig. 2213.*) are much more pointed than those of the common spruce, and longer. The tree at Studley is 121 ft. high; and, from its dense mass of dark foliage, it is considered a much finer tree than the common spruce.



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‡ *A. e. 3 carpatica; A. carpatica Hort. and Loud Hort. Brit. The Carpathian Spruce.*—This variety has vigorous shoots, and foliage as dense and long as that of the preceding, but lighter. There is a tree at Dropmore, which in 1837, after being five or six years planted, was nearly 6 ft. high.

‡ *A. e. 4 pendula; A. communis pendula Booth; Pinus Abies pendula Lodd. Cat., ed. 1836. The pendulous, or weeping, branched Norway Spruce.*—This is distinguished from the species by the drooping habit of its branches; and also by the darker glossy green colour, and greater length, of its leaves. There is a plant in the Hackney arboretum 5 ft. high, the shoots of which are somewhat pendulous.

‡ *A. e. 5 foliis variegatis, P. A. foliis variegatis Lodd. Cat.,* has the leaves blotched with yellow, and forms a more compact dwarf-growing tree than the species. There is a plant in the Horticultural Society's Garden, 8 years planted, which is 7 ft. high.

* *A. e. 6 Clanbrasiliana; P. Clanbrasiliana Lodd. Cat., ed. 1837;* is a low, compact, round bush, seldom seen higher than 3 ft. or 4 ft., and never, that we have heard of, producing either male or female blossoms. The annual shoots are from 1 in. to 3 in. or 4 in. in length; the leaves from ¼ in. to ½ in. long; and their colour is lighter than that of the species. The original plant is said to have been found on the estate of Moira, near Belfast, probably about the end of the last century; and to have been first introduced into Great Britain by Lord Clanbrasil; whence the specific name. The largest plant that we know of in the neighbourhood of London is at Cashibury, near Watford; where, in 1837, it was 3 ft. 6 in. high, having been 30 years

planted; at Kenwood, Hampstead, it is 3 ft. high, after being 8 years planted; at Dropmore, it is 2 ft. 6 in. high; and in the Horticultural Society's Garden, after being 10 years planted, it is 3 ft. high. At Cranmore, near Belfast, it is 3 ft. high; diameter of the stem 2 in., and of the head 3 ft. It appears to us very doubtful whether such a stunted variety as this was ever found in a bed of seedlings: we think it much more probable that it is a continuation by cuttings of one of those bird-nest-like monstrosities that are occasionally found on all trees, and which are to be met with on several trees of the common spruce at Pain's Hill, and various other places. *A. e. Clanbrasiliana*, like the other varieties of the spruce fir, is readily propagated by cuttings, and makes a beautiful little fir for growing in a pot.

- ♁ *A. e. 7 Clanbrasiliana stricta*.—This variety was found in the park at Florence Court, by Mr. Young, gardener there, who sent us a drawing of the bush, and a specimen, in 1834. The bush has a clear stem of about 1 ft. in height; the head is of a narrow ovate conical form; and the shoots are of upright rapid growth; forming, Mr. Young observes, a very beautiful shrub for a lawn. Plants of it have been sent, by Mr. Young, to Mr. Knight of the Exotic Nursery, King's Road, and to Messrs. Smith, nurserymen, Ayr.
- ♁ *A. e. 8 pygmaea*, *A. nana* in the Horticultural Society's Garden, *A. elegans Smith of Ayr*, is said to be a dwarfer plant than *A. e. Clanbrasiliana*. A specimen in the Horticultural Society's Garden, 2 years planted, was, in 1837, 6 in. high.
- ♁ *A. e. 9 tenuifolia*, *A. tenuifolia Smith of Ayr*, has very slender leaves and shoots. A plant in the Hackney arboretum is 1 ft. high.
- † *A. e. 10 gigantea*, *A. gigantea Smith of Ayr*.—There is a plant at Messrs. Loddiges's 1 ft. high, with leaves rather larger and stronger than those of the species.
- ♁ *A. e. 11 monstrosa*, *A. monstrosa Hort.*, has the shoots and leaves thicker than those of the species, and is said never to make any lateral branches. The plant in the Horticultural Society's Garden, after having been 12 years planted, consists of a single, upright, unnatural-looking, thickened shoot, 3 ft. in length, and densely covered with leaves.

Other Varieties. Bosc mentions a variety which was cultivated in the royal nurseries at Paris, and had been sent thither from the Vosges. It had the leaves flatter and more pointed than the common spruce, and different cones. Bosc says that this kind might, perhaps, form a distinct species; but that the plant was torn up when the royal nursery in which it grew was destroyed, and he had neglected previously to describe it. Hayes speaks of a seminal variety of the spruce, which has been denominated the long-coned Cornish fir, the cones being frequently nearly 1 ft. long; and of which, in the year 1790, there was a fine tree in the park of Avondale, in the county of Wicklow. (*Pract. Treat.*, p. 165.) Linnæus has five varieties in his *Flora Suecica*; but, as we are not aware of their having been propagated in British nurseries, we have not enumerated them. According to Gärtner, the species is exhibited in two forms, called the white and the red Norway spruce; one with pale, and the other with deep-coloured, cones; but the timber of both is white. Although these distinctions are not known in British gardens, we have thought it right to direct attention to them.

Description. The Norway spruce fir is the loftiest of European trees, attaining the height of from 125 ft. to 150 ft., or even, in some cases, 180 ft.; with a very straight upright trunk, from 2 ft. to 6 ft. in diameter; and with a very extending branches, which spread out regularly on every side, so as to form a cone-like or pyramidal shape, terminating in a straight arrow-

like leading shoot. The branches, in young trees, are disposed in regular whorls from the base to the summit; but in old trees the lower branches drop off, and the tree terminates in a pyramid of open angular branches, so that the regular whorls only occupy the middle portion of the tree. In young trees, the branches are nearly horizontal; but in old trees they droop gracefully at their extremities; and this pendulous disposition of the branches, joined to the dark sombre green of the leaves, gives to the whole tree somewhat of a gloomy or melancholy aspect. (See *fig. 2214.*, to a scale of 24 ft. to 1 in.) Between the regular whorls of branches, a few small abortive shoots appear occasionally. The bark of the trunk is rather thin, warty, and of a reddish brown, becoming wrinkled and scaly on old trees.

The roots are spreading, without a taproot, and with numerous fibres. The leaves are solitary, of a dark grassy green, generally under 1 in. in length, curved or bent, sharp-pointed, very straight and stiff, and more crowded together laterally than on the upper and under sides of the branchlets. The male catkins are numerous, solitary, in pairs, or a few together; from $\frac{1}{2}$ in. to 1 in. in length, on long peduncles; cylindrical, generally curved, of a yellowish colour, tipped with red; resembling at first a half-ripe strawberry, but gradually lengthening and becoming looser; and, when ripe, discharging a great quantity of yellow pollen from the anthers.

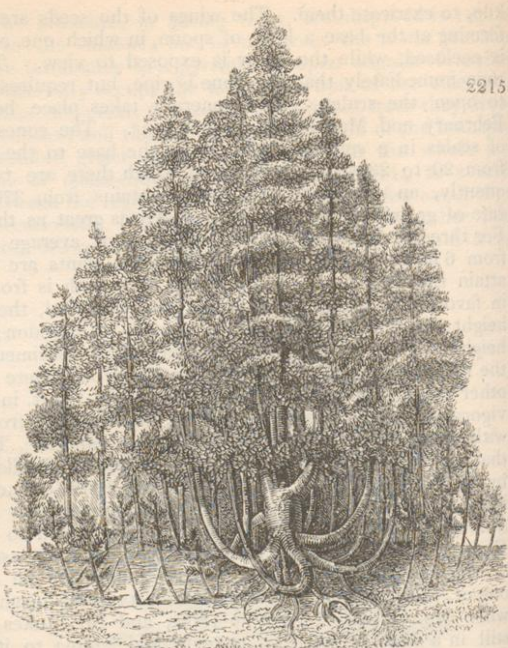
The female catkins are produced at the extremities of the branches; and the cones, as they ripen, become pendent. When in flower, the catkins are red or purplish, and pointed; but they soon take the form of a cone, or, rather, pointed cylinder; their colour then becomes greenish, and this changes, as they ripen, into a rich reddish brown. In different soils and situations, the colour of the female catkins, when in flower, varies from a dark red or purple to a pale red or yellow, or even to a greenish hue. The ripe cones are from 5 in. to 7 in. in length, and from $1\frac{1}{2}$ in. to 2 in. broad. The scales are rhomboidal, slightly incurved, and rugged or toothed at the tip, with two seeds in each scale. The seeds are very small, and resemble those of *P. sylvestris*; but are sharper-pointed, of a deep reddish brown, and rougher to the touch. In Germany, according to Hartig, they are frequently used for adulterating those of *P. sylvestris*, as they are obtained from their cones with scarcely any trouble; while those of *P. sylvestris* require considerable time and labour, and very frequently the employment of a



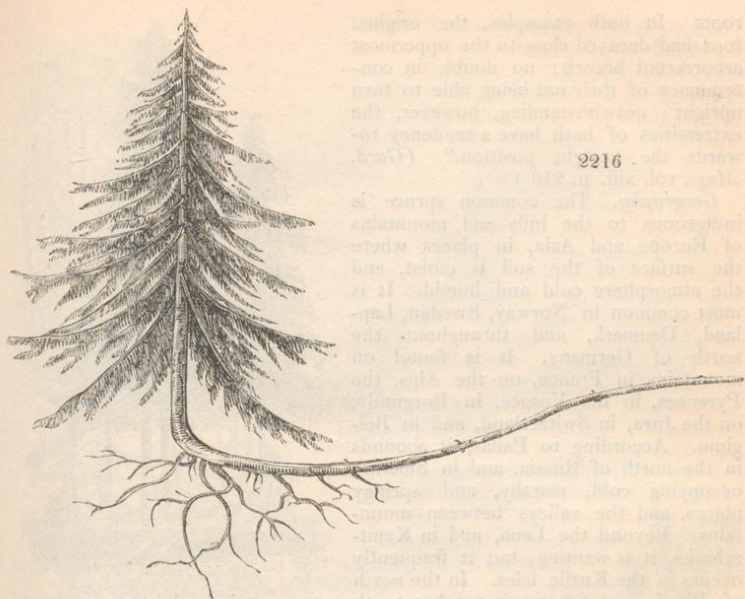
kill, to extricate them. The wings of the seeds are oval, and pale brown; forming at the base a kind of spoon, in which one of the sides of the seed is enclosed, while the other is exposed to view. The seed does not escape immediately that the cone is ripe, but requires heat and drying winds to open the scales. This generally takes place between the months of February and May of the second year. The cones have each eight rows of scales in a spiral direction from the base to the summit; each row has from 20 to 23 scales, in each of which there are two seeds; and, consequently, an ordinary-sized cone contains from 320 to 368 seeds. The rate of growth in the spruce is nearly as great as that of the Scotch pine. For three or four years, at first, it does not average a growth of more than from 6 in. to 8 in. a year; but, after the plants are 3 ft. high, and till they attain the height of 50 ft., the rate of growth is from 2 ft. to 3 ft. a year, in favourable soils. In 10 years from the seed, the plants will attain the height of 12 ft. or 15 ft. in the climate of London; and, in 50 years, the height of from 90 ft. to 100 ft. The tallest specimens that we know of in the neighbourhood of London are at Syon, where it is drawn up among other trees, with a slender trunk, to nearly 100 ft. in height; but the most vigorous specimens are at Whitton, and they are from 85 ft. to 90 ft. high, with trunks from 2 ft. to 2 ft. 6 in. in diameter. The largest in England, that we have had any account of, is a tree at Studley, of which a portrait by H. W. Jukes, Esq., is given in our last Volume, and which is 132 ft. high, with a trunk 6 ft. 5 in. in diameter, regularly clothed with branches from the base to the summit. This tree is said to have been planted by Eugene Aram, who was steward of the Studley estate, about the middle of the last century. This spruce stands in the pleasure-grounds, near one of the cascades. We remarked its great height and fine appearance when we visited Studley, in 1806; and Mr. Jukes informs us that it is still in a state of vigorous growth, and adding to its height yearly. The lower branches form an ample canopy, beneath which a person may stand, and look up close to the bole of the tree to its very summit; the insertions of the branches being naked, the trunk perfectly straight, and the remainder of the branches being densely clothed with leaves, and forming a thick casing which excludes the light, and acts on the vision of a spectator below like the tube of a telescope. The duration of the tree in its native habits is considered to be from 100 to 150 years. The trunk seldom, if ever, attains so great a thickness as that of *P. sylvêstris*; but it is uniformly straighter; and the wood is whiter, more elastic, less resinous, and consequently lighter, than the timber of that tree.

From the pendent habit of the lower branches of the spruce, some curious anomalies are occasionally found in its habit of growth. The shoots next the ground, when they have attained a considerable length, naturally rest on the soil at their extremities; and the soil being kept moist by the shade of the branches, these often root into it; and the points of their shoots taking a vertical direction, a series of new trees are formed in a circle round the old tree. Some of the most remarkable examples of this kind that we are aware of are to be found at the Whim, an estate formerly belonging to the Duke of Argyll whose name, as an arboriculturist, has been so frequently mentioned in this work. An account of these spruces has been given in the *Gardener's Magazine*, by Mr. James M'Nab, of the Experimental Garden, Edinburgh, from which the following is an extract:—"The Whim is situated on the high grounds bordering the Pentland range of hills, 14 miles south-west of Edinburgh. The soil is chiefly composed of brown moss or bog earth, which is deep and spongy; the subsoil is various, but is chiefly a retentive whitish clay. A large proportion of this property was planted with the Norway spruce and a few black spruces, by the Duke of Argyll, soon after 1730. Nearly all the fine old specimens of spruces and other trees on this estate were cut down about 1810; but there are still some spruce firs, about 60 ft. high.

The girth of the largest common spruce on the estate is 5 ft. 10 in. at the surface of the ground; and that of the largest black spruce is 5 ft. 1 in. The peculiarities of growth which we have mentioned are shown in several specimens in different parts of the property; the most fantastic of which is one growing in the centre of a piece of elevated mossy ground, about an acre in extent, and within the boundary of the kitchen-garden wall, called the Wilderness. This tree has received the appellation of the Travelling Fir, on account of its branches having taken root



wherever they have come in contact with the soil. In this specimen (*fig. 2215.*, to a scale of 1 in. to 12 ft.), many natural layers from the trunk, and from the primary substems, have taken root, so as to form a double series of young trees, in two concentric circles round the parent trunk. The depth of the peat soil where this remarkable spruce grows is about 14 ft. That portion of the branch which is between the trunk of the original tree and the part where it roots into the ground, and which is sometimes several feet in length, rarely increases in diameter after its extremity has rooted (as shown in *fig. 2216.*, to a scale of 2 in. to 4 ft.). If these horizontal branches do increase in diameter, it is in a very slight degree; as some branches proceeding both from the main trunk and from primary substems, in the first concentric circle of young trees formed by them, vary from 2 ft. to 6 ft. in length, and are only from 1½ in. to 2 in. in diameter; while their extremities, which have rooted in the ground, and assumed the appearance of stems, vary from 6 in. to 2 ft. in circumference. The branches proceeding from the primary substems have also branches, equally healthy with themselves, proceeding from them, and with every appearance of their producing others; which, if allowed room, may, in course of time, cover the whole Wilderness. That portion of the main stem, or trunk of the parent tree, which remains above the surface of the soil, is little more than 4 ft. high before upright branches are produced; and it is 7 ft. in its greatest circumference. These upright branches, or rather limbs, are from 30 ft. to 35 ft. in height. The primary substems, which constitute the inner concentric circle of young trees, vary from 8 ft. to 25 ft. in height; and the secondary substems, which form the trees of the outer circle, are from 4 ft. to 10 ft. high. There are upwards of thirty rooted stems surrounding the mother tree; and 30 ft. is the greatest diameter of the space covered by stoloniferous branches; though in one case a secondary layer has reached as far as 18 ft. from the main trunk. The other specimens of this kind of tree were far inferior in size to the one now described; perhaps owing to the cattle browsing the side shoots, and destroying the tops of the young offspring;



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whereas no cattle could enter the Wilderness to injure the spruce growing there. Besides the tree mentioned, other anomalies, equally interesting,

occur in two specimens, also of Norway spruce, which were blown down a great many years ago. The gardener, Mr. Young, has been at the Whim 15 years; and, during that period, no difference, he says, has been observable on the horizontal portions; but he knows considerable alteration in the upright stems, both as regards their circumference and height. One of these is called the Man-of-War Spruce. (*Fig. 2217.*, to a scale of 1 in. to 12 ft.) It has four stems, differing in height and distance from each other, as represented in the figure; the tallest being 34 ft. in height from the ground. At first sight, this tree seems to derive its principal nourishment from the lower portion of the root, at the extremity of the fallen stem: such, however, is not the case; for, on digging beside the horizontal trunk, several strong roots were found to have proceeded from the under portion of it, and these roots spread out many feet, at a few inches under the surface. In the other specimens (*fig. 2218.*, to a scale of 1 in. to 12 ft.), roots were seen protruding above ground, from the side of the horizontal stem; and, when examined by digging, the under surface was also found to have produced

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was also found to have produced

roots. In both examples, the original tops had decayed close to the uppermost arborescent branch; no doubt, in consequence of their not being able to turn upright: notwithstanding, however, the extremities of both have a tendency towards the upright position." (*Gard. Mag.*, vol. xiii. p. 249.)

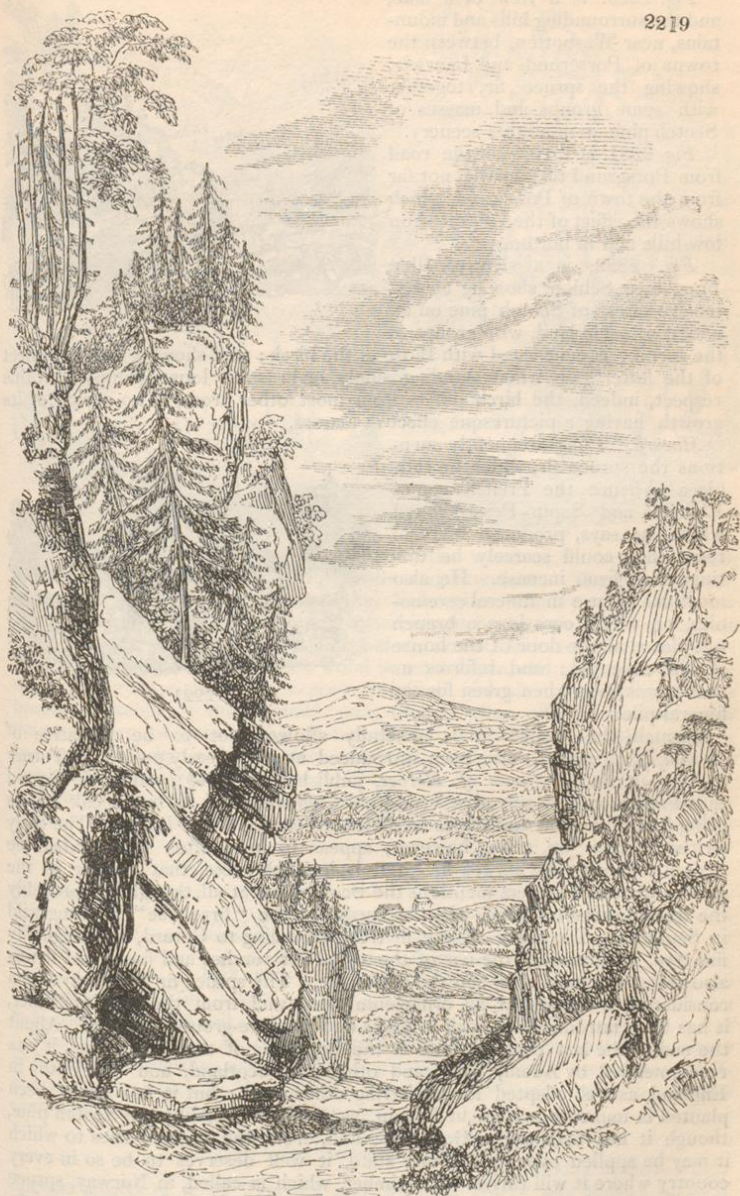
Geography. The common spruce is indigenous to the hills and mountains of Europe and Asia, in places where the surface of the soil is moist, and the atmosphere cold and humid. It is most common in Norway, Sweden, Lapland, Denmark, and throughout the north of Germany. It is found on mountains in France, on the Alps, the Pyrenees, in the Vosges, in Burgundy, on the Jura, in Switzerland, and in Belgium. According to Pallas, it abounds in the north of Russia, and in Siberia; occupying cold, marshy, and springy places, and the valleys between mountains. Beyond the Lena, and in Kamtschatka, it is wanting; but it frequently occurs in the Kurile Isles. In the north of Russia and Siberia, it reaches to the arctic circle, and in some places beyond it; and in the north of Sweden and Lapland, as far as N. lat. 69°. It grows on the Swedish mountains at the elevation of 2000 ft., where *P. sylvestris*, according to Dr. Agardh (*Gard. Mag.*, vol. xii. p. 63.), is found principally in the plains. On the Lapland mountains, it grows at the height of 1000 ft. The spruce, in Norway, according to Schouw, extends to N. lat. 70°, and there grows at an elevation of 750 ft. In the south of Norway, it grows at the height of 3000 ft. The order of hardiness of the Scandinavian trees, according to Schouw, is: 1. the birch, which grows nearest the summits of the mountains; 2. the spruce fir; and, 3. the Scotch pine. The superior hardiness of the spruce to any other trees of the pine and fir tribe is thus established beyond a doubt. (See *Gard. Mag.*, vol. xii. p. 60.) The soil in which the spruce fir is generally found differs from that in which the Scotch pine abounds, in being softer and moister on the surface. Among dry rocks and stones, where the Scotch pine would flourish, the spruce fir will scarcely grow. The spruce fir, on the Alps of Switzerland, is frequently found above 150 ft. in height, with trunks from 4 ft. to 5 ft. in diameter, growing in moist soil in mountain valleys; and the timber of these trees is hard, tough, and very durable. The finest forests of this tree which we have seen are on the southern shores of the Baltic, between Memel and Königsberg, where the surface consists of a thin stratum of black peaty soil, incumbent on a bed of sand, and the whole of which is under water a great part of every winter. We have also seen the tree making a fine appearance on rocky banks in different parts of Sweden; but scarcely anywhere in that country is it to be found in situations so grand and picturesque as it is in Norway.

In the year 1817, and subsequently, a great many views in Norway were taken by James White, Esq., all of which he has kindly lent to us; and, from these we have made a selection to show the effect of the spruce fir, the Scotch pine, and, as connected with them, the common birch, in landscape scenery.

Fig. 2219. is a view of the Pass of Kroglevin, on the road to Ringerike,



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near the Lake of Tiri Fjord, showing the effect of the spruce fir and the Scotch pine, on rocky precipices. The lake seen in the middle distance is Tiri Fjord.

Fig. 2220. is a view of a lake, and the surrounding hills and mountains, near Wasbotten, between the towns of Porsgrund and Laurwig, showing the spruce fir, together with some groups and masses of Scotch pine on mountain scenery.

Fig. 2221. is a view on the road from Porsgrund to Laurwig, not far from the town of Porsgrund, which shows the effect of the spruce fir on low hills and in bottoms.

Fig. 2222. is a view of Illoe Fors, near Schion, showing an extensive forest of Scotch pine on an extent of table land, with groups of the spruce, as contrasted with those of the birch; and showing the fine effect of the latter tree when standing singly, or in small loose groups. In this respect, indeed, the birch differs from most other trees, at no period of its growth having a picturesque effect in masses.

History. Pliny frequently mentions the spruce fir, which he calls *picea* (whence the French names *E'picea* and *Sapin-Pesse*), and which, he says, produced tears of resin that could scarcely be distinguished from incense. He also mentions its use in funeral ceremonies, on which occasions a branch was placed at the door of the house of the deceased; and informs us that it was used when green for the funeral pile.

Though the spruce fir is generally allowed not to be a native of Britain, it appears to have been introduced at a very early period, as Turner includes it in his *Names of Herbes*, published in 1548; and both Gerard and Parkinson not only give very good engravings of it, but speak of its being found in great quantities in different parts of the island. The early British writers on trees, however, appear to have often confounded the Scotch pine with the spruce fir; and it is remarkable, that neither of the above-mentioned writers mentions the Scotch pine at all, though it is probably the tree Parkinson means, when he speaks of the "firre tree" growing wild in Scotland. The name of the fir tree, according to Gerard, was originally fire tree, in allusion to the use of the wood for torches and fuel; and it was also called the mast tree, and the deal tree. The spruce fir has always been considered, in Britain, as an ornamental tree; and, from the time of Miller, it has been introduced as such in parks and pleasure-ground scenery. About the end of the last century, and in the beginning of the present one, it was recommended by Adam, Sang, and others, in Scotland, and by Pontey in England, as well adapted for sheltering other trees; but it has never been planted in immense masses in Britain, as a timber tree, like the Scotch pine, though it has been so in Germany; and, from the various uses to which it may be applied even in a young state, it well deserves to be so in every country where it will thrive. The timber, which is called, in Norway, spruce pine, has been for an unknown period imported from that country into Britain, chiefly in the form of entire trunks, which are used for scaffolding-poles, spars, oars, and masts for small craft; but partly, also, sawn into planks or deals, known in commerce as white deal, white Baltic deal, and white Christiania deal; the red deal being, for the most part, the timber of *P. syl-*



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vétris; though, as before stated, p. 2294., the wood of the spruce is red, when the tree is grown in certain soils and situations. The poles, spars, and oars are the thinnings of the Norwegian woods; and the deals and planks are made from the larger trees, which are left. The slenderest poles are taken from the largest and oldest woods, and are called seedlings: they are always found where the wood is most dense, and very often close by the side of a large tree. They grow very tall and slender, wholly without branches, except at the summit, and, though often only a few inches in diameter, are of great age. Some curious information on this subject, communicated by a Norwegian woodman, will be found in Montearth's *Forester's Guide*, from p. 226. to p. 232.

Poetical Allusions. According to some, the spruce fir was dedicated to Diana. Virgil speaks of it as being used in the funeral ceremonies of Misenus: —

“Procumbunt piceæ.” *Æn.*, vi. 180.

He also says: —

“Lucus in arce fuit summa,
Nigranti picea, trabibusque obscurus acernis.” *Æn.*, ix. 87.

A grove waved on the summit of the hill,
Dark with black picea, and the lofty maple.

In the *Georgics* (lib. ii. 257.), Virgil speaks of the spruce fir as one of the indications of a cold soil.

The British poets so often mention the Scotch pine under the name of fir, which name they also apply to the spruce fir, that it is sometimes difficult to know which of these trees is meant; the following quotations, however, appear to belong to the spruce: —

“Here spiry firs extend their lengthen'd ranks,
There violets blossom on the sunny banks.”

FAWKES'S *Bramham Park*.

Spenser speaks of it as “the fir that weepeth still;” and Fairfax terms it “the weeping fir;” both evidently alluding to the pendulous disposition of the branches. Prior, also, says: —

“There towering firs in conic forms arise,
And with a pointed spear divide the skies.”

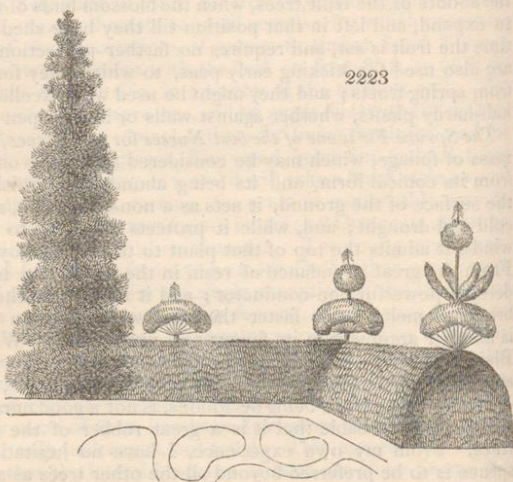
Properties and Uses. The wood of the spruce fir is light, elastic, and varying in durability according to the soil on which it has grown. Its colour is either a reddish or a yellowish white, and it is much less resinous than the wood of *P. sylvestris*. According to Hartig, it weighs 64 lb. 11 oz. per cubic foot when green, 49 lb. 5 oz. when half-dry, and 35 lb. 2 oz. when quite dry; and it shrinks in bulk one seventieth part in drying. The value of the wood for fuel is to that of the beech as 1079 is to 1540; and its charcoal is to that of the beech as 1176 is to 1500. Both as fuel and charcoal, the spruce fir is superior to the silver fir. As fuel, it is to the silver fir as 1211 to 1079; and as charcoal, as 1176 to 1127. The ashes furnish potash; and the trunk produces an immense quantity of resin, from which Burgundy pitch is made. The resin is obtained by incisions made in the bark, when it oozes out between that and the soft wood; and the mode of procuring and manufacturing it will be detailed hereafter. The bark may be used for tanning; and the buds and young shoots for making spruce beer, the details respecting which will be given under the head of *A. nigra*. The cones, boiled in whey, are considered good in cases of scurvy. The principal use to which the wood is applied is, for scaffolding-poles, ladders, spars, oars, and masts to small vessels; for which purposes, the greater proportion of the importations of spruce fir timber from Norway are in the form of entire trunks, often with the bark on, from 30 ft. to 60 ft. in length, and not more than 6 in. or 8 in. in diameter at the thickest end. The planks and deals are used for flooring rooms, and by musical instrument makers and carvers; they are also used by cabinet-makers for lining furniture, and for packing-boxes, and many similar purposes. The wood, being fine-grained, takes a high polish, and does well for gilding on; and it will take a black stain as well as the wood of the pear tree. In carving, the grain is remarkably easy to work, taking the tool every way. No wood glues better; and hence its great use for lining furniture, and making musical instruments. The young trees, especially when the bark is kept on, are found to be more durable than young trees of any other species of pine or fir, with the single exception of the larch; and for this reason they are admirably adapted for fencing, for forming roofs to agricultural buildings, and for a variety of country purposes. The durability of young trees of the spruce fir was first pointed out by Pontey in his *Profitable Planter*; and the circumstance which led him to discover it was, the sound state in which he found the dead branches in spruce fir plantations, which, though probably some of them had been dead more than twenty years, he uniformly found not only undecayed, but tough. This agrees with an observation of Mitchell, that the lateral branches of both the silver fir and the spruce fir are so full of turpentine, as to be as red as brick, and 4 lb. per foot heavier than oak. On further examination, Pontey discovered that young trees, which had been employed as beams in buildings, were perfectly sound at the end of 24 years; the bark, which had been left on, being also perfectly sound. There are but few spruce fir trees in Britain old enough to produce timber of large dimensions; but some of the older trees cut down at Blair, on the estate of the Duke of Athol, have been used as spars and topmasts, and found equal in quality to those imported from Norway. The value of the bark for tanning is nearly equal to that of the birch and the larch, quite equal to that of the silver fir; and much stronger than that of the Scotch pine. In Sweden, and also (according to Kasthofer) in Switzerland, the young shoots form a winter food for cattle and sheep. The inhabitants of Finmark mix the points of the shoots with the oats given to their horses; and the Laplanders eat an excrescence about the size of a strawberry, which they collect from the extremity of the branches, where it is produced by the puncture of insects. The floors of rooms in Norway and Sweden, we are informed by Mary Wolstonecroft, and also by Samuel Laing, Esq., (the author of *Journal of a Residence in Norway during the Years 1834-35-36*), are, at least once a week, strewed over with the green tops of the fir or juniper; which, on a white well-scoured deal floor, have a lively and pretty effect, and prevent the mud on the shoes from adhering to and soiling the wood, giving out at the same time,

when trodden on, a refreshing odour; the more necessary in countries where the rooms being heated by stoves, for the sake of saving fuel, are badly ventilated. At funerals, the road into the churchyard and to the grave is strewed with these green sprigs; the gathering and selling of which is a sort of trade for poor old people about the towns. In both Sweden and Norway, the inner bark is made into baskets; and the canoes, which are made of the timber of the large trees, and which are so light, as Acerbi informs us, as to be carried on a man's shoulders when a rapid or cascade interrupts the navigation, have their planks fastened together with strings or cords made of the roots, so that not a single nail is used in their construction. The long and slender roots are made use of to form this kind of strings; and they are rendered flexible by splitting them down the middle, and by boiling them for two or three hours in water mixed with alkali and sea salt. After this, they are dried and twisted into cordage, which is used as a substitute for hemp, both for naval and agricultural purposes. In Britain, the frond-like branches form an excellent protection to the blossoms of fruit trees on walls; being tucked in among the shoots of the fruit trees, when the blossom buds of the latter are beginning to expand, and left in that position till they have shed their leaves; by which time the fruit is set, and requires no farther protection. Spruce fir branches are also used for sticking early peas, to which they form a secure protection from spring frosts; and they might be used with excellent effect for protecting half-hardy plants, whether against walls or in the open garden.

The Spruce Fir is one of the best Nurses for other trees, not only from its dense mass of foliage, which may be considered as a reservoir of heat, but because, from its conical form, and its being abundantly furnished with branches on the surface of the ground, it acts as a non-conductor, and keeps the soil from cold and drought; and, while it protects the plant to be sheltered from high winds, it admits the top of that plant to the free enjoyment of light and air. From the great abundance of resin in the leaves and bark, the tree is considered a powerful non-conductor; and it is said that the snow that falls on its branches melts much faster than that which falls on any other tree, which is another argument in its favour as a nurse plant. William Adam, Esq., of Blair, in Kinross-shire, a planter of great experience, gave the following opinion as to the comparative merits of the larch, the spruce, and the silver fir, in 1794:—“The larch being deciduous, is not a good nurse; and, from its quick growth, it is probable that it is a great robber of the nourishment of other trees. From my own experience, I have no hesitation in saying that the spruce is to be preferred beyond all the other trees as a nurse. I have thousands of instances of oaks and elms growing up uninjured in the bosom of spruces. The fact is most important, and reason at the same time supports it. Deciduous trees send their roots downwards, particularly the oak: the spruce spreads its roots close under the surface; and their nourishment is drawn from different sources. The larger the oak grows, the more it derives its nourishment from the subsoil, and, consequently, the less its roots interpose with those of the spruce. This last rises, in a regular and very pointed cone, so that it leaves full space for the spreading top of the oak. The spruce is thickly clothed with leaves, and its branches are of a strong unpliant nature; consequently, it gives much protection, and does little injury to its neighbour; and, as it is very much feathered and bushy at the root, it protects the forest tree from being wind-waved. The larch, on the contrary, is naked of leaves during the worst of the season; and, from its boughs being thin and pliant, it lashes the neighbouring trees unmercifully, and it is in a condition, from its nakedness, to make every lash be felt just at the time when its neighbours begin to spring. It has also no peculiar thickness at the bottom, to protect the others from wind-waving. It might be supposed that the silver fir would make as good a nurse as the spruce; but, in point of fact, I have not observed that the forest tree grows so kindly with this fir as with the spruce; and it may be observed that the silver fir is not so thoroughly leaved as the spruce: the sides of the bough only are covered with leaves; and the tree itself is

not so well clothed, especially near the surface of the earth." (*Gen. Rep. Scot.*, vol. iv. p. 477.)

No tree is better adapted than the spruce fir for planting in narrow strips for *shelter or seclusion*; because, though the trees in the interior of the strip may become naked below, yet those on the outside will retain their branches from the ground upwards, and effectually prevent the eye from seeing through the screen. The tendency of the tree to preserve its lower branches renders it an excellent protection to game; and for this purpose, and also for the sake of its verdure during winter, when planted among deciduous trees, and cut down to within 5 ft. or 6 ft. of the ground, it affords a very good and very beautiful undergrowth. The tree bears the shears; and, as it is of rapid growth, it makes excellent hedges for shelter in nursery gardens. Such hedges are not unfrequent in Switzerland, and also in Carpathia, and in some parts of Baden and Bavaria. In 1814, there were spruce fir hedges in some gentlemen's grounds in the neighbourhood of Moscow, between 30 ft. and 40 ft. high. At the Whim, already mentioned, p. 2297., a spruce fir hedge (*fig. 2223.*) was planted, in 1823, with plants 10 ft. high, put in 3 ft. apart; and, with the exception of three left to shoot up, for the purpose of being clipped into ornamental figures, the whole were cut down to 5 ft., and afterwards trimmed to the shape represented in the figure. The hedge was first cut on January 25., the year after planting; and, as the plants were found to sustain no injury, about the end of that month has been chosen for cutting it every year since. Every portion of this hedge, Mr. M'Nab observes, "is beautiful and green; and the annual growths are very short, giving the surface of the hedge a fine healthy appearance." (*Gard. Mag.*, vol. xiii. p. 254.)



As an ornamental tree, all admirers of regularity and symmetry are partial to the spruce, unless we except the author of the *Planter's Kalendar*, who says that, next to the Lombardy poplar and the Scotch pine, it is the least ornamental of common trees; the meaning of the writer probably being, that it has less variety in itself. Gilpin is evidently no great admirer of the tree; but still he allows it to have its peculiar beauties. "The spruce fir," he says, "is generally esteemed a more elegant tree than the Scotch pine; and the reason, I suppose, is, because it often feathers to the ground, and grows in a more exact and regular shape: but this is a principal objection to it. It often wants both form and variety. We admire its floating foliage, in which it sometimes exceeds all other trees; but it is rather disagreeable to see a repetition of these feathery strata, beautiful as they are, reared tier above tier, in regular order, from the bottom of a tree to the top. Its perpendicular stem, also, which has seldom any lineal variety, makes the appearance of the tree still more formal. It is not always, however, that the spruce fir grows with so much regularity. Sometimes a lateral branch, here and there, taking the lead beyond the rest, breaks somewhat through

the order commonly observed, and forms a few chasms, which have a good effect. When this is the case, the spruce fir ranks among picturesque trees. Sometimes it has as good an effect, and in many circumstances a better, when the contrast appears still stronger; when the tree is shattered by some accident, has lost many of its branches, and is scathed and ragged. A feathery branch, here and there, among broken stumps has often an admirable effect; but it must arise from some particular situation. In all circumstances, however, the spruce fir appears best either as a single tree, or unmixed with any of its fellows; for neither it, nor any of the spear-headed race, will ever form a beautiful clump without the assistance of other trees." (*For. Scen.*, i. p. 93.) "Luxuriantly as the spruce fir grows with us in Britain," says Sir Thomas Dick Lauder, "we must crave for it the same justice we have demanded for the Scotch pine, and deprecate any rash judgment being formed, either on its external appearance, or on its timber, from any other than the specimens exhibited in its native forests; where individuals are to be found 150 ft. high, and with trunks 5 ft. in diameter. The spruce fir is the great tree of the Alps; and, so far as our opinion of its effect in landscape may go, we can only say that, with us, it is so mentally associated with the grandeur of Swiss scenery, that the sight of it never fails to touch chords in our bosom which awaken the most pleasing recollections. What can be more truly sublime than to behold, opposed to the intensely blue ether, the glazed white summits of Mont Blanc, or the Jungfrau, rising over the interminable forests of spruce firs which clothe the bases of the mountains; whilst some such gigantic specimens as those we have been noticing rise in groups among the rocks before us, many of them shivered, broken, and maimed by tempests, their dark forms opposed to all the brilliant prismatic hues of some immense gorgeous glacier, which nourishes in its vast bosom a mighty river, that is doomed to fertilise and to enrich whole kingdoms." (*Lauder's Gilpin*, i. p. 178.) Sir James Edward Smith observes that the long, sweeping, fan-like branches of the spruce, after broken down by loads of snow, and boisterous winds, have a grand effect in alpine landscapes, and have been well employed in the sublime compositions of Salvator Rosa and the German engravers.

The resinous Products of the Spruce Fir are of a different kind from those of most of the trees of the genus *Pinus*. The sap does not flow from the tree in the form of turpentine, but slowly oozes out from between the bark and the soft wood, hardening by exposure to the air. The principal product of this tree is the Burgundy pitch of the shops, which is the congealed sap melted, and clarified by boiling it in water. To collect it, the operator, in spring, before the sap is in motion, cuts out a strip of bark 3 ft. long, and 1 in. or $1\frac{1}{4}$ in. wide, vertically from the south side of the tree, as deep as the soft wood, but without wounding it. This is done with an instrument made on purpose, resembling a knife, with a crooked blade at one end, and a flat blunt piece of iron at the other. The lower part of the incision, which is brought down to within 20 in. of the ground, is cut sloping, so as to prevent the rain water from lodging in the groove. As soon as the sap is in motion, the sides of this groove begin to fill with resinous matter, which, however, accumulates very slowly; and it is not till the month of July or August in the following year that the groove will be full; when the resin is scraped out with the hooked-bladed knife before mentioned, and put into a conical basket, or scuttle, made of bark, till wanted for manufacturing. In the spring of the next year, a thin slice of bark is cut off each side of the groove; and in the August of the year following, a second crop of resin is obtained; but this is much inferior to the first. As the process may be carried so far as to destroy the tree, the following rules have been laid down by Hartig for procuring the resin:—1st, To choose the trees only from forests destined to furnish wood for fuel. 2dly, Not to begin to extract resin till within 10 or 12 years of the period when the trees are destined to be cut down; and

not to collect resin more than five or six times from each tree. 3dly, Not to scrape off the resin before the month of July or August of the year after that in which the groove has been made, or its edges fresh-pared, in order to give the resin time to harden, and the bark under it to heal sufficiently to prevent the rain from rotting the wood; and, 4thly, Not to make more than one groove at a time upon a tree if it be small, or two if it be large; and never to make the grooves more than 4 ft. in length or, more than 1 in. or $1\frac{1}{2}$ in. in width. Attempts have been made to show that resin may be procured from trees artificially, without seriously injuring them; and one author (M. Burgsdorf) asserts that, if the spruce fir has attained its full growth, all its resin may be extracted from it without injuring the quality of the wood for fuel or charcoal; while another (M. Malus) assures us that the timber of the tree may still be used even for the purposes of construction. Du Hamel, Hartig, and most other authors, however, are of a very different opinion; Hartig having found that carrying the process of extracting the resin to an extreme degree, not only renders the wood unfit for the purposes of construction, but even makes it almost useless for fuel. In Sweden, and on the southern shores of the Baltic, a similar opinion prevails; and the resin is there only collected from those trees which have been pruned; in which case it generally oozes out from the wound.

Mode of preparing the Burgundy Pitch. This pitch, or rather resin, is principally made in the Vosges. The slightest scar in the bark of the tree will be sufficient to make the resin ooze out; but it must be observed that it never flows to the ground like turpentine, but congeals as soon as it issues from the wound, and remains attached to the bark in tears or crystals, something like the gum of cherry trees. To procure the sap in abundance, it is necessary, as we have already observed, to take off a narrow strip of bark, which is done with the broad end of the instrument before mentioned, or with a small hatchet; great care being taken not to wound the wood. The resin from young trees is softer than that from old ones; but it is always dry enough to be put into bags, in which it is kept till a sufficient quantity is collected. To prepare the pitch, it is first necessary to melt the resin; and, for this purpose, caldrons are set in masonry, in such a manner that the fire only touches the bottom of the caldron; and the chimney is carried to such a height, or to such a distance, as to prevent all danger of the flame issuing from it being driven by the wind or other causes on the resin. A quantity of water is then put into the caldron so as to fill it 4 in. or 5 in. high; and into this the resin is put a little at a time, till the caldron is about four fifths full. A gentle fire is then lighted below, which is gradually augmented, till the water boils, and the resin is all melted. It must now be gently stirred; after which, the fire is withdrawn, and the resin is in a state for being purified. This is done by pouring the liquid from the caldron into a bag made of coarse linen, which has been previously wetted; filling it not more than two thirds, and afterwards putting it under a light press. The resin flows pure and clear into small casks made of fir wood; and in this state it is the yellow Burgundy pitch of commerce. The refuse left in the sack, being pressed a second time, yields a blacker resin, which is used for the same purposes as the colophony of the pine; and what remains, after this has been pressed out, is burned in order to make lampblack. In general, 100 lb. of resin, as collected from the tree, yields 50 lb. of Burgundy pitch, and 2 lb. of colophony. Trees grown on fertile soils are said to yield a greater proportion of resin than those grown on poor soils; and the pitch is said to be better when the resin has been collected in a hot dry summer, than in a cold and humid one. An essential oil is produced from the Burgundy pitch, by distillation; but it is very inferior to spirit of turpentine. A strong and vigorous spruce fir will yield, every second year, from 40 lb. to 50 lb. of congealed resin; and this may be collected for from 20 to 25 years, if no other value is set on the tree; but, if the collection of the sap be continued for this length of time, the tree becomes

rotten and decays, giving birth to myriads of insects, which seriously injure the surrounding trees. It is therefore better to cut the trees down after extracting the sap for 10 or 12 years, as before advised; because the wood may then probably be used for packing-boxes, &c., and, at any rate, will be good for fuel and charcoal.

Soil, Situation, Propagation, and Culture. All agree that the spruce fir requires a soil somewhat moist. Like all other firs, Sang observes, it will grow and thrive in soils of very different qualities; but it never attains large dimensions in shallow soils and exposed places. On dry soils, it invariably becomes stunted, produces a great number of cones at an early age, and soon dies. The check given to large trees by transplanting also throws them into bearing; by which means, even in the most suitable soils, the progress of the tree in making wood is much impeded. Hence, in the case of the spruce, as in all the other *Abiétinæ*, the great advantage of transplanting the tree when young. The spruce fir grows most luxuriantly in deep loams and low situations; or on acclivities with a north-east aspect, and a moist sandy soil; in which last situation, at Blair and other places in Scotland, it is found to produce timber as strong and durable as that imported from Norway. The mature cones may be gathered any time between November and April: they should be chosen from healthy vigorous trees, and exposed to the heat of the sun, placed in a warm room, or slightly dried on a kiln; after which, the seeds will drop out by merely shaking the cones, or gently thrashing them. Fifteen gallons of cones will produce 2 lb. of seeds with their wings, or 1 lb. 4 oz. without them. After being collected, the seeds may be kept three or four years, and will still preserve their vitality; but it is always safest to sow them immediately after taking them from the cones, or in the course of the following March or April. The seeds of the spruce fir, being nearly of the same size as those of the Scotch pine, may be treated in the nursery in a similar manner (see p. 2179.); but, as the plants, when they come up, are more prolific in fibrous roots, and less so in shoots and leaves, they may be kept in the nursery, by frequent transplanting, till they attain a much larger size. The most convenient time for planting them where they are finally to remain is after they have been two years in the seed-bed, and one year transplanted; and the operation should never be performed but in mild weather, and when the air is somewhat moist. Where the seeds are to be sown to grow up at once into a plantation, without transplanting, the same quantity may be used as in the case of the Scotch pine (see p. 2178.). In Germany, and in some parts of France, according to Baudrillart, the seeds of the common spruce are sown along with those of oats, rye, or barley, at the rate of from 2 quarts to 4 or 5 quarts per acre; and, after the crop of corn is removed, the ground is enclosed, and left to become a spruce fir wood. The same thing is practised with the Scotch pine, and various other forest trees. The first year from the seed, young plants of the spruce fir make very little progress, not producing more than eight or nine leaves, and not rising higher than from 1 in. to 2 in. The second year, they push from 2 in. to 4 in.; and the third year they put out lateral branches. The fourth and fifth years, the plants begin to grow fast, showing whorls of branches in the same manner as full-grown trees. The period of growth for the annual shoots, from this year, and ever afterwards, is from two to two and a half months; but the roots continue growing the whole summer. The eighth year, the length of the leading shoot will be from 2 ft. to 3 ft. Where the tree is grown principally for its branches, either as undergrowth for hedges, or as strips for shelter or seclusion, the plants ought to be placed 5 ft. or 6 ft. apart, and thinned out as soon as they touch each other; but, where they are planted in masses for the purpose of producing rods for stakes, or poles for hops, fencing, or spars, they may be planted from 3 ft. to 6 ft. apart every way, and not thinned till they are of such a length as to be sufficient for some useful purpose. Full-grown plantations of spruce firs should be thinned either by cutting out the smallest, where the

main object is to produce timber trees; or by cutting out the largest when fit for poles, if this be the main object. Very little pruning is required for the spruce fir, except in the case of large trees; when the lower branches may be cut off close to the stem, to the height of a fourth, or from that to a third, part of the height of the whole tree. When pruned, the branches ought to be cut off close to the stem, in order that the wound may heal over as speedily as possible. Hayes mentions a practice adopted by a gentleman in Ireland, of cutting off every other tier of branches, for the purpose of strengthening those which were left; and, by allowing the branches to hang down more freely, thus to increase the picturesque appearance of the tree. (*Pract. Treat.*, p. 166.) At whatever age the trees are cut down, the roots ought to be grubbed up, as they furnish a valuable material for fuel or charcoal. The season of felling, where the bark is to be kept on, should be mid-winter, when the sap is in its most dormant state: but, where the bark is wanted for tanning, May is preferable; because then the sap is in motion, and the bark easily separates from the wood.

Statistics. In the Environs of London. At Mount Grove, Hampstead, 18 years planted, it is 29 ft. high; at Svon, it is between 90 ft. and 100 ft. high; at Chiswick Villa, it is 60 ft. high; at Whitton, between 80 ft. and 90 ft. high.—South of London. In Somersetshire, at Kingsweston, it is 95 ft. high, with a trunk 3 ft. in diameter. In Surrey, at Bagshot Park, 16 years planted, it is 35 ft. high; at Claremont, it is 95 ft. high, the diameter of the trunk 2 ft., and of the head 36 ft. In Sussex, at Cowdrey, it is 80 ft. high, with a trunk 3 ft. 9 in. in diameter. In Wiltshire, at Longleat, 80 years planted, it is 99 ft. high, the diameter of the trunk 4 ft., and of the head 44 ft.—North of London. In Buckinghamshire, at Temple House, 40 years planted, it is 50 ft. high. In Essex, at Audley End, 61 years planted, it is 60 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 30 ft. In Herefordshire, at Haffield, 105 years old, it is 71 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 15 ft. In Hertfordshire, at Aldenham Abbey, 34 years planted, it is 65 ft. high. In Leicestershire, at Donnington, 38 years planted, it is 52 ft. high. In Norfolk, at Merton Hall, it is 87 ft. high, with a trunk 3 ft. 6 in. in diameter. In Shropshire, at Hardwicke Grange, 10 years planted, it is 28 ft. high; at Willey Park, 18 years planted, it is 40 ft. high, the diameter of the trunk 1 ft., and of the head 20 ft. In Staffordshire, at Trentham, it is 90 ft. high, the diameter of the trunk 3 ft. 4 in., and of the head 30 ft. In Suffolk, at Finborough Hall, 60 years planted, it is 100 ft. high, the diameter of the trunk 3 ft., and of the head 50 ft. In Worcestershire, at Hadzor House, 10 years planted, it is 20 ft. high. In Yorkshire, in Studley Park, the tree of which a figure is given in our last Volume, 132 ft. high.—In Scotland. In Ayrshire, at Kilkerran, 55 years planted, it is 95 ft. high, with a trunk 3 ft. 6 in. in diameter, and that of the head 30 ft. In Aberdeenshire, at Thainston, 54 years planted, it is 67 ft. high. In Argylshire, at Toward Castle, 15 years planted, it is 30 ft. high. In Forfarshire, at Monboddoo, 28 years planted, it is 30 ft. high; at Courtachy Castle, 14 years planted, it is 27 ft. high; another, 50 years planted, is 55 ft. high. In Inverness-shire, at Coan, 40 years planted, it is 60 ft. high. In Perthshire, at Invermay, it is 84 ft. high, the diameter of the trunk 5 ft. 9 in., and of the head 64 ft.; at Taymouth, it is 100 ft. high, the diameter of the trunk 4 ft., and of the head 51 ft. In Stirlingshire, at Sauchie, it is 96 ft. high, diameter of the trunk 2 ft. 6 in., and of the head 30 ft.; at Blair Drummond, 120 years old, it is 98 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 20 ft.—In Ireland. In Fermanagh, at Florence Court, 55 years planted, it is 70 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 60 ft.; at Castle Coole, it is 62 ft. high, the diameter of the trunk 2 ft. In Sligo, at Mackree Castle, it is 96 ft. high, the diameter of the trunk 2 ft. 8 in. In Tyrone, at Baron's Court, 60 years planted, it is 100 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 50 ft.—In Saxony, at Wörlitz, 60 years planted, it is 80 ft. high, the diameter of the trunk 4 ft., and of the head 40 ft.—In Cassel, at Wilhelmshoe, it is 60 years old, with a trunk 4 ft. in diameter.—In Bavaria, in the Botanic Garden at Munich, 24 years planted, it is 40 ft. high.—In Austria, at Vienna, in the University Botanic Garden, 30 years planted, it is 50 ft. high; at Brück on the Leytha, 60 years planted, it is 100 ft. high.—In Prussia, near Berlin; at Sans Souci, 40 years planted, it is 60 ft. high.

Commercial Statistics. Price of seeds, in London, 3s. per lb.; and of plants, one year's seedlings, 1s. 6d. per thousand; three years' seedlings, 8s. per thousand; and transplanted plants, from 12 in. to 18 in. high, 25s. per thousand. At Bollywyler, single plants are 8 cents each; and at New York, from 50 cents to 1½ dollar, according to the size.

‡ 2. *A. ALBA Michx.* The white Spruce Fir.

Identification. Michx. Fl. Bor. Amer., 2. p. 207., Arb., 1. p. 133.; N. Amer. Syl., 3. p. 182.; Poir. Dict. Encyc., 6. p. 521.; N. Du Ham., 6. p. 291.
Synonymes. *Pinus alba* Ait. Hort. Kew., 3. p. 371., Willd. Berol. Baumz., p. 221., Lamb. Pin., ed. 2., 1. t. 36.; *P. laxa* Ehrh. Beitr., 3. p. 24.; *P. canadensis* Du Roi Harbk. p. 124., Wangh. Beyt., 5. t. 1.; *A. bies* Picea föllis, &c., Hort. Angl., 2. t. 1., Du Ham. Arb., 1. p. 3.; *A. curvifolia* Hort.; single Spruce, Amer.; *Epinette blanche, Canada*; *Sapinette blanche, Fr.*
Engravings. Lamb. Pin., ed. 2., 1. t. 36.; Wangh. Beyt., 5. t. 1. f. 2.; Hort. Angl., 2. t. 1.; N. Du Ham., t. 81. f. 2.; Michx. N. Amer. Syl., 3. t. 148.; our fig. 2224.; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves somewhat glaucous, scattered round the branches, erect, quadrangular. Cones oblong-cylindrical, pendulous, lax; scales with entire margins. (*Michx.*) Cones from 1¾ in. to 2½ in. long, and from ¾ in. to 1 in. broad; on the tree at Dropmore, 4 in. long. Seed very small;



with the wing, $\frac{3}{8}$ in. long, $\frac{3}{16}$ in. broad. Leaves $\frac{3}{4}$ in. long; on the tree at Dropmore, twice the length of those of *A. nigra*, very glaucous when they first come out. A tree, from 40 ft. to 50 ft. high, a native of North America. Introduced in 1700; flowering in May and June.

Variety.

1 *A. a. 2 nana* Dickson of the Chester Nursery is a low-growing plant, apparently somewhat distinct. The specimen in the Horticultural Society's Garden, 10 years planted, is 3 ft. high.

Other Varieties. Loiseleur Deslongchamps states that, according to the specimens of *A. orientalis* which Tournefort brought from the Levant, this alleged species cannot be separated from *A. álba*. He therefore introduces *A. orientalis* Tourn., *Poir. Dict.*, vi. p. 508., and *Lamb. Pin.*, ed. 1., ii. t. 39., as a variety of *A. álba*. We have placed it at the end of this section, in small type, as not having been seen by us in a living state.

Description, &c. The general aspect of the white spruce is much lighter than that of any other species of the genus. It has a tapering trunk, which, according to Michaux, in America, rarely exceeds 50 ft. in height, and 1 ft. or 1 ft. 4 in. in diameter; and its branches form a regular pyramid. The bark is considerably lighter in colour than that of any other spruce; the leaves are also less numerous, longer, more pointed, at a more open angle with the branches, and of a pale bluish green. The male catkins are pendulous, on long footstalks, and of a brownish yellow. The female catkins are ovate and pendulous. When ripe, the cones are small, of a lengthened oval in shape, and a light brown colour; the scales are loose and thin, round or bluntly pointed, with entire edges. The seeds are minute, with a very small wing, and ripen a month earlier than those of the black spruce. When the tree is agitated with the wind, or when the cones are gently struck with a stick, the seeds drop out, and fall slowly to the ground with a tremulous fluttering motion, resembling a cloud of small pale brown moths. The wood is inferior in quality to that of any of the other spruces; and it "snaps more frequently in burning." The white spruce is a native of Canada, New Brunswick, and the district of Maine. It extends from the Lake St. John, in 48° or 49°, to about 70° N. lat.; but is much less common than the black spruce is in the same districts. Dr. Richardson, in his *Appendix to Captain Franklin's Tour to the North Pole*, mentions *A. álba* as the most northerly tree that came under his observation; and states that, on the Coppermine River, within 20 miles of the Arctic Sea, he found trees of it 20 ft. high. The wood is considered of little value; but the fibres of the roots, macerated in water, are very flexible and tough when deprived of their pellicle, split, and cleaned; and they are used, in Canada, to stitch together the canoes of birch bark (see p. 1709.), the seams of which are afterwards smeared over with a resin, improperly called gum, that distils from the tree. (*Michx.*, and *Gard. Mag.*, vol. vi. p. 406.) Mr. Lambert states that the bark is used in tanning, and the young sprigs for

spruce beer; but both these appear to be mistakes. Michaux and Pursh, indeed, both expressly assert that the branches are quite unfit for making beer; and Michaux adds that the leaves, when bruised, diffuse an unpleasant odour. It was introduced into England by Bishop Compton, in 1700. The rate of growth, in the climate of London, in sandy soil somewhat moist, is from 12 ft. to 15 ft. in 10 years. In 30 years, the tree will attain the height of from 30 ft. to 40 ft.; but in dry soils it seldom reaches either this age or height: indeed, all the American spruces may be considered, in England, as short-lived trees. The largest specimen that we know of in England is one at White Knights, where, in 1837, after being 40 years planted, it was 50 ft. high; one at Dropmore is 47 ft. high; and a plant in the Horticultural Society's Garden, 12 years planted, is 14 ft. high. The tree is very ornamental when its summit is richly laden with cones.

Statistics. In England. In Surrey, at Farnham Castle, 50 years old, it is 40 ft. high; at Bagshot Park, 16 years planted, it is 35 ft. high; at Deepdene, 9 years planted, it is 20 ft. high. In Oxfordshire, in the Oxford Botanic Garden, 40 years planted, it is 20 ft. high. In Staffordshire, at Trentham, it is 20 ft. high. — In Scotland. In Forfarshire, at Courtachy Castle, 14 years planted, it is 18 ft. high. In Berwickshire, at the Hirsell, 18 years planted, it is 23 ft. high. — In Ireland. At Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 20 ft. high. In Down, at Ballyleady, 60 years planted, it is 55 ft. high. In Galway, at Cool, it is 56 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 37 ft. — In France, near Paris, at Scéaux, 10 years planted, it is 24 ft. high. — In Hanover, at Harbecke, 10 years planted, it is 16 ft. high. — In Austria, near Vienna, at Brück on the Leytha, 50 years planted, it is 40 ft. high. — In Bavaria, at Munich, in the English Garden, 20 years planted, it is 18 ft. high. — In Prussia, at Sans Souci, near Berlin, 30 years planted, it is 40 ft. high.

Commercial Statistics. Price of seeds, in London, 4s. per lb.; of plants, two-years' seedlings, 10s. per thousand. At Bollwyller, plants are 1 franc each; and at New York, 50 cents.

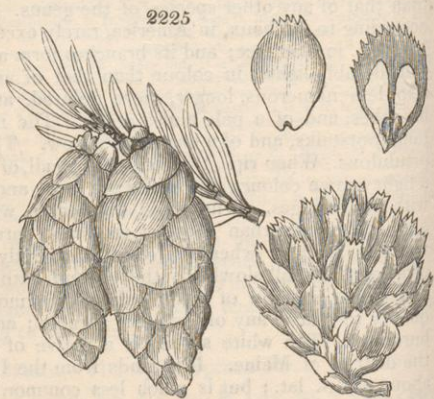
‡ 3. *A. NIGRA* Ait. The black Spruce Fir.

Identification. Poir. Dict. Encyc., 6. p. 520.; Michx. Arb., 1. p. 123.; N. Amer. Syl., 3. p. 176.; N. Du Ham., 6. p. 292.

Synonymes. *Pinus nigra* Ait. Hort. Kew., 3. p. 370., Willd. Berol. Baumz., p. 220., Lamb. Pin., ed. 2., 1. t. 37., Du Roi Harbk., ed. Pott., 2. p. 182.; *P. mariana* Ehr. Beyt., 3. p. 23.; *Abies mariana* Wagh. Beyt., p. 75.; double Spruce.

Engravings. Lamb. Pin., ed. 2., 1. t. 37.; Michx. N. Amer. Syl. 3., t. 147.; our fig. 2225.; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves solitary, regularly disposed all round the branches; erect, very short, somewhat quadrangular. Cones ovate, pendulous; scales somewhat undulated; the apex of the scale crenulated or divided. (*Michx.*) Cones from 1½ in. to 1¾ in. long, and from ¾ in. to nearly 1 in. broad. Seed rather larger than that of *A. álba*, but the wing smaller. Leaves from ½ in. to ⅝ in. long. A large tree, a native of North America. Introduced in 1700; flowering in May or June.



Varieties. The kind generally designated as *A. rubra*, *P. rubra* Lamb., is asserted by Michaux to be only a variety, or rather variation, of *A. nigra*, produced by the influence of the soil on the wood. "The inhabitants of the country, and mechanics who work in the woods," says Michaux, "take notice only of certain striking appearances in forest trees, such as the quality of the wood, its colour, and that of the bark; and, from ignorance of botanical characters, they give different names to the same tree, according to certain variations in these respects arising from local circumstances. To this cause must be attributed the popular distinction of red and black

spruce." (*N. Amer. Syl.*, iii. p. 178.) As the variety appears tolerably distinct in British gardens, as far as respects the colour of the cones, we have, for convenience' sake, given it as a species; though we entirely agree with Michaux in thinking it only a variety.

Description. A tall tree, attaining in America the height of 70 ft. or 80 ft. in the woods, though the trunk is seldom more than from 1 ft. 3 in. to 1 ft. 8 in. in diameter. The branches spread more in a horizontal than in a drooping direction, like those of the Norway spruce; and, consequently, the black spruce (notwithstanding the darkness of its foliage) has not the gloomy aspect of the European tree. The trunk is smooth, remarkably straight, and diminishes regularly from the base to the summit, which is terminated by an annual lance-like shoot, 1 ft. or 1 ft. 3 in. long. The bark is smooth and blackish. The leaves are of a dark sombre green: they are short, being scarcely $\frac{1}{2}$ in. long, thickly set, stiff, and are attached singly to the branches, which they cover all round. The male catkins are cylindrical, erect, and on peduncles; about 1 in. long; yellowish, with red-tipped anthers. The female catkins are oval, and at first erect, but soon become pendulous: they are purplish, and almost black, when young; but become, when ripe, of a dusky reddish brown. When full-grown, they are about $1\frac{1}{2}$ in. long, and $\frac{3}{4}$ in. in diameter at the middle. The scales are blunt, rounded, very thin, and, when ripe, rugged and torn on the margin, and sometimes half through the scale. The seeds are small, scarcely more than a line in length, with rather a small rigid wing. The rate of growth of *A. nigra* is more rapid than that of *A. álba* under similar circumstances. The finest specimens that we have seen in the neighbourhood of London are at Pain's Hill, near the Temple of Bacchus; where, in 1837, there were several trees between 60 ft. and 70 ft. high, laden with cones. The tree in the Horticultural Society's Garden, after being 12 years planted, was 20 ft. high. One at Dropmore, lately planted, was, in 1837, 10 ft. high, bearing abundance of cones. *A. nigra*, like *A. excélsa*, is liable to take root at the extremity of the branches, and form circles of trees round the parent plant. There is a remarkable specimen of this kind at Syon, of which *fig.* 2226. is a portrait to the scale

of 1 in. to 12 ft. The entire mass, which consists of a centre tree, with a double circle of young trees, is 30 ft. high, and 30 ft. in diameter; and the trees of which it is composed bear abundance of cones. One is described by Mr. Gorrie, in the *Magazine of Natural History*, vol. ii. p. 173., as standing in the woods of Braco Castle, Perthshire; of which *fig.* 2227. is a portrait by Mr. Gorrie. This tree, in 1828, was about 40 years old, and its height about 40 ft.

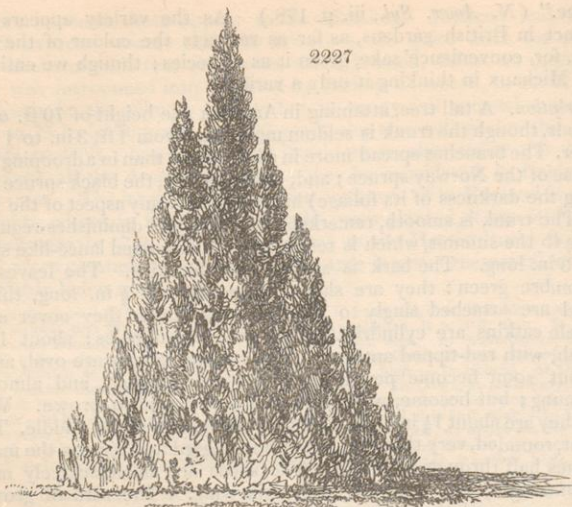


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Mr. Gorrie adds that a natural seedling, which had sprung up not far from the mother tree, and was apparently about 12 years of age, was also, in its turn, already surrounded by a numerous and healthy progeny of young trees, proceeding from the extreme points of the branches.

Geography and History. According to Michaux, this tree is a native of the coldest regions of North America; but is most abundant in the countries

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lying between 44° and 53° n. lat., and between 55° and 75° w. long.; viz. in Lower Canada, Newfoundland, New Brunswick, Nova Scotia, the district of Maine, Vermont, and the upper parts of New Hampshire, where it is so abundant, as to constitute a third part of the native forests. Farther south it is rarely seen, except in cold and humid situations on the top of the Alleghanies. "It is particularly remarked in a large swamp not far from Wilkesburg in Pennsylvania, and on the Black Mountain in South Carolina; which is one of the loftiest summits in the southern states, and is probably thus named from the melancholy aspect occasioned by the dusky foliage of this tree. It is sometimes met with, also, in the white cedar swamps near Philadelphia and New York; but in these places, which are always miry, and sometimes submerged, its vegetation is feeble." (*Michx.*) The regions in which the black spruce is most abundant are often diversified by hills; and the finest forests are found in valleys, where the soil is black, humid, deep, and covered with a thick bed of moss; and where the trees, though crowded so as to leave an interval of only 3 ft., or at the most 5 ft., between the trunks, attain their greatest height. It is found in the same countries on the declivities of the mountains, where the soil is strong, dry, and covered only with a thin bed of peat, and on what are called in America the poor black lands; but in these situations it does not exceed 50 ft. in height, with short thick leaves, of a blackish green, and cones scarcely more than half their usual size. This tree is called *épinette noire*, and *épinette à la bière*, in Canada; double spruce in the district of Maine; and black spruce in Nova Scotia. It has been long known in Europe; and Josselyn, in his *History of New England*, published in London, in 1672, informs us that it was considered, at that period, to furnish the best yards and topmasts in the world. It was introduced into England by Bishop Compton, before 1700. Cones being frequently imported, the tree is abundant in British nurseries, and has been generally distributed as an ornamental tree; which it richly merits, not only on account of the colour of its cones when young, but of the dense habit of growth of the tree.

Properties and Uses. The black spruce, according to Pursh, is of "great mechanical use" in America, besides being "the tree of which that wholesome beverage called spruce beer is made." Michaux says "the distinguishing properties of the black spruce are, strength, lightness, and elasticity. In the dockyards of the United States, the spars are usually of black spruce

from the district of Maine; and it is exported in great quantities, for the same purpose, to the West Indies and Liverpool. The knees of vessels, at Boston and in the district of Maine, are sometimes made of the base of this tree, and one of the principal roots; and it is substituted for oak in many places, where the timber of that tree is becoming scarce. In Maine and Boston, it is often employed for the rafters of houses, and is more esteemed for that purpose than even the hemlock spruce. It is sometimes used for floors; for which purpose it is found tougher than the white pine (*P. Stròbus*), but is more liable to crack. In all these regions, but particularly in Maine and New Brunswick, the black spruce is sawn into boards of considerable width, which are sold a fourth cheaper than those of white pine, and are exported in great quantities to the West Indies and to England; being used in the latter country, principally at Birmingham and Manchester, for packing-cases. This species is not resinous enough to afford turpentine as an article of commerce; and the wood snaps when burning, like that of the chestnut.

Mode of making Spruce Beer. The following is the method given by Du Hamel: — "To make a cask of spruce beer, a boiler is necessary, which will contain one fourth part more than the quantity of liquor which is to be put into it. It is then filled three parts full of water, and the fire lighted. As soon as the water begins to get hot, a quantity of spruce twigs is put into it, broken into pieces, but tied together into a faggot or bundle, and large enough to measure about 2 ft. in circumference at the ligature. The water is kept boiling, till the bark separates from the twigs. While this is doing, a bushel of oats must be roasted, a few at a time, on a large iron stove or hot plate; and about fifteen *galettes*, or as many sea biscuits, or if neither of these are to be had, fifteen pounds of bread cut into slices and toasted. As these articles are prepared, they are put into the boiler, where they remain till the spruce fir twigs are well boiled. The spruce branches are then taken out, and the fire extinguished. The oats and the bread fall to the bottom, and the leaves, &c., rise to the top, where they are skimmed off with the scum. Six pints of molasses, or 12 lb. or 15 lb. of coarse brown sugar, are then added; and the liquor is immediately tunned off into a cask which has contained red wine; or, if it is wished that the spruce beer should have a fine red colour, five or six pints of wine may be left in the cask. Before the liquor becomes cold, half a pint of yeast is mixed with it, and well stirred, to incorporate it thoroughly with the liquor. The barrel is then filled up to the bung-hole, which is left open to allow it to ferment; a portion of the liquor being kept back to supply what may be thrown off by the fermentation. If the cask is stopped before the liquor has fermented 24 hours, the spruce beer becomes sharp, like cider; but, if it is suffered to ferment properly, and filled up twice a day, it becomes mild, and agreeable to the palate. It is esteemed very wholesome, and is exceedingly refreshing, especially during summer." (*Du Ham. Arb.*, i. p. 17.) According to Michaux, "the twigs are boiled in water, a certain quantity of molasses or maple sugar is added, and the mixture is left to ferment." The essence of spruce (which is what spruce beer is made from in this country) is obtained "by evaporating to the consistence of an extract the water in which the ends of the young branches of black spruce have been boiled." Michaux adds that he cannot give the details of the process for making the extract, as he has never seen it performed; but that he has often observed the process of making the beer, in the country about Halifax and the Maine, and that he can affirm with confidence that the white spruce is never used for that purpose. He also states that spruce beer is considered very salutary, and, in long voyages, is found efficacious in preventing attacks of the scurvy.

Statistics. In England. At Kenwood, Hampstead, 40 years planted, it is 28 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 20 ft. In Surrey, at Deepdene, 9 years planted, it is 20 ft. high. In Sussex, at Kidbrooke, it is 60 ft. high, the diameter of the trunk 3 ft., and of the head 45 ft. In Wiltshire, at Longleat, 80 years planted, it is 53 ft. high. In Buckinghamshire, at Temple House, 40 years planted, it is 30 ft. high. In Radnorshire, at Maeslaugh Castle, 50 years planted, it is 70 ft.

high, the diameter of the trunk 2 ft. 10 in., and of the head 34 ft. In Suffolk, at Finborough Hall, 60 years planted, it is 90 ft. high, the diameter of the trunk 2 ft. 9 in., and of the head 50 ft. In Worcestershire, at Croome, 40 years planted, it is 35 ft. high. — In Scotland. In Banffshire, at Gordon Castle, it is 25 ft. high, with a trunk 9 in. in diameter; at Cullen House, 80 years old, it is 77 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 50 ft. In Clackmannanshire, in the garden of the Dollar Institution, 10 years planted, it is 12 ft. high. In Forfarshire, at Courtachy Castle, 14 years planted, it is 19 ft. high. — In Ireland. At Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 35 ft. high. In Fermanagh, at Florence Court, 40 years planted, it is 45 ft. high; at Castle Coole, 40 years planted, it is 50 ft. high. In Louth, at Oriel Temple, 56 years planted, it is 56 ft. high.

Commercial Statistics. Plants, in the London nurseries, two-years' seedlings, are 20s. per thousand; transplanted plants, 2 ft. high, 25s. per thousand.

‡ 4. *A. (N.) RUBRA* Poir. The red Spruce Fir, or Newfoundland red Pine.

Identification. Poir. Dict. Encyc.; Du Roi Harbk., ed. Pott., 2. p. 182.

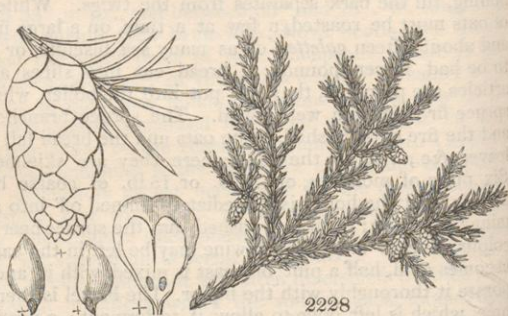
Synonymes. *P. americana rubra* Wang. Beyl., p. 75.; *Pinus rubra* Lamb. Pin., 1. t. 38.

Engravings. Lamb. Pin., ed. 2., 1. t. 38.; Wang. Beyl., t. 16. f. 54.; and our fig. 2228.

Spec. Char., &c. Leaves solitary, awl-shaped, acuminate. Cones oblong, blunt; scales round, somewhat 2-lobed, entire. (Lamb. Pin.) Leaves little more than $\frac{1}{2}$ in. long; slightly tetragonal. Cones about 1 in. long, and $\frac{1}{2}$ in. broad; scales notched. Seeds very small. A large tree, cultivated in England before 1755; flowering in May.

Variety. *A. (n.) r. 2 cærulea*, *A. cærulea* Booth, is a variety or subvariety of which there are young plants in the Flötbeck Nurseries, which were received from M. Reichenberg of Leipsic, in 1832. It has glaucous leaves, and appears to us to differ from *A. (n.) rubra* only in the colour of the cones.

Description, &c. The red spruce, although it is treated as a species by Mr. Lambert, and by Pursh, Wangerheim, and others, is considered by Michaux to be merely a variety of *A. nigra*. (See p. 2312.) According to Mr. Lambert, Wangerheim describes it as a tree not exceeding 30 ft. in height, with short, awl-



shaped, acute leaves, and a reddish brown bark. The cones are rather longer and redder than those of *A. nigra*, and covered with resin. Mr. Lambert states that, on examining two parcels of cones obtained from America, he found those of *A. rubra* "longer, larger, more obtuse, of a shining reddish brown colour; the scales semicircular, each divided by a notch in the middle, and with their margins entire." Michaux says that the red spruce is in no way inferior to the black spruce in the quality of its timber, which "unites in the highest degree all the good qualities that characterise this species." He also states that, instead of being a low tree, it is superior in size to the black spruce, as it generally grows in richer soil; and that the wood is reddish, instead of being white. In Lawson's *Manual*, it is stated that *A. rubra* differs essentially both from *A. nigra* and *A. alba* in all its parts; and particularly in its leaves, which are more slender and sharper-pointed than in either of these species. (*Man.*, p. 369.) According to Wangerheim, it is a native of Nova Scotia and Newfoundland, and the more northern parts of North America. It was cultivated in England, by Miller, before 1755. The rate of growth is the same as that of *A. nigra*, from which the trees in the Horticultural Society's Garden, and at Dropmore, seem scarcely to differ, except in the colour of the cones.

Statistics. In England: in Berkshire, at Bearwood, 14 years planted, it is 30 ft. high: in Yorkshire, at Hackness, 40 years planted, it is 60 ft. high, the diameter of the trunk 1 ft. 8 in., and of the head

28 ft. ; at Grimston, 13 years planted, it is 40 ft. high. In Ireland, at Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 35 ft. high. In France, in the Park of Clervaux, 28 years planted, it is 39 ft. high. In Bavaria, in the English Garden at Munich, 18 years planted, it is 14 ft. high.

♀ 5. *A. SMITHIANA* Wall. Smith's, or the Himalayan, Spruce Fir.

Synonymes. *Pinus Smithiana* Wall. Pl. Asiat. Rar., 3. p. 24. t. 346. Cat., No. 6063.; Lamb. Pin., 3. t. 88.; *P. Khitrow* Royle III., t. 84. f. 1.; *A. Morinda* Hort; Raga, or Raggioe, in the Parbutee language.

Engravings. Wall. Pl. As. Rar., t. 246.; Royle III., t. 84. f. 4.; Lamb. Pin., 3. t. 88.; and our fig. 2229. from Royle.

Spec. Char., &c. Leaves compressed, tetragonal, straight, awl-shaped, sharp-pointed. Cones ovate-oblong; scales obovate-roundish, coriaceous, rigid, smooth on the margin. Crest of the anthers roundish, irregularly crenated. (*D. Don*. in *Lamb. Pin.*) Leaves, in Royle's specimen, and in the Horticultural Society's Garden, from 1 in. to $1\frac{1}{2}$ in. in length. Cone, in Royle's figure, 6 in. long, and $2\frac{1}{2}$ in. broad; scale $1\frac{1}{2}$ in. in length, and the same in breadth at the widest part. Seeds about the size of those of the common spruce; with the wing, $\frac{7}{8}$ in. long, and $\frac{3}{8}$ in. broad. A pyramidal drooping-branched tree; growing, in the Himalayas, to the height of 50 ft. Introduced in 1818.

Varieties. Dr. Royle observes that the leaves of *A. Smithiana*, in Wallich's figure, are much broader than those in his figure; and that they may probably be different species or varieties. Judging from the leaves, the tree in the Horticultural Society's Garden appears to be Dr. Royle's variety.

Description, &c. A pyramidal tree, 50 ft. or more in height, with a light grey bark. Branchlets remotely verticillate, spreading, somewhat pendulous. Unexpanded buds copper-coloured. Leaves turned in every direction; from 1 in. to $1\frac{1}{2}$ in. long; erect and spreading, fine, compressed-tetragonal, straight, awl-shaped, stiff and mucronate, rigid; pale green, and somewhat glaucous, arising from a very faintly marked silvery line in the grooves between the angles. Male catkins solitary, thick, oval-oblong, obtuse; scarcely 1 in. long; yellow, with numerous oblong-obtuse, revolute, brown scales, torn on the margin. Anthers linear-wedge-shaped; 2-celled, opening beneath longitudinally by two fissures; 3 lines long; crowned with a roundish, slightly crenulated, cartilaginous, rather rigid, convex crest. Cones terminal, solitary, pendulous, ovate-oblong, cylindrical, 4—7 in. long, swelled in the middle; scales obovate-roundish, coriaceous, rigid, quite entire, rarely cracked; brown, convex, smooth, loosely imbricated.

Seeds wedge-shaped, angled; brown, with a crustaceous testa; wing unequally sided, obovate, thinly membranaceous, dark yellow, truncate at the apex, obsoletely crenulated. (*Lamb., Laws., and obs.*) According to Royle, a very fine resin is secreted on the cones, which would yield a superior kind of turpentine. The rate of growth of this tree in British gardens is almost as rapid as that of the common spruce, perhaps equally so. A tree at Hopetoun House, raised from seed in 1818, was, in June, 1837, 17 ft. 6 in. high; though the early growth of the plant had been checked by its having been kept for two years in a pot. The tree in the Horticultural Society's Garden has been 8 years planted, and is 12 ft. high. The Himalaya spruce is a native of Kamaon and Sirmore; and, according to Professor Don, it is chiefly



distinguished from *A. orientalis* Tourn., *P. orientalis* Lamb. Pin., t. 39., a nearly related species from Armenia and the western parts of Georgia, by its more compressed and slenderer leaves, and by its larger cones with broader scales. Cones of this species were first sent to the Earl of Hopetoun, by Dr. Govan of Cupar, in 1818; who had received them from his son in the East Indies, under the name of khutrow; and from these seeds six plants were raised the same year. After having been kept in pots for two years, two of them were planted in the arboretum at Hopetoun House, one was sent to the Horticultural Society of London, and the remainder to the Botanic and Experimental Gardens at Edinburgh. We have already mentioned that the larger of the two at Hopetoun House was 17 ft. 6 in. in June, 1837; the diameter of the trunk, at 1 ft. from the ground, 2 ft. 2 in.; and of the space covered by the branches, 11 ft. The branches, Mr. Smith informs us, are a little pendulous; and the leading shoot, in 1836, was about 18 in. long. Some scions from the side branches of this tree have been grafted, in the herbaceous manner, on the common spruce, at the height of 4 ft. or 5 ft. from the ground, allowing three or four tiers of branches of the spruce to remain; and the contrast between these branches and those of the Himalayan spruce is very striking. Several plants have been raised from the trees at Hopetoun House by cuttings, which form as handsome young trees as those raised from seed. Cones and seeds have since been received by different persons; and there are several in Lawson's museum, Edinburgh. These cones, it is observed, are in size and shape somewhat resembling those of *A. excelsa*, but differ in their scales, which are almost round and entire on the margin; while those of the Norway spruce are of a rhomboidal shape, and rugged or notched on the outer extremity. The seeds and wings are also very similar. (*Lawson's Manual*, p. 370.) There can be little or no doubt, but that this tree is as hardy in the climate of Britain as the common spruce; and, as it is unquestionably more ornamental, it well deserves a place in every collection. It is readily propagated by cuttings; and, as the trees in this country will probably in a short time produce cones, plants, if there should be an extensive demand for them, will soon be nearly as cheap as those of the common spruce fir. In the mean time, the price, in the London nurseries, is 21s. each. A great many plants of this species have been raised in Knight's Exotic Nursery, from seeds received from the Himalayas, and extensively distributed under the name of *P. Pindrow*. Some confusion in the description of this species, in the *Penny Cyclopædia* and in *Lawson's Manual*, has resulted from the cones in Dr. Wallich's figure being placed upright, which, if they had been actually so, would have constituted it a *Picea*; and, accordingly, Dr. Lindley calls it the Indian silver fir. (See Professor Don, in Lambert's third volume, t. 88.)

‡ 6. *A. (? E.) ORIENTALIS* Tourn. The Oriental Spruce Fir.

Identification. Tourn. Cor., 41.; Du Ham. Arb., 1. p. 4.

Synonyme. *Pinus orientalis* Lamb. Pin., ed. 2., 1. t. 39., *Lin. Sp. Pl.*, 1421., *Syst.*, ed. Reich., 4. p. 178., *Vitman. Sp. Pl.*, 5. p. 346.

Engraving. Lamb. Pin., ed. 2., 1. t. 39.

Spec. Char., &c. Leaves solitary, tetragonal. Cones ovate-cylindrical; scales rhomboid. (*Lamb. Pin.*) Mr. Lambert states that he inserts this species on the authority of Tournefort, who says (*Voy. du Levant*, p. 288.) that he found it growing in the vicinity of Trebisonde, where it is known by the name of elate. Its trunk and branches he states to be about the size of those of *Picea pectinata*. The leaves are 4 or 5 lines in length, and not more than half a line in breadth; their colour is a shining greenish brown. The cones are described as being nearly cylindrical, about 2½ in. long, and 8 or 9 lines in diameter; pointed, and composed of soft, thin, rounded scales, which cover very minute and resinous seeds. The above description was written in 1804, before Mr. Lambert had seen a specimen of *A. orientalis*, either recent or dried, from a drawing made of the plant in the time of Tournefort. Previously to the publication of his second edition, Mr. Lambert received a specimen from Sir Gore Ouseley, collected by that gentleman in the vicinity of Tefis; from examining which, he states the specific distinctions of *A. orientalis* to be: "short quadrangular leaves, closely and imbricately arranged on the branches; and oblong elliptical cones, four times shorter than those of *A. excelsa*, with rhomboidal entire scales. The leaves are twice or thrice shorter than those of *A. excelsa*, and are distinctly mucronulate, not pointless, as represented in Mr. Lambert's figure. The scales of the cone finally become emarginate, or slightly crenulate. Mr. Lambert's figure being, according to his own account, very imperfect, we have not copied it. We have already mentioned, under *A. álba*, the opinion of Loiseleur Deslongchamps (formed, as he states, after comparing the drawings made for Tournefort with the specimens of *A. álba* brought from America by Michaux), that *A. orientalis* is only a variety of that species. (See *N. Du Ham.*, v. p. 291.) We think it only a variety of *A. excelsa*.

Sect. ii. *Leaves flat, generally glaucous beneath, imperfectly 2-rowed.*

† 7. *A. DOUGLASSII* Lindl. The *trident-bracted*, or Douglas's, Spruce Fir.

Identification. Lindl. in Penn. Cyc., 1. p. 32.

Synonymes. *P. taxifolia* Lamb. Pin., ed. 2, 2. t. 47., *Pursh Fl. Amer. Sept.*, 2. p. 640.; *A. californica* Hort.; *Pinus Douglàssii* Sabine MSS., Lamb. Pin., vol. 3. t. 90.; the Nootka Fir, *Smith in Rees's Cyc.*, No. 28.

Engravings. Lamb. Pin. ed. 2, 2. t. 47., and vol. 3. t. 90.; our *fig. 2230.*, from a specimen and sketch sent to us by Mr. M'Nab, jun., of the Caledonian Horticultural Society's Garden; and the plate of this species in our last Volume, taken from the young tree in the London Horticultural Society's Garden, and from a drawing in the possession of the Horticultural Society.

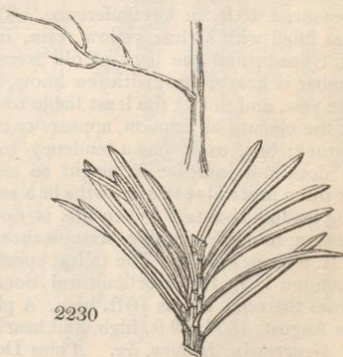
Spec. Char., &c. Leaves flat, blunt, entire, pectinate, silvery beneath. Cones ovate-oblong. Bractees elongated, linear, 3-pointed. (*D. Don in Lamb. Pin.*) Leaves from 1 in. to $1\frac{1}{4}$ in. long. Cones from $3\frac{3}{4}$ in. to 4 in. long, and $1\frac{1}{2}$ in. to $1\frac{3}{4}$ in. broad; scales, without the bractea, $1\frac{1}{8}$ in. long, and the same broad; with the bractea, $1\frac{3}{4}$ in. in length. Seed, with the wing, $\frac{7}{8}$ in. long, and $\frac{3}{8}$ in. broad; without the wing, $\frac{1}{4}$ in. long, and $\frac{3}{16}$ in. broad. The seeds are about the same size as those of *Picea pectinàta*, but more oblong. Cotyledons, ?. A native of the north-west coast of North America, where it was discovered by Menzies about 1797, and afterwards by Douglas, who introduced it in 1826. It flowers at Dropmore in May.

Varieties. Pursh states that he has among his specimens two varieties, or probably distinct species, which, for want of the fructification, he can not decide upon. One has acute leaves, green on both sides; and the other emarginate leaves, glaucous beneath. The seedling plants of *A. Douglàssii*, raised in England, exhibit some difference in the length and width of their foliage; but, as far as we have observed, none worthy of being propagated by extension as a distinct variety. Mr. M'Nab, jun., and Mr. Lawson, however, inform us that there is a very distinct variety in several gardens in the neighbourhood of Edinburgh, which was raised from seeds sent home by Drummond. The largest specimen is in the collection at Lahill, near Largo, in Fife, where it is 14 ft. high; and there is one in the Caledonian Horticultural Society's Garden, under the name of *A. taxifolia*, which, in 1837, was 5 ft. high. From what Mr. M'Nab, jun., told us, it may be described as follows:—

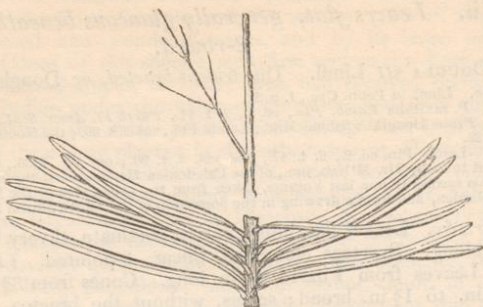
† *A. D. 2 taxifolia.*—Stem and side branches straight; while in *A. Douglàssii* they are always, when young, more or less in a zigzag direction, though they become eventually straight. Leaves twice the length of those of *A. Douglàssii*, and of a much deeper green. *Fig. 2230.*

is from a specimen and a sketch received from Mr. M'Nab, showing the foliage and manner of branching of *A. Douglàssii* in the Caledonian Horticultural Society's Garden, and which corresponds exactly with the trees of this name in the London Horticultural Society's Garden, and at Dropmore. *Fig. 2231.* is from a sketch of the mode of ramification and of the foliage of a tree named *A. taxifolia* in the Edinburgh Botanic Garden, and which was raised

from seeds received from the late Mr. Thomas Drummond, after the arctic expedition. It is, Mr. M'Nab observes, an upright-growing tree; and, with its long and dark leaves, very distinct from all the specimens of *A. Douglàssii* that he had seen elsewhere. The tree



2231



of *A. D. taxifolia* in the Edinburgh Botanic Garden is 8 ft. high, diameter of the head 4 ft. 6 in., and of the trunk 3 in. The tree of *A. Douglasii* in the Caledonian Horticultural Society's Garden Mr. M'Nab describes as a large bush, with a very weak leading shoot, 8 ft. high, diameter of the head 10 ft., and of the trunk 4 in.

Description, &c. A large conical tree, with a rugged greyish brown bark, from 6 in. to 9 in. thick, and abounding in balsamic resin. Leaves somewhat pectinate and spreading, narrow-linear, obtuse on the margin and apex, quite entire, flat; dark green above, marked on the middle with a depressed line, and silvery beneath; 1 in. long. Male catkins short, dense, obtuse, scarcely $\frac{1}{2}$ in. long. Bractees scarious, concave, very obtuse, ciliate and torn on the margin. Anthers obovate, very short, 2-celled; crest very short, obtuse, thick, tubercle-like. Cones terminal on the apex of the branches, solitary, pendulous, ovate-oblong, bright brown, with many linear acuminate bractees at the base; scales roundish, concave, coriaceous, quite entire, persistent, smooth. Bracteoles linear, tricuspidate, cartilaginous and membranaceous, twice as long as the scales; teeth acuminate, middle one by much the longest. Seeds oval; testa crustaceous; wing elliptic, obtuse, chestnut brown, slightly convex on the exterior margin. (*Lamb., Penn. Cyc., and obs.*) According to Douglas, the trunks of this species, in the forests of the north-west of America, vary from 2 ft. to 10 ft. in diameter, and from 100 ft. to 180 ft. in height. Occasionally, the tree arrives at still greater dimensions; as a proof of which, Douglas mentions a stump which still exists near Fort George, on the Columbia river, which, exclusive of the bark, and at 3 ft. from the ground, measured 48 ft. in circumference. The bark in young trees has its receptacles filled with a clear yellow resin, in the same manner as that of the balm of Gilead; and the bark of old trees is said to make excellent fuel. The timber is heavy, firm, with few knots, about the same yellow colour as that of the yew, and not in the least liable to warp. The rate of growth of this tree, in the climate of London, appears to be nearly as great as that of the common spruce; but, as it has a tendency to send out a profusion of side branches, it does not increase in height so much as it does in width and bushiness. It often protrudes two growths in a season, but often, also, sends up contending leading shoots. When this is not the case, the terminal shoot of the season, under favourable circumstances, in a tree 6 ft. high, is from 1 ft. 3 in. to 1 ft. 8 in. in a year. The tallest specimen in the immediate neighbourhood of London is in the Horticultural Society's Garden; where, in 1837, 10 years from the seed, it was 10 ft. high. A plant at Dropmore, of the same age, was, in August, 1837, 19 ft. high, and bearing several cones.

Geography, History, &c. *Abies Douglasii* is found in immense forests in north-west America, from 43° to 52° n. lat. It was originally discovered by Mr. Menzies, at Nootka Sound, when he touched at that coast during his voyage round the world with Captain Vancouver, in 1797; and, from a specimen without flowers or cones, a figure was published by Mr. Lambert, under

the name of *Pinus taxifolia*, in 1826. It was also gathered on the banks of the Columbia by Mr. Lewis, and specimens of it were seen in his herbarium by Pursh. In 1825, the tree was re-discovered by Douglas, and cones were sent home by him, from which plants were raised by the London Horticultural Society, in 1826, and distributed throughout the country. The trees appear to be as hardy in England as the silver fir; and in Scotland, in Perthshire, at Methven Castle, they produce shoots of from 1 ft. 4 in. to 1 ft. 6 in. long every year. The tree bore cones, for the first time in England, at Dropmore, in 1835, when the plant there already mentioned produced one cone. This year (1837) it has above a dozen; so that, in all probability, there will soon be abundance of seeds of this species, from which extensive plantations may be raised, and the value of the species as a timber tree proved. In the mean time, the plant is readily propagated by cuttings, which appear to make as good trees as seedling plants.

Statistics. In the neighbourhood of London, at Muswell Hill, it is 9 ft. high; at the Duke of Devonshire's Villa, at Chiswick, and at Hendon Rectory, 9 ft. high. In Kent, at Cobham Hall, it is 8 ft. high. In Bedfordshire, at Flitwick House, it is 6 ft. high. In Berkshire, at Highclere, it is 8 ft. high; at Englefield House, 13 ft. high. In Hertfordshire, at Danesbury, it is 6 ft. high; at Cheshunt, it is 9 ft. high. In Yorkshire, at Scoresby, in the garden of J. Wood, Esq., it is 19 ft. 4 in. high. In Staffordshire, at Rolleston Hall, it is 8 ft. high. — In Scotland, at Edinburgh, in the Experimental Garden, Inverleith, it is 6 ft. 6 in. high. In Cromarty, at Cool, it is 6 ft. high. In Dumfriesshire, at Jardine Hall, it is 13 ft. 2 in. high. In Fifeshire, at Lahill, the variety is 14 ft. high. In Renfrewshire, at Caldecuch, near Glasgow, the species is 7 ft. 6 in. high.

† 8. *A. MENZIE'SII* Douglas. Menzies's, or the warted-branched, Spruce Fir.

Identification. Doug. MS., Lindl. in Penn. Cyc., 1 p. 32.

Synonymæ. *Pinus Menziesii* Lamb. Pin., 3.

Engravings. Lamb. Pin., 3. t. 89; and our fig 2232, from Lambert, and the seeds from specimens in the Horticultural Society's herbarium sent home by Douglas.

Spec. Char., &c. Leaves acute, flat; silvery beneath, turned in every direc-

tion. Cones cylindrical; scales scarious, gnawed on the margin.

(*D. Don* in *Lamb.*

Pin.) Leaves $\frac{3}{4}$ in.

long. Cones from

$2\frac{3}{4}$ in. to 3 in. long,

and from 1 in. to

$1\frac{1}{2}$ in. broad; scales

$\frac{3}{4}$ in. long, and $\frac{2}{3}$ in.

broad. Seed very

small, scarcely

$\frac{1}{8}$ in. long; with

the wing, $\frac{5}{8}$ in.

long. A native of

the north of Cali-

fornia, where it

was discovered by

Douglas, and in-

troduced by him

in 1831.

Description, &c. A

tree with the gene-

ral appearance of *A.*

Douglasii. Branch-

es and branchlets tu-

bercle. Buds ovate,

acute, covered with

resin. Leaves turned

in every direction,

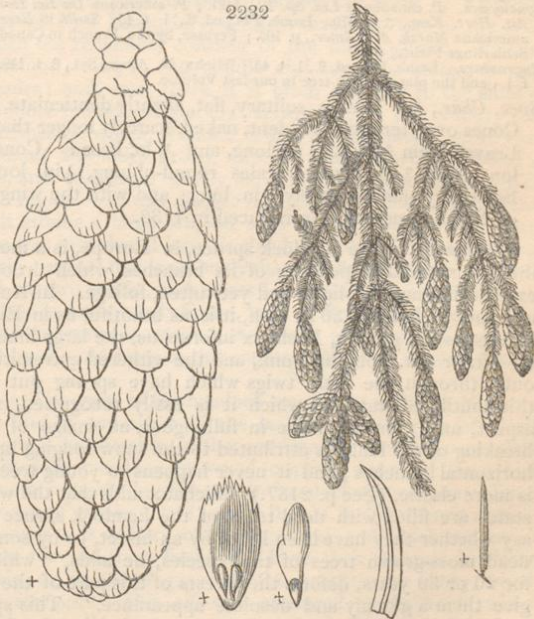
resupinate from

being twisted at the

base, linear, mucronu-

late, incurved; sil-

very beneath,



articulated with an elevated tubercle, very short, not more than 2 in. long, rigid, rather sharp-pointed, and very soon falling off the dried specimens. Cones pendulous, cylindrical, 3 in. long; scales elliptic, obtuse, loose, somewhat wavy, cartilaginous and scarious; bright brown; ragged, when mature, on the upper margin; persistent after the seeds have dropped. Bracteoles lanceolate, acute, rather rigid, irregularly crenulated on the margin; half the length of the scales. Seeds small, brown, first convex, and then flat; wing somewhat elliptic, slightly and irregularly crenulated at the apex; the other margin straight, thick, and revolute. (*Lamb., Penn. Cyc.*, and observations.) Douglas describes the wood of this species as being of excellent quality; but little is known respecting the habit of the tree. It was found on the north-west coast of America, in North California; and named by its discoverer in honour of our much esteemed friend, Archibald Menzies, Esq.; a botanist who has introduced many valuable species; and who, having discovered many others, of which he was unable to procure seeds, nearly 40 years ago, has had the pleasure of seeing them at length introduced, and brought into general cultivation. Only a very few plants of *A. Menziesii* were raised in the Horticultural Society's Garden in the year 1832; so that the species is at present extremely rare in this country; it is, however, as we are informed by Mr. Lawson and Mr. M'Nab, jun., much more plentiful in Scotland. The plant in the Horticultural Society's Garden is nearly 3 ft. high; and there are plants about the same height at Highclere and Hendon Rectory. It is readily propagated by cuttings; and plants may be procured in the nurseries at 3 guineas each.

‡ 9. *A. CANADENSIS* L. The Canada Pine, or Hemlock Spruce Fir.

Identification. Michx. N. Amer. Syl., 3. p. 185.

Synonymes. *P. canadensis* Lin. Sp. Pl., 1421; *P. americana* Du Roi *Harbk.*, ed. Pott., 2. p. 151.

Atl. Hort. Kew., 3. p. 370., *Lamb. Pin.*, ed. 2., 1. t. 45., *Smith in Rees's Cyc.*, No. 29.; *P. Abies americana* Marsh. *Arb. Amer.*, p. 103.; Perusse, by the French in Canada; Sapin du Canada, Fr.; Schierlings Fichte, Ger.

Engravings. *Lamb. Pin.*, ed. 2., 1. t. 45.; Michx. N. Amer. Syl., 3. t. 149.; N. Du Ham., 5. t. 82. f. 1.; and the plates of this tree in our last Volume.

Spec. Char., &c. Leaves solitary, flat, slightly denticulate, obtuse, two-ranked. Cones oval, terminal, pendent, naked, scarcely longer than the leaves. (*Lois.*) Leaves from $\frac{2}{3}$ in. to $\frac{3}{4}$ in. long, and $\frac{1}{10}$ in. broad. Cones from $\frac{5}{8}$ in. to $\frac{7}{8}$ in. long, and $\frac{3}{8}$ in. broad; scales round-oblong, $\frac{1}{2}$ in. long, and $\frac{3}{8}$ in. broad. Seed very small, scarcely $\frac{1}{2}$ in. long; and with the wing, $\frac{3}{8}$ in. long. Native of North America. Introduced in 1736.

Description. The hemlock spruce, in Europe, is a most elegant tree, from the symmetrical disposition of its branches, which droop gracefully at their extremities, and its light, and yet tufted, foliage. In America, while the tree is young and under 30 ft. high, it is as beautiful as in England; but, when it attains its full growth, Michaux informs us, the large limbs are usually broken off 4 ft. or 5 ft. from the trunk, and the withered extremities are seen "staring out" through the little twigs which have sprung out around them. "In this mutilated state, by which it is easily recognised, it has a disagreeable aspect, and presents, while in full vigour, an image of decrepitude." This breaking of the limbs is attributed to the snow lodging upon the close, tufted, horizontal branches; and it never happens to young trees, the wood of which is more elastic. (See p. 2137.) Michaux adds that the woods in the northern states are filled with dead trees of the hemlock spruce; but he is unable to say whether they have been killed by an insect, or by some other cause. The dead moss-grown trees of this species, he adds, "which stand mouldering for 20 or 30 years, deform the forests of this part of the United States; and give them a gloomy and desolate appearance." This species has the peculiarity of sometimes ceasing to grow at the height of 2 ft. or 2 ft. 6 in. In this state, says Michaux, it has a pyramidal shape, and its compact tufted branches adhere to the ground. The trunk of the hemlock spruce is straight, and of uniform size for two thirds of its height. The branches are numerous and

spreading, but slender in proportion to their extent. The bark is light-coloured and smooth, except on very old trees. The leaves are from $\frac{1}{2}$ in. to 8 lines long, flat, mucronous, and disposed, though irregularly, in two ranks; and downy when young, and serrated, or rough, at their margins; they are of a very vivid light green, with two silvery stripes underneath. The male flowers are few together, forming a small head on a long footstalk. The cones are only a little longer than the leaves; pendulous on the extremities of the branches; green when young, but becoming brownish when ripe; the scales are few, roundish, smooth, and entire on the margins. The seeds are very small, and of a light brown, with the wings nearly white. (*Michx.*) The full-grown trees of the hemlock spruce, in England, have a rounder head, and a more pendulous habit of growth, than is the case with any other fir, either of America or Europe. Most of the largest specimens, also, such as the original tree at Mill Hill, a large tree at Woburn Farm, one at Claremont, and that at Strathfieldsaye, have forked trunks. When the tree is young, the branches are quite pendulous, and remarkably elegant. The rate of growth, in the climate of London, is rather slow; but plants, in 10 years, will attain the height of 6 ft. or 8 ft.; and in 20 years, of 15 ft. or 20 ft. The finest specimens in the neighbourhood of London are those alluded to above, which are from 50 ft. to 60 ft. in height; and some trees at Whitton (of one of which a portrait will be found in our last Volume), which are from 30 ft. to 50 ft. in height, with trunks from 1 ft. 6 in. to 2 ft. in diameter.

Geography and History. According to Pursh, the hemlock spruce is found in the most northern regions of Canada, and on the highest mountains, as far south as Carolina. Michaux says that it is a native of the coldest regions of the New World, and that it begins to appear about Hudson's Bay. Near the Lake St. John, and in the neighbourhood of Quebec, it fills the forests; and in Nova Scotia, New Brunswick, the district of Maine, the state of Vermont, and the upper parts of New Hampshire, it forms three quarters of the ever-green woods, of which the remainder consists of the black spruce. Farther south, it is less common; and, in the middle and southern states, is seen only on the Alleghanies; and, even there, it is often confined to the sides of torrents, and to the more humid and gloomy exposures. In the country east and north of Massachusetts, which, without embracing Canada, is more than 750 miles long, by about 250 miles broad, these trees are constantly found at the foot of the hills, and constitute nearly half the unbroken forests which cover that extensive region. In this district moist soils appear unfavourable to its growth; but it attains a large size on soils proper for growing corn. The hemlock spruce was introduced into England by Peter Collinson, about the year 1736; and the original tree is probably that still standing in the grounds at Mill Hill, where it has two trunks, each about 1 ft. in diameter, and 50 ft. high. (See p. 57.) The tree is occasionally found, both in France and Germany, of considerable size, and ripening its seeds. As seeds are annually imported, and even produced by the old trees in this country, the plant is not scarce in the nurseries.

Properties and Uses. The wood of the hemlock spruce, according to Michaux, is less valuable than that of any other of the large resinous trees of North America; but the bark is inestimable, in that country, for the purposes of the tanner. It is esteemed an excellence in wood to split in a straight line, which it does when the fibre is vertical; but that of the hemlock spruce is so oblique, that it makes the circuit of trunks 1 ft. 3 in. or 1 ft. 8 in. in diameter, in ascending 5 ft. or 6 ft. Besides this defect, which is general, and which renders it unfit for rural fences, the old trees frequently have their concentric circles separated at intervals, or, in the language of the country, are shaky, which greatly impairs their strength. This effect is produced by the winds, which have a powerful hold upon the large compact summit formed by the head of the hemlock spruce, exposed, as it generally is, above the heads of the surrounding trees. The wood is found to decay rapidly when exposed to the atmosphere, and is therefore improper for the external covering of

houses; which is another important defect in a country where nearly all the houses are of wood: but when covered it is of great duration; and as the white pine (*P. Ströbus*) becomes rarer, the hemlock spruce is substituted for it as extensively as possible. It is firmer, though coarser grained; affords a tighter hold to nails; and offers more resistance to the impression of other bodies. For this reason, it is employed, in the district of Maine, in the form of 2-inch planks, for threshing-floors. But the most common use, in which great quantities are consumed in the northern states, is for the first sheathing of wooden houses, which are afterwards covered with clap-boards (see p. 2284.) of white pine. For economy, the interior frame is sometimes made of hemlock spruce; and it is found, when guarded from humidity, to be as durable as any other species. It is always chosen for the laths of the interior walls, and is exported in this form to England. In the district of Maine, it is usually taken for the posts of rural fences, which last about 15 years, and are preferable to those of the grey and red oaks (*Quercus ambigua* and *Q. rubra*). It contains little resin, and the trunk is but slightly coated with turpentine, even where large pieces of bark have been a long time removed. The bark, when used for tanning, is taken from the tree in the month of June; and half the epidermis is shaved off with a plane before it is thrown into the mill. From the district of Maine, it is exported to Boston, Providence, &c., and is almost exclusively employed in the tanyards at those places. It is brought to New York from the upper parts of the Hudson, and is sometimes carried to Baltimore. Its deep red colour is imparted to the leather; and, though it is inferior to the bark of the oak, the American tanners think the bark of the two kinds united are better than either of them alone. Hemlock spruce bark was once exported to England, but the commerce has ceased with the demand. The Indians are said to use it in dyeing their light baskets made of red maple. (*Michx.*) The young twigs and ends of the shoots are used by the settlers as a substitute for tea; and the essence of spruce is also extracted from the shoots. In England, the hemlock spruce forms one of the most ornamental of the fir family; being among needle-leaved evergreen trees what the weeping willow is among the willows. As it bears the knife, and is extremely hardy, it might be employed as hedges; for which purpose it is used in the American nurseries, along with the *Thuja occidentalis*.

Statistics. In the environs of London, at Kenwood, Hampstead, 60 years planted, it is 25 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 40 ft.; at York House, Twickenham, it is 30 ft. high, with a trunk 1 ft. 2 in. in diameter; at Muswell Hill, it is 30 ft. high; at Abercorn Priory, at Stanmore, it is 30 ft. high, diameter of the trunk 1 ft. 6 in., and of the head 33 ft. — South of London. In Devonshire, at Bystock Park, 21 years planted, it is 50 ft. high. In Dorsetshire, at Melbury Park, 15 years planted, it is 23 ft. high. In Hampshire, at Alresford, 41 years planted, it is 59 ft. high; at Sirathfieldsaye, it is 45 ft. high, the diameter of the trunk 2 ft., and of the head 42 ft. In Somersetshire, at Kingsweston, 12 years planted, it is 18 ft. high. In Surrey, at St. Ann's Hill, 34 years planted, it is 38 ft. high; at Claremont, it is 45 ft. high, the diameter of the trunk 2 ft. 9 in., and of the head 55 ft.; at Ockham, 35 years planted, it is 18 ft. high. In Sussex, at Westdean, 10 years planted, it is 19 ft. high. In Wiltshire, at Wardour Castle, 50 years planted, it is 30 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 43 ft. — North of London. In Bedfordshire, at Southill, it is 22 ft. high, with a trunk 1 ft. in diameter. In Berkshire, at Bearwood, 10 years planted, it is 15 ft. high; at Ditton Park, 34 years planted, it is 30 ft. high. In Herefordshire, at Stoke Edith Park, 50 years old, it is 30 ft. high, the diameter of the trunk 1 ft. 8 in., and of the head 26 ft. In Hertfordshire, at Cashibury, 30 years planted, it is 28 ft. high; at Cheshunt, 10 years planted, it is 17 ft. high. In Leicestershire, at Elvaston Castle, 16 years planted, it is 12 ft. high; at Belvoir Castle, 15 years planted, it is 15 ft. high. In Nottinghamshire, at Clumber Park, it is 25 ft. high. In Staffordshire, at Trentham, it is 16 ft. high. In Warwickshire, at Combe Abbey, 60 years planted, it is 41 ft. high, the diameter of the trunk 2 ft. 3 in., and of the head 36 ft. In Worcestershire, at Croome, 40 years planted, it is 35 ft. high. In Yorkshire, at Grimston, 12 years planted, it is 18 ft. high. — In Scotland, at Hopetoun House, it is 35 ft. high, the diameter of the trunk nearly 2 ft., and of the head 21 ft. In Roxburghshire, at Minto, 50 years planted, it is 35 ft. high. In Perthshire, at Taymouth, it is 20 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 12 ft.; another, 50 years planted, is 26 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 18 ft. In Ross-shire, at Brahan Castle, it is 20 ft. high, the diameter of the trunk 14 in. — In Ireland, in Louth, at Oriel Temple, 35 years planted, it is 32 ft. high. — In France, at Colombey, near Metz, 67 years planted, it is 40 ft. high, the diameter of the trunk 1 ft. 6 in. — In Hanover, in the Botanic Garden, Göttingen, 20 years planted, it is 20 ft. high. — In Saxony, at Wörlitz, 60 years planted, it is 60 ft. high, the diameter of the trunk 3 ft., and of the head 40 ft. — In Austria, at Vienna, at Brück on the Leytha, 36 years planted, it is 26 ft. high. — In Bavaria, in the English Garden at Munich, 10 years planted, it is 10 ft. high. — In Prussia, near Berlin, at Sans Souci, 50 years planted, it is 40 ft. high.

Commercial Statistics. Plants, in London, are 25s. per hundred; 2 ft. high, 50s. per hundred; at Bollwyller, from 3 francs to 5 francs each; and at New York, 50 cents.

† 10. *A. DUMOSA* Lamb. The bushy alpine Spruce Fir.

Synonymes. *Pinus dumosa* Lamb. *Pin.*, ed. 2, 1. t. 46.; *Abies Brunoniæna* Lindl. in Penn. Cyc., No. 9.; *P. decidua* Wall. *MS.*; *P. Brunoniæna* Wall. *Plant. As. Rar.*, 3. p. 24. t. 247.

Engravings. Lamb. *Pin.*, ed. 2., 1. t. 46.; Wall. *Plant. As. Rar.* 3. t. 247.; and our *figs.* 2233. and 2234.

Spec. Char., &c. Leaves solitary, linear, obtuse, mostly on one side of the branches; glaucous beneath, denticulated. Cones ovate, terminal, solitary: bracteoles wedge-shaped, plicate, emarginate, glabrous. (*Lamb. Pin.*) Leaves $\frac{1}{2}$ in. to 1 in. long. Cones, scales, and seeds scarcely different from those of *A. canadensis*. A native of Nepal, not yet introduced.



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Description. A dense and very bushy tree, 70 ft. or 80 ft. high, with the appearance of *Abies canadensis*. Branches numerous, spreading, twiggy, covered with an ash-coloured brownish bark. Leaves solitary, linear, obtuse, 2-rowed, somewhat pectinate, more crowded than in *A. canadensis*; from 5 lines to 1 in. long, 1 line broad; green above, shining and glaucous beneath; deflexed on the margin, obsolete denticulate towards the apex. Cones terminal, solitary, ovate, mucronate, smooth, sessile, 1 in. long; scales roundish, somewhat membranaceous, brownish, curled and torn on the margin: bracteoles very short, somewhat membranaceous, roundish, wedge-shaped, slightly plaited, nearly fan-shaped, emarginate; margins unequal, smooth. Seeds small, cumate, ferruginous, furnished with an oblong, obtuse, pale, shining, membranaceous wing. (*Lamb., Wall., and Penny Cyc.*) Dr. Wallich observes that the leaves of this fir are mealy beneath, and that they are so



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extremely deciduous, that the slightest shake of the branch is sufficient to detach them. The natives, who call the tree *Tangshang*, do not use the wood, as they find it liable to warp. It was discovered by Captain Webb, and named *Brunoniæna* by Dr. Wallich, in honour of Mr. Brown; the specific name of *dumosa* refers to the bushy habit of the tree. This species is a native of Nepal and Bhotan. Dr. Wallich's collectors gathered it on the lofty peak of Gossainthan. According to Dr. Royle, it is rare, and was only seen by him on the more northern parts of the hills. Mr. Lambert justly observes that this species is very nearly allied to the hemlock spruce; but he adds that it differs from it, in having longer and more crowded leaves, with their margins deflected. The cones are larger, with their scales wavy, and somewhat erose at the edges, and the bracteas not fringed at the margins. As there can be little doubt of its being quite hardy in England, it is much to be desired that it should be introduced.

† 11. *A. CEPHALONICA*. The Cephalonian Silver Spruce Fir.

Synonymes. *Koukounaria*, and also *Elatos*, in Cephalonia; *A. taxifolia* Hort.; *A. luscombeana* Hort.; the Mount Enos Fir.

Engravings. Our *figs.* 2235. and 2236., from living specimens received from Hampton Lodge, Luscombe, and Dropmore.

Spec. Char. Cones, ?. Leaves subulate, flat; dark green above, and silvery beneath; tapering from the base to the summit, which terminates in a sharp spine. Petioles very short, dilated lengthwise at the point of their attachment to the branches; the dilated part of a much lighter green than the rest of the leaf. A tree, in its native country (Cephalonia), upwards of 60 ft. high, with a trunk 9 ft. or 10 ft. in circumference, and numerous side branches, which, when young, give it the general appearance of an araucaria. Introduced in 1824.

Description. General Charles James Napier, who, when governor of Cephalonia, paid great attention to this tree, and first sent seeds of it to England, informs us that the largest specimens which he saw of it in Cephalonia were 60 ft. high and upwards; and that the side branches, when the tree is not crowded by others, are very numerous, and spread out to a great distance, so as to form a very broad tree in proportion to its height. The leaves, on plants raised in England, are equally and thickly distributed over the branches, and stand out nearly at right angles on every side. They are of a fine shining dark green above, and have two rather obscure silvery lines, separated by the midrib, beneath. They differ from those of all other species of *Abies* and *Picea*, in terminating in a long, brown, sharp, prickle, and in having the footstalks (which are so short that the leaves are almost sessile) dilated lengthwise in the direction of the branches; the dilated part being of a much

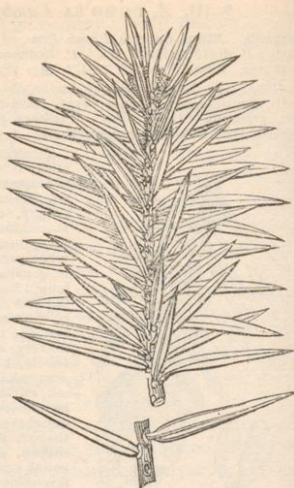
lighter green than the rest of the leaves. The leaves, on branches at some distance from the ground, and on the leading shoot, as compared with those of other pines and firs, may be described as dagger-shaped, or as resembling miniature bayonets.

They are equally and closely distributed over the branches; and, being almost without footstalks, and broad at the base in proportion to their length, they give the branches which are clothed with them a good deal of the appearance of *Araucaria brasiliensis*. The leaves, on the branches which are close to the ground, are rather more two-rowed, in the manner of the silver fir, than those on the higher branches; as may be seen in fig. 2236, which represents a portion of the lowest branch of the young tree in the pinetum at Dropmore. The colour of the bark of the young shoots is a decided brown; which, contrasting with the light colour of the petioles, and the dark green of the upper surface of the leaves, and their silvery lines below, gives the plant at once a rich and a lively appearance.

The buds are prominent, somewhat square-sided, pointed, and slightly covered with resin. In plants kept under glass, they have much more resin than in those kept in the open air. The branches are very numerous; and, though originating at the main stem in regular tiers, yet, at a short distance from it, they divaricate in all directions; and, in plants in pots, from 3 ft. to 4 ft. high, which are the largest that we have seen, they form a bush broader than it is high. This is also said to be the case with the plants in the open ground at Luscombe and at Hampton Lodge.

The general resemblance which the plant, in this state, has to an araucaria is very remarkable; and, if the cones should prove to be as different from those of other species of *Abies* and *Picea* as the leaves, this tree will form a connecting link between the firs and the araucarias. The cones have not yet been seen in Britain; but General Napier thinks that they are sometimes pointing upwards, and sometimes turned down; and Mr. Curling, who was superintendent of the Colonial Farm in Cephalonia at the time that General Napier was governor of the island, and who is now steward to Sir Henry Bunbury, at Mildenhall, Suffolk, thinks that he recollects that the cones were soft and pendulous, like those of the spruce fir. This point, through the kindness of General Napier, now (January, 1838,) residing at Bath, who has promised to procure cones for us, and a specimen of the wood, we hope soon to be able to determine.

Geography. The only known habitat of this remarkable fir is in Cephalonia, on a ridge of mountains, the highest point of which was anciently called Mount Enos; but the general name of the ridge is now the Black Mountain. This ridge is between twelve and fifteen miles in length, and between 4000 ft. and 5000 ft. above the level of the sea. Dr. Holland, who saw it in 1813, describes it as the most striking feature in the general aspect of the island. On the summit of the highest point of this ridge, the Mount Enos of antiquity, stood, according to Strabo, an altar dedicated to Jupiter Ænesius; and Dr.



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Holland was informed that some of the stones of this altar, and of the bones of the animals sacrificed on it, were still occasionally to be found on its site. "The name of the Black Mountain," he says, "was obtained from the large pine forests which once covered its acclivity; but, during the disturbed state of the islands fifteen years ago (about 1798), these forests were wantonly set on fire, and in great part destroyed; so that now (Feb., 1813) the appearance of the mountain entirely contradicts its name. This is especially the case on its southern side, where the precipitous point, which rises by a single majestic elevation from the base to the summit, is broken by numerous deep gullies, displaying the white limestone rock of which the mountain is composed." (*Travels in the Ionian Isles, &c.*, p. 35.)

The main ridge of the Black Mountain lies in the direction of north-west and south-east. The upper part only is, or rather was, covered with forest; while the lower part of the sides is covered with vineyards, olive grounds, corn fields, and gardens. The ridge, General Napier informs us, is very narrow, and its sides steep, and in many places almost without soil; nevertheless, this fir springs, in many places, from the crevices of the rock, though, like other mountain trees in similar cases, the tree only attains a large size in mountain hollows, where the soil is deep and the situation sheltered. Neither Pouqueville nor Olivier mention this forest; and, though Dr. Pococke speaks of the mountain, the highest point of which he calls Mount Gargasso, he does not mention its trees. This omission is, however, accounted for by the fact, that Dr. Pococke did not go on shore on the island. In General C. J. Napier's work, entitled *The Colonies*, published in 1833, there are more ample details. It is there stated that, notwithstanding a great part of this forest was burned down several years ago, it is still very extensive; though it is greatly injured by the vast number of goats which are permitted to range at pleasure among the trees, and which destroy the young ones by uniformly biting off the leading shoot. As wood is very valuable in Cephalonia, the forest, General Napier observes, might be made a source of great riches and utility; and twenty years' care, would make it magnificent. Count Marine Mataxa, one of the nobles of the island, he adds, told him that, "when he was presented to the Emperor Napoleon, His Majesty's first question was about the forest on the Black Mountain." (*Colonies, &c.*, p. 336.) The following is an extract from an *Agricultural Report* made to Colonel Conyers respecting this forest in 1832, by Mr. Edward Curling, the director of the Colonial Farm already mentioned:—"Before I conclude, I must draw your attention to the fine forest of firs that might be had on the Black Mountain of Cefalonia. With a very little attention, this would form a source of riches to the islands, which, at present, import all the wood they require for houses, ship-building, &c. This forest, at one time, contained some of the finest trees in the world, but was unfortunately burned down by the negligence of some Greeks in setting fire to their lands; and, since then, the goats have effectually prevented anything like a good tree from growing. These animals always eat off the leading shoot, and thus entirely ruin the tree: for this fir does not renew its leading shoot when injured. And thus, only stunted crooked trees are to be found, except a few that have sprung up since Colonel Napier took pains to keep the goats out; though, immediately that the island was left in less attentive hands, the goats renewed their incursions. Even these young trees are in danger of being destroyed by the women who collect resin, who take off about a foot of the bark of the leading shoot; and, of course, the tree dies. Colonel Napier has made a road up to the forest; and the thinnings would pay all the expenses of taking care of it, as firewood sells enormously dear at Argostoli." (*Colonies, &c.*, p. 283.)

"It has been said that 'it is useless to take any pains to protect this forest, as there is scarcely a tree in it worth the trouble;' but this is the very reason why it should be protected, to prevent the trees from being injured as they have hitherto been, and to allow the trees to attain a timber-like size." (*Ibid.*)

History. As far as we have been able to discover, no botanist has yet

noticed this tree. We were once inclined to conjecture that it might be the *Abies orientalis* of Tournefort, notwithstanding the discrepancy between the description and the Cephalonian plant; but, having examined the specimen of *Abies orientalis* in Mr. Lambert's herbarium, we are satisfied that the latter is a variety of the common spruce fir. The merit of introducing *A. cephalonica* into England entirely belongs to General Napier, who, from his work, *The Colonies*, and also from a pamphlet by him, entitled, *Memoir on the Roads of Cephalonia*, seems to possess an enthusiastic attachment to the island, and an ardent desire for its improvement. He was particularly anxious that this forest ridge should be enclosed so as to exclude the goats, and to allow the trees to grow up and become timber; and, when he was governor, made many remonstrances on the subject to Sir Frederick Adam, the chief commissioner, but without effect. In 1824, in compliance with a request of Henry L. Long, Esq., of Hampton Lodge, near Farnham, who was desirous of knowing the species of fir described by the ancient writers as the *peukē* and the *elatē*, Colonel Napier sent a packet of seeds of the Cephalonian fir to England. The seeds were without the cones, and were sent to the care of the colonel's sister, Lady Bunbury. The packet was duly forwarded to Hampton Lodge; but some seeds having dropped from it, Lady Bunbury gave these seeds to Charles Hoare, Esq., of Luscombe. Mr. Richard Saunders, the woodreeve at Luscombe, in a letter dated November, 1837, informs us that he recollects receiving the "seeds from Colonel, now General, Napier, about thirteen years since;" and "hearing that the general had obtained them from his brother, at that time governor of Cefalonia." "The seeds," he adds, "were of the largest size. I raised twelve plants from them, four of which I lost, when young, by damp and frost, having planted them out in the open ground at the age of two years only. Three of the plants raised were given to Mr. Pince of the Exeter Nursery, and one to Mr. Pontey of the Plymouth Nursery. The other four plants are remaining at Luscombe, flourishing exceedingly well, and never having had any protection during the winter, since they were planted in the open air. The largest of the plants at Luscombe is 3 ft. 10 in. high, and the branches cover a space 4 ft. 3 in. in diameter. All the plants are very thickly furnished with side branches quite close to the ground, forming, at a distance, very handsome green bushes. — R. S. Luscombe, Nov. 6. 1837." It thus appears that the *Abies cephalonica* was introduced into England by General Charles James Napier in 1824, though it never was heard of in any public collection, or in the nurseries, till within the last two or three years.

The plant sent to the Plymouth Nursery was, in 1837, sold to the Duke of Bedford for 25 guineas. Two of those sent to the Exeter Nursery were sold to the Rev. Theodore Williams of Hendon Rectory, for about the same sum each; and the third is retained as a stock plant to propagate from.

The seeds sent to Hampton Lodge were safely received, and vegetated without difficulty. Mr. Long, in a letter dated Dec. 3. 1837, says:—"I lost a great number of plants by spring frosts and by rabbits, owing to want of care whilst I was on the Continent. I have only three plants left; and they are in full vigour, and have made shoots, during the past summer, from 6 in. to 7 in. in length." The highest plant is 3 ft., and the breadth of space covered by its branches is 4 ft. in diameter. "I gave some plants to Lord Orford, for his pinarium at Wolterton, in Norfolk; some to Lord King, for his collection at Ockham Park, Surrey; two to Robert Mangles, Esq., of Sunninghill; three I have planted out myself; and the remainder I gave this year to Mr. Penny, the nursery-gardener at Milford." We are thus enabled to account for all the plants raised from the seeds sent home by General Napier.

Properties, Uses, Propagation, &c. The timber of this tree is said to be very hard, and of great durability. General Napier informs us that, in pulling down some old houses in the town of Argostoli, which had been built from 150 to 300 years before, all the wood-work of the Black Forest fir was as hard as oak, and perfectly sound. In Britain, the tree may be considered as one of the most interesting and beautiful of the *Abiétinæ*; and, when it attains the

dimensions of our cedars of Lebanon, which there is no reason to suppose it will not do in favourable situations, its timber may probably be found as useful here as it was in Cephalonia. Should, however, its timber be of no more use than that of the cedar of Lebanon, it is still in every way as worthy of being planted as an ornamental object as that fine tree. As the plant strikes with great readiness by cuttings, a number have been propagated in the Devonshire nurseries, and also in the neighbourhood of London. There are plants in the pinetum at Dropmore, and in the garden of Robert Mangles, Esq., of Sunninghill. The large plants at Hendon Rectory, and in the pinetum at Woburn Abbey, are upwards of 3 ft. high; but the one at Dropmore is only about 18 in. high. Price of plants, in the British nurseries, 2 guineas each.

App. i. *Species of Abies of which little more is known than their Names.*

A. obovata D. Don MS., *Picea obovata* Led. *Icon. Pl. Fl. Ross.*, t. 500. Leaves arranged in many series, curved upwards. Cones erect, cylindrical. Scales abruptly dilated at the cuneate base into a quadrangular lamina, broader towards the point. Bractees somewhat quadrangular, mucronate, not half the length of the scale, scarcely broader than the wing of the fruit, which is straight on both margins towards the apex. Found on the Altai Mountains, at an elevation of 5272 ft. Flowering in May; not yet introduced. Professor Don informs us, that he strongly suspects this tree to be only a northern form of *Abies Smithiana*. Ledebour, he says, has committed the same error in regard to his *P. obovata*, as Dr. Wallich did in the case of *Abies Smithiana*; that is, he has described the cones as erect, while, from the other parts of his description, it must belong to *Abies*.

A. Mertensiana Bong. and *A. sitchensis* Bong. are mentioned by M. Bongard in his observations on the Island of Sitcha, on the west coast of North America, in N. lat. 57°, as indigenous there. The article is quoted in the *Annales des Sciences Naturelles*, 2d ser., tom. iii. p. 237; but no description is given. *A. trigona*, *A. heterophylla*, *A. aromatica*, *A. microphylla*, *A. obliquata*, and *A. falcata* are mentioned by Rafinesque as being found in the Oregon country; but, as he gives no description of these trees, it is uncertain whether they belong to *Abies* or *Picea*. The same observations will apply to *A. hirtella* Humboldt et Kunth Nov. Gen. et Sp. Plant., pl. 2. p. 5., of which nothing is known either of the flowers or cones; and *A. Kämpferii* and *A. Thunbergii*, mentioned by Thunberg; and *A. Mörni*, *A. Torano*, and *A. Araragi*, enumerated by Siebold in *Verhandl. Batav. Genootsch.*, xii. p. 12., as quoted in *Pen. Cyc.*

GENUS III.



PICEA D. Don. THE SILVER FIR. *Linn. Syst. Monœcia Monadelphica.*

Identification. D. Don in Lamb. Pin., vol. 3.

Synonymes. *Pinus Lin.*, in part; *Abies Link.*, Nees von Esenbeck, and Ledebour; *Abies Du Roi*, in part; *Sapin, Fir*; *Tannen, Ger.*

Derivation. From *Pin*, pitch; the tree producing abundance of resin. Loiseleur Deslongchamps observes that the silver fir was called by the ancients *Abies*, and the spruce *Picea*; and that Linnaeus has created much confusion by reversing the application of the names. He proposes, therefore, to call the silver fir *Abies vera*, and the spruce fir *Abies Picea*. (*N. Du Ham.*, v. 214. note.) Link has divided the spruces and silver firs into two genera, and given the classical names of *Picea* to the first genus, and *Abies* to the second (see *Abhandl. Akad. der Wissenschaften*, Jahr 1827, p. 157.); and in this he has been followed by Nees von Esenbeck, and Ledebour.

Description. Trees remarkable for the regularity and symmetry of their pyramidal heads; readily distinguished from the genus *Abies*, by their leaves being more decidedly in two rows; by their cones being upright, and having the scales deciduous; and by the seeds being irregular in form. The nucleus of the seed is exposed at the inner angle, through a considerable opening in the outer testa, as if the junction of the two sides had been ruptured by the rapid enlargement of the nucleus. (*D. Don.*) They are natives of Europe, Asia, and America; but, generally, in regions more temperate than those in which the species of spruce abound. In Britain, with the exception of *P. pectinata*, they are solely to be considered as ornamental trees.

1. *P. PECTINATA.* The comb-like-leaved Silver Fir.

Synonymes. *Abies* of Pliny; *Pinus Picea Lin. Sp. Pl.*, 1420., *Syst.*, ed. Reich., 4. p. 175., *Huds. Angl.*, p. 423., *Scop. Carn.*, No. 1193., *Pall. Fl. Ross.*, 1. p. 7., *Alton. Fl. Ped.*, 2. p. 179., *Vill. Dauph.*, 3. p. 809., *Art. Hort. Kew.*, 3. p. 370., *Willd. Bert. Baumz.*, p. 217., *Hayne Dend.*, p. 176., *Hüss Andelt.*, p. 17., *Lamb. Pin.*, ed. 2., l. t. 40., *Hab. Helv.*, No. 1517.; *P. Abies Du Roi Harbk.*, ed. Pott., t. 2. p. 183., *Reit. und Abel. Abb.*, t. 98.; *Abies alba Miß. Dict.*, No. 1., *Lin. Hort. Cliff.*, p. 449.; *A. Taxii fôho Tourn. Inst.*, p. 585., *Du Ham. Ar.*, 1. p. 3., *Lauh. Pin.*,

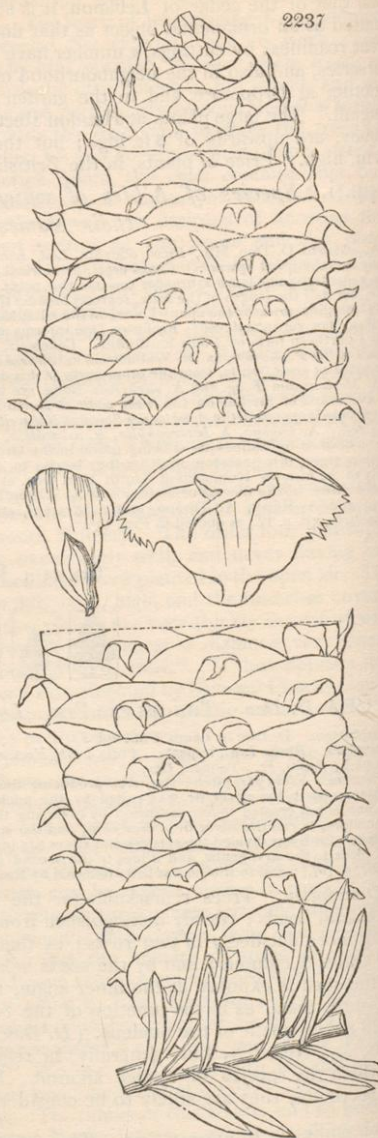
505; *A. vulgaris* Poir. *Diet. Encyc.*, 6. p. 514; *A. pectinata* Dec. *Fl. Fr.*, 2. p. 375, *N. Du Ham.*, 5. p. 294; *A. taxifolia* Hort. *Par.*; *A. Picea* Lindl. in *Penn. Cyc.*, No. 1; *A. excelsa* Link *Abhand.*, &c., Jahr 1827, p. 182; Spanish Fir; Sapin commun, Sapin à Feuilles d'If, Sapin blanc, Sapin argenté, Sapin en Peigne, Sapin de Normandie, *Fr.*; weiss Tanne, Edelanne, *Ger.*
Engravings. Lamb. Pin., ed. 2., 1. t. 40; Nov. Act. Acad. Nat. Cur., 3.; App., t. 13. f. 29. 44.; Pall. Ross., 1. t. 1. f. F.; Woodv. *Med. Bot.*, t. 209.; Reit. und Abel. *Abb.*, t. 98.; *N. Du Ham.*, 5. t. 82.; our *fig.* 2237. of the natural size, and *fig.* 2238. to our usual scale; and the plates of this species in our last Volume.

Spec. Char., &c. Leaves solitary, flat, obtuse; 2-ranked, with their points turned up. Cones axillary, cylindrical, erect; scales with a long dorsal bractea. Anthers with a short crest, with two teeth. (*Lois.*) Buds short, egg-shaped, blunt; of a reddish yellow, with from 16 to 20 blunt scales. Leaves from $\frac{1}{2}$ in. to 1 in. long, stiff, turned up at the points; of a shining dark green above, and with two lines of silvery white on each side of the midrib beneath. Cones from 6 in. to 8 in. long, and from $1\frac{1}{2}$ in. to 2 in. broad; cylindrical; green when young, afterwards reddish, and, when ripe, brown. Scale $\frac{1}{2}$ in. to $1\frac{1}{4}$ in. long, and $1\frac{1}{4}$ in. broad. Seeds variously angular, $\frac{3}{8}$ in. long, and $\frac{3}{16}$ in. broad. Cotyledons 5. The blossoms appear in May, and the cones are matured in the October of the following year.

Varieties.

† *P. p. 2 tortuosa* Booth has the branches and branchlets remarkably twisted or crooked. There is a plant in Messrs. Loddiges's arboretum 3 ft. high.

† *P. p. 3 foliis variegatis* has the leaves variegated. There is a fine plant of this variety, about 4 ft. high, in the collection of the Rev. Theodore Williams, at Hendon; and the lower branch of a large tree at White Knights has become variegated, from which we have brought cuttings, and presented them to the Horticultural Society, and to the Hammersmith and Fulham Nurseries.



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♂ *P. p. 4 cinerea*, *Pinus Picea cinerea Baum. Cat.*, ed. 1835, is a low plant with greyish bark, not yet introduced.

Description. The silver fir, the noblest tree of its genus, except *P. Webbiana*, rises to the height of from 160 ft. to 180 ft., with an erect stem, regularly furnished with whorls of candelabrum-like branches. The trunk, in full-grown trees, is from 6 ft. to 8 ft. in diameter, covered, till its fortieth or fiftieth year, with a whitish grey bark, tolerably smooth; but, as it increases in age, becoming cracked and chapped. At a still greater age, the bark begins to scale off in large pieces, leaving the trunk of a dark brown colour beneath. The branches stand out horizontally, as do the branchlets and spray, with reference to the main stem of the branch. The leaves, on young trees, are distinctly two-rowed, and the general surface of the rows is flat; but, as the trees advance in age, and especially on cone-bearing shoots, the disposition of the leaves in rows is less

perfect. The leaves are, in every stage of the tree's growth, turned up at the points; but more especially so on old trees, and on cone-bearing branches. The leaves are of a darker green above than those of any other fir; and underneath they have two white silvery lines running lengthwise on each side of the midrib. As the leaves are partially turned up, these silvery lines make a conspicuous appearance in the general aspect of the tree; whence its name. The cones are large, and have a magnificent appearance, both before and after they are mature. They are cylindrical, erect, and bluntly pointed at both ends. When nearly full grown, the scales are of a fine red; and the bractees are long, and of a light green. The seeds are of an irregular form, enveloped and surmounted with a membranaceous wing, somewhat broader above than below. The roots spread horizontally, not so near the surface as in the spruce fir. They extend to a great distance, and are not so abundantly furnished with fibres as in the case of most of the spruces, nor have they a conspicuous taproot, as is the case, more or less, with all the genus *Pinus*. The rate of growth of the tree is slow when young, but rapid after it has attained the age of 10 or 12 years. The following scale of the progress of the silver fir in the Jura, in France, is given by Baudrillart; but its growth in England is much more rapid. The first year, it rises in five or six weeks after it has been sown, with five or six leaves, and is about $\frac{1}{2}$ in. in height. The second year, it advances 1 in., retaining the leaves of the first year. The third year, it advances from 1 in. to 2 in., indicating the rudiment of a small lateral branch. The fourth year, it advances about 2 in., showing a second lateral branch; and, if taken up at this time, the plant will be found to have a small taproot. The fifth year, it begins to grow somewhat more freely, but still so slowly, that, unless under very favourable circumstances, the plants are seldom found, at that age, above 9 in. or 1 ft. in height. About the eighth year, they begin to increase more rapidly; gradually lengthening the annual growth of the leading shoot, till, at their 20th year, it is from 2 ft. to 3 ft. in length. Cones with fertile seeds are seldom produced before the tree has attained its 40th year; though cones without seeds often appear before half that period has elapsed. The female catkins are often produced for years together, without any males appearing on the same tree. In the Jura, a silver fir, at the age of 20 years, is commonly from 9 ft. to 10 ft. in height, with a trunk from 12 in. to 1 ft. 4 in. in circumference. After this, it increases in height at the rate of from 1 ft. 8 in. to 2 ft. 2 in. a year. At 40 years' growth, the trunk is from 3 ft. to 3 ft. 6 in. in circumference; at 50 years, from 4 ft. to 5 ft.; at 60 years, from 6 ft. to 8 ft.; at 75 years, from 10 ft. to 11 ft. 6 in.; and, at 100 years, about 13 ft. From 100 to 120 years' growth is necessary to produce a tree of from 114 ft. to 130 ft. in height: after which period, it



scarcely grows higher, but continues to increase slowly in thickness till it has attained the age of 150 years; when it begins slowly to decay. The rate at which the tree tapers, in the Jura, is about 1 in. in 6 ft.; so that a trunk 60 ft. high, and 6 ft. in diameter at the lower end, would be 5 ft. 2 in. at the upper end. In England, in favourable situations, the growth of the silver fir seems to be at least twice as rapid as in the Jura; but it is apt to lose its leader by very severe spring frosts; and, hence, we frequently find old silver firs with forked trunks and branchy heads. Even young plants in the nurseries are apt to lose their leaders from the same cause; for which reason, in the Goldworth and Knaphill Nurseries, in Surrey, the common silver fir and the balm of Gilead silver fir are always sown and transplanted under a spreading deciduous tree; most commonly the apple or pear. The silver fir does not bear the knife, and cannot be made into hedges, like the spruce; but, after it has attained 20 or 30 years' growth, the lower branches may be cut off to a considerable height up the trunk, with advantage to the progress of the head. A silver fir, planted when two years old, at Harefield Park, in Middlesex, in 1603, which was one of the first planted in England, was in 1679, according to Evelyn, 81 ft. high, though forked at the top; and the girt, a little above the ground, was 13 ft. The quantity of timber in the trunk of this tree was estimated at 140 ft. In Ireland, Lord Farnham had many silver firs of 40 years' growth, which had trunks 12 ft. in circumference at the ground; and one still thicker, which contained 76 ft. of solid timber. In the Park at Woburn Abbey, there is a tree which, on the 1st of February, 1837, was exactly 114 ft. high, with a trunk 11 ft. 1 in. in circumference at 4 ft. from the ground. This tree was measured eight years before (viz. in 1829); and its increase during this short period was, in height, 4 ft.; in circumference, 7 in.; in cubic feet of timber in the trunk, 11 ft.; and in cubic feet of timber in the branches, 24 ft. The total amount of available timber in the trunk of this tree, on the 1st of February, 1837, was 210½ cubic feet; and in the larger branches, 139 ft. 6 in.; making a total of 350 cubic feet of marketable timber, exclusive of 20 ft. of forked head. The age of this tree was probably not much above 100 years, as most of the old pine and fir trees at Woburn are said to have been planted in the time of Miller. The loftiest silver fir in England is believed to be a tree at Longleat, which, in 1834, being then 180 years planted, was 138 ft. high, the diameter of the trunk 5 ft. 8 in., and of the head 44 ft. The largest tree in Scotland is supposed to be one at Roseneath, 124 ft. high; the most remarkable one is also at Roseneath, of which a portrait was published by Mr. Strutt, in his *Sylva Britannica*, and of which fig. 2239. is a copy, reduced to the scale of 1 in. to 50 ft. This tree, we were informed by Lord Frederick Campbell, in 1835, was then in much the same state in which it was when Mr. Strutt made his drawing, about 1829: it was at that time 90 ft. high; the diameter of the trunk, at 1 ft. from the ground, was 7 ft. 7 in.; and the diameter of the head was 66 ft. Its solid contents were estimated at 619 cubic feet 10 in.; and it was supposed to be 200 years old. The largest tree in the neighbourhood of London is one at Whitton, planted by the Duke of Argyll, probably about 1720, which, in 1837, was 97 ft. high, with a trunk 3 ft. 9 in. in diameter. In the immediate environs of London, the tree does not thrive; nevertheless, we found in the Layton Nursery the young tree figured in our last Volume, which had attained the height of 22 ft. in about 15 years. The silver fir ripens its seeds freely both in England and Scotland. In the woods at White Knights, wherever there are old silver firs, there are numerous young plants arising around them from self-sown seeds.



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One of the most remarkable circumstances connected with the silver fir is, the vitality of the stump for many years after the tree has been cut down. As far as we are aware, this was first noticed by Loiseleur Deslongchamps, in the *Nouveau Du Hamel*, v. p. 316.; where he says, speaking both of the silver fir and the spruce, that, after being cut down, the stump vegetates for some time; its external ligneous layers increase with the liber, and endeavour, by forming a callosity inwards, to cover the section of the stump. M. Dutrochet had observed this process taking place on the stumps of the silver fir in the Jura, in 1833; and he procured, in 1805, several stumps from the Jura forests, which were in a living state when taken up. One of these was the stump of a silver fir felled in 1821, which had thus been increasing in diameter during 14 years; the new wood and bark being easily distinguishable from the former wood and bark, which were in a state of incipient decomposition. The total thickness of the 14 layers of this new ligneous production was 5·669 lines (nearly $\frac{1}{2}$ in.) in the vertical part of the stump; and this thickness is increased to 8·032 ($\frac{3}{4}$ in.) in the ligneous part of the callosity (*bourrelet*) protruded over a part of the section made by the axe. Another stump was that of a tree felled in 1743; and it was still full of life when examined at the end of the year 1836. The wood formed since the tree was felled consisted of 92 layers, the total thickness of which was nearly 2 in. The wood of which the stump was composed when the tree was felled had entirely disappeared; and the thick rind, or callosity, which had formed round the margin had curled over so as almost to cover the top of the stump. This stump, which had lived and increased in diameter during 92 years, would, in all probability, have endured much longer; so that we are ignorant how far this singular prolongation of life and increase of growth may extend, in stumps deprived of their trunk and leaves, and which only receive nourishment from the roots. (*Gard. Mag.*, vol. xiii. p. 93.)

Geography. The silver fir is indigenous to the mountains of Central Europe, and of the west and north of Asia, rising to the commencement of the zone of the Scotch pine. It is found in France, on the Pyrenees, the Alps, and the Vosges; in Italy, in Spain, and Greece in the south of Germany; and Russia, and in Siberia: but it is not found in Sweden or in Scotland. On the Carpathian Mountains, it is found to the height of 3200 ft.; and on the Alps, to the height of from 3000 ft. to 4000 ft. It attains a large size in the narrow valleys between the Swiss mountains; in the Black Forest in the south of Germany; and on the Pollino, and in the Forest of Rubia, in the kingdom of Naples. According to Pallas, it is common in Caucasus, the Uralian, Altaic, and Baikal Mountains, growing in the clefts of the rocks; but it is seldom found in the plains. The trees on Caucasus have the branches more elongated and slender, and the leaves more thinly scattered, broader, and more emarginate, than the trees of Siberia; these last being, in all probability, the *Abies Pichta* of Fischer. Wherever it is found attaining a large size, it invariably grows in good soil, and in a situation sheltered rather than exposed. In Germany, in the neighbourhood of Darmstadt, Baden, and Donaueschingen, in the Black Forest, it is found growing among oaks and other trees, in deep loamy soil, moist rather than dry; attaining the height of from 80 ft. to 100 ft., with trunks from 16 ft. to 20 ft. in circumference at 6 ft. from the ground. In the neighbourhood of Strasburg, and in the Vosges, where it has attained the height of 150 ft., the situation has always been low and sheltered, and the soil a deep loam.

History. Some confusion exists in the works of modern authors respecting the silver fir and the spruce; partly, as it would appear, from the circumstance of Linnæus having made an erroneous application of the names given to these trees by Pliny. The tree which Theophrastus calls *Elatē*, Pliny calls *Abies*, and Linnæus *Pinus Picea*; while the tree that Pliny calls *Picea*, and which is our spruce fir, is named by Linnæus *P. Abies*. The silver fir was esteemed by the Romans for its use in carpentry, and for the construction of vessels; and hence Virgil's expression, —

"Casus abies visura marinos."

Georg., ii. 68.

The fir about to brave the dangers of the seas.

And in Claudian, —

"Apta fretis abies."

The fir useful in ship-building.

In the *Eclogues*, Virgil says, alluding to the situations in which it grows, —

—— "Pulcherrima abies in montibus altis."

Ecl., vii. 66.

The abies is the most beautiful tree on lofty mountains.

In the *Æneid* he says, —

—— "Undique colles

Inclusere cavi, et nigrâ nemus abiete cingunt."

Æn., viii. 599.

"Hills clad with fir, to guard the hallow'd bound,
Rise in the majesty of darkness round."

Pitt's trans.

The wood was employed by the ancients for many different purposes. Pliny speaks of it in several places. It is preferred to that of the larch, he says, for the masts of vessels, on account of its lightness. In his 16th book, he speaks of a silver fir that formed the mast of a vessel on board which the Emperor Caligula had an obelisk transported from Egypt to Rome. This mast required the outstretched arms of four men to encircle it, and cost 80,000 sesterces, or about 30*l.* The Romans employed the silver fir for javelins, as appears by the following lines from Virgil: —

—— "Cujus apertum

Adversi longâ transverberat abiete pectus."

Æn., xi. 666.

Whose breast exposed the long fir spear transpierced.

The resinous products of the silver fir were also well known to Theophrastus and Pliny, who both detail the modes practised by the Greeks and Romans in preparing pitch and tar, which scarcely differ at all from those in common use at the present day.

The silver fir was introduced into England in the seventeenth century; but the precise period is not known. Plot and Ray mention some trees growing near Newport in Shropshire; and Evelyn speaks of two Spanish or silver firs growing in Harefield Park, Middlesex, that were planted there in 1603, at two years' growth from the seed. The tree was strongly recommended by Evelyn for its beauty, and its fitness to adorn walks and avenues; and it has, accordingly, been very generally planted for ornamental purposes. In 1797, the Society of Arts gave their gold medal to Henry Vernon, Esq., of Hilton Park, near Wolverhampton, for having planted upwards of 6000 silver firs. As this tree ripens seeds freely, it is now common in the nurseries, and very generally introduced into plantations, especially such as are ornamental; and, in grounds laid out before the middle of the eighteenth century, it may be seen near mansions, rearing its fine pyramidal head above all other trees.

Properties and Uses. The wood of the silver fir is elastic, and the colour is whitish. The grain is irregular, as the fibres which compose it are partly white and tender, and partly yellow, or fawn-coloured, and hard. The narrower the white lines are, the more beautiful and solid is the grain of the wood. In the Vosges, it is said that the external layers are more compact than the internal ones; which may arise from the practice of barking the trees there before they are cut down. The weight of this wood varies exceedingly, according to the age of the tree, the place where it grew, and even the part of the trunk from which it was taken. According to Hartig, the wood of a tree 80 years old weighs 66 lb. 14 oz. per cubic foot green, and 41 lb. 5 oz. when dry; while that of a tree 40 years old weighs only 37 lb. 9 oz. when dry. It shrinks considerably in drying, like all white woods. It is used for planks, and carpentry of all kinds; for the masts of small vessels; for joists and rafters; and for building the boats used for navigating rivers. It is said to endure a long time when used as piles, and to be much employed in Hol-

land for that purpose. In the Vosges, it is used in every department of agriculture, carpentry, joinery, and even cabinet-making and sculpture. In England, the wood of the silver fir has been chiefly used for flooring; and, according to Arthur Young, and also to Mitchell, boards sawn out of full-grown trees may be laid down at once, without any risk of their shrinking. (See *Young's Tour in Ireland*, vol. i. p. 245., and *Mitch. Dend.*, p. 270.) As fuel, the wood of the silver fir is to that of the beech as 1079 is to 1540; and to that of the spruce, as 1079 is to 1211. The charcoal is to that of the beech as 1127 is 1600. Though the charcoal is much inferior to that of the beech, yet it is preferred for heating iron that is to be forged; as producing the heat more slowly, in consequence of which the iron is more pliant to work. The bark may be employed for tanning leather, and is used generally in some parts of Switzerland. A resinous sap flows from the trunk and branches, called *larmes de sapin*. This sap is bitter, acrid, and viscous; and its smell approaches to that of the citron: it is healing, balsamic, and antiseptic. The resinous fluid is found in small tumours or blisters, under the epidermis of the bark; and in the green cones, from the latter of which it is collected about midsummer. From the resin of this tree are manufactured Strasburg turpentine (so called from a large forest of silver firs, the Hochwald, near Strasburg), colophony, and white pitch. The quantity of potash furnished by the bark and wood is in the proportion of 2 lb. of potash to 1000 lb. of wood and bark; which places the silver fir in the rank of 21 in a series of 73 ligneous plants. In some parts of Europe, the young cones, reduced by boiling to a pulp, and preserved with sugar, are eaten as a sweetmeat. This conserve is put into tea, to which it is said to communicate an agreeable odour. The leaves serve for litter; and, in Switzerland, according to Kasthoffer, are given to sheep and goats; but they are said to give the milk a peculiar taste.

Mode of extracting and preparing the Strasburg Turpentine. Every year, about the month of August, the Italian peasants who live near the Alps make a journey into the mountains to collect the turpentine. They carry in their hands cornets of tin, terminating in a sharp point, and a bottle of the same metal suspended to the girdle round their waists. Some use bullocks' horns instead of vessels of tin. Thus accoutred, the peasants climb to the summits of the loftiest silver firs; their shoes being armed with cramping-irons, like spurs, which enter into the bark of the trees, and thus support the climber; who also clings to the trunk of the tree with his knees, and one arm, while with the other hand he presses his cornet to the little tumours, or bladders, which he finds in the bark, to extract the turpentine within them. As soon as a cornet is filled with the clear turpentine which flows from the tumour, or blister, on the tree, it is emptied into the tin bottle, which is carried suspended from the waist; and, when this bottle is full, its contents are strained into a large leathern bottle, or goatskin. The straining is to free the turpentine from the leaves, and bits of bark and moss, which may have fallen into the contents; and this is the only preparation that is given to this kind of turpentine, which is kept in the goatskins, or leathern bottles for sale. Besides the turpentine collected from the tumours, or blisters, an inferior kind is produced by slightly wounding the bark of the tree. In rich soils, the trees will yield their sap twice a year, viz. in spring and August; but, in general, the tumours, or vesicles, form only once a year, viz. in spring, and are full of turpentine in August. The tumours are sometimes round, and sometimes oval; but, when the latter, their greatest length is always in a horizontal direction. Good Strasburg turpentine ought to be clear, free from impurities, transparent, and of the consistence of syrup, with a strong resinous smell, and rather a bitter taste. It is employed, as well as the essential oil of turpentine which is distilled from it, both in medicine and the arts; being found superior to all the other substitutes for the turpentine of *Pistacia Terebinthus*. It is the only kind of turpentine, produced by any kind of pine or fir tree, which is used in the preparation of the clear varnishes, and by artists

for their colours; and its oil sells it a higher price than any other. It is distilled with water, in the same manner as the other kinds of turpentine, and the residuum is a kind of colophony; a name applied to black resin, because a natural hard resin, sometimes used in plasters, and said to be the product of the *Dammara orientalis*, which is mentioned by Dioscorides, was brought from Colophon, in Ionia. The proportions for making oil of turpentine from the Strasburg turpentine are, 5 lb. of liquid resinous juice to 4 pints of water, distilled in a copper alembic. This is the essential oil of turpentine; and, if 1 lb. of it be redistilled with 4 pints of water, it is called rectified or ætherial oil of turpentine. Both preparations are used, in small doses, as diuretics, and in cases of rheumatism: they are also considered powerful styptics. In farriery, the essential oil of turpentine is much used for strains and bruises, and is found very efficacious.

The Silver Fir in British Plantations. Though the silver fir has been planted in some instances, in Britain, in masses, with a view to producing timber, yet its principal use has been as an ornamental tree. Before the cedar of Lebanon became so common, or was known to be so hardy as it has been since found to be, the silver fir was planted near mansions, as a choice and a striking tree, which, as the cedar does now, might distinguish the residence of the large landed proprietor from those of his more humble neighbours. This it did, not only by raising its pyramidal head above all other trees, but by its striking regularity of form, fine dark green foliage, and candelabrum-like regular tiers of branches. This regularity of form was, of course, objected to by the admirers of the picturesque. Gilpin says: "The silver fir has very little to boast in point of picturesque beauty. It has all the regularity of the spruce, but without its floating foliage. There is a sort of harsh, stiff, unbending formality in the stem, the branches, and in the whole economy of the tree, which makes it disagreeable. We rarely see it, even in its happiest state, assume a picturesque shape. Assisted it may be in its form, when broken and shattered, but it will rarely get rid of its formality. In old age, it stands the best chance of attaining beauty. We sometimes see it, under that circumstance, a noble shattered tree, finely adorned with ivy, and shooting out a few horizontal branches, on which its meagre foliage and tufted moss appear to advantage. I may add that the silver fir is, perhaps, the hardest of its tribe. It will out-face the south-west wind; it will bear, without shrinking, even the sea air: so that one advantage, at least, attends a plantation of silver firs; you may have it where you can have no other; and a plantation of silver firs may be better than no plantation at all." (*For. Scen.*, i. p. 90.) "As to the picturesque effect of this tree," Sir Thomas Dick Lauder observes, "we have seen many of them throw out branches from near the very root, that twined and swept away from them in so bold a manner, as to give them, in a very great degree, that character which is most capable of engaging the interest of the artist." (*Laud. Gilp.*, i. p. 180.) The advantage of planting the silver fir, in preference to the spruce, on stiff soils, Mr. Curtis of Glazenwood observes, is that the one advances to a large timber tree, while the other stops at 20 ft. or 30 ft. high, and becomes rusty and stunted. There are, in Essex, in the neighbourhood of Glazenwood, silver firs of 100 ft. high, on soils in which the spruce would not have attained half that height.

Soil, Situation, &c. The silver fir, like all the other *Abietinæ*, will attain a large size on soils of a very opposite description; but a loam, rather rich and deep than otherwise, appears to suit it best. It has attained its greatest height, in soils of this description, at Studley and Castle Howard; but it has also attained a very great height in sandy loam at Woburn Abbey, and on clay, incumbent on a retentive clayey subsoil, at Panmure. It is in vain, says Boucher, to plant silver firs in hot, dry, or rocky situations, where they commonly not only lose their top shoots, but their under branches soon become ragged; and, in place of that lively shining verdure peculiar to them in a suitable soil, they become of a pale languid hue; nay, he adds, "I have known trees of them about twenty years planted out in such soils, entirely destroyed

by a hot dry summer. At the same time, they are, in other respects, amongst the least delicate of any plants in the choice of their food; as the largest and most flourishing trees of them I have ever seen, over the island, in general grow on sour, heavy, obstinate clay, of all different qualities and colours; and though for ten or twelve years, they do not advance so fast as several of the other pines and firs, yet in twenty years they will outgrow them all, and continue that advantage till they arrive to their greatest magnitude." The silver fir requires a low situation, comparatively with the spruce fir, not being nearly so hardy as that tree, either when in the nursery or full grown. The cones, which are apt to shed their seeds in spring, ought to be gathered in October or November, and kept in a dry place till the sowing season. The seeds may be easily separated from them by a very slight exposure to the sun, and then by thrashing them, without having recourse to the kiln. The seeds should be sown, according to Sang, in March, and at such a distance as to allow the plants to rise 1 in. apart; and the covering, he says, should be a full inch thick. When the plants are 2 years old, they may be transplanted into nursery lines; and, after being 2 years in that situation, they may either be again transplanted in the nursery, to a greater distance apart, or removed to where they are finally to remain.

Accidents, Diseases, &c. The silver fir suffers more from extreme drought than any other species of the pine and fir tribe; whole forests being occasionally destroyed in this way in the north of France and in Switzerland. When the trees are young, they are liable to have their leading shoot injured by the frost; but this is not the case after the plants have attained the height of 5 ft. or 6 ft. The tree suffers from various insects, as has been already noticed in our general introduction, p. 2139.

Statistics. Recorded Trees. The two trees at Harefield Park, planted in 1603, and one of which, in 1679, was 81 ft. high, and contained 145 ft. of good timber, have been already mentioned. Mitchell mentions scores of trees at Wardour Castle, "whose aspiring heads," he says, were far advanced beyond all other trees there." At Longleat, he mentions a grove of 16 trees, 22 ft. apart, 110 ft. high, and from 10 ft. to 13 ft. in circumference. Each tree contained upwards of 200 ft. of timber. At the above distance of 22 ft., this would give 90 trees per acre, or 360 loads of timber; which, at the very moderate price of 3*l.* a load, is 1080*l.* In 1813, Mitchell felled three silver firs, which were planted in 1786; they stood in a line, 15 ft. apart, and were from 100 ft. to 112 ft. high. Each tree had lost its leader at 40 ft. high, and had formed a branchy head. The first tree contained 299 ft. of timber; the second 273 ft., and the third 164 ft. The top (that is, tops and lateral branches) made 288 hevens 2 cords and 88 parts of cordwood. A silver fir at the House of Polkemet, in West Lothian, measured in October, 1799, was 10 ft. in circumference, at 4 ft. from the ground. A silver fir at Drumlanrig Castle, in Nithsdale, was, in 1773, 12 ft. in circumference. One at Woodhouselee, Mid-Lothian, measured in 1793, was 11 ft. 1 in. in girth; and in 1835 it was 14 ft. 10 in. in girth, and 94 ft. high. Under this tree, now in a state of decay, we have often played in our boyish days. A tree in Styria, growing on the Martinsberg, in the forest district of Zirl, measured 5 ft. in diameter, at 9 ft. from the ground; and, at a height of between 90 ft. and 95 ft. from the ground, still retained a diameter of between 8 in. and 9 in. (*Handbook for Southern Germany*, p. 262.) In the Museum of Natural History, at Strasburg, is a section of the trunk of a silver fir, cut so as to form a seat, called there *Le grand sapin du Hochwald, à Barr*, department de Bas Rhin. This tree was 150 ft. high, with a trunk straight and clear of branches to the height of 50 ft., at which point it became forked. The diameter of the trunk, at the surface of the ground, was 8 ft.; and, at the height of 50 ft., 5 in. The estimated age of the tree was 360 years. It was cut down on the 16th of June, 1816, the trunk having begun to decay in the centre. We were informed, when we saw this section in 1828, that there was a tree standing very near where this one stood almost as large. The Forest of Hochwald was composed entirely of silver firs, and before the revolution belonged to the town of Strasburg.

Existing Trees. In the environs of London, at Whitton Place, near Twickenham, it is 97 ft. high, with a trunk 3 ft. 9 in. in diameter; at Syon, the tree figured in our last Volume is 96 ft. high. — South of London. In Cornwall, at Carclew, it is 99 ft. high, the diameter of the trunk 3 ft. 9 in., and of the head 20 ft. In Devonshire, at Bilton, 104 ft. high, the diameter of the trunk 3 ft., and of the head 36 ft.; at Luscombe, 21 years planted, it is 37 ft. high; at Bystock Park, 41 years planted, it is 55 ft. high; at Endsleigh Cottage, 22 years planted, it is 65 ft. high. In Hampshire, at Alresford, it is 120 ft. high, the trunk containing 230 cubic feet of timber, the diameter of the head is only 42 ft.; at Strathfieldsaye, it is 120 ft. high, with a trunk 4 ft. 6 in. in diameter. In Kent, at Knowle, 106 ft. high, the diameter of the trunk 4 ft. 10 in., and of the head 187 ft. In Somersetshire, at Kingsweston, 104 ft. high, with a trunk 4 ft. 3 in. in diameter. In Surrey, at Bagshot Park, 12 years planted, it is 30 ft. high. In Sussex, at Cowdrey, it is 120 ft. high, with a trunk 4 ft. 6 in. in diameter, clear of branches to the height of 55 ft.; at Kidbrooke, it is 80 ft. high, with a trunk 4 ft. in diameter. In Wiltshire, at Longleat, 180 years old, it is 138 ft. high, the diameter of the trunk 5 ft. 8 in., and of the head 44 ft.; at Wardour Castle, 50 years planted, it is 60 ft. high, the diameter of the trunk 5 ft. 4 in., and of the head 42 ft.; at Longford Castle, it is 60 ft. high, with a trunk 2 ft. in diameter. — North of London. In Bedfordshire, at Woburn Abbey, the tree already mentioned, p. 2332, is 114 ft. high; at Southill, it is 80 ft. high, the diameter of the trunk 3 ft. 4 in., and of the head 54 ft. In Buckinghamshire, at Temple House, 40 years planted, it is 60 ft. high. In Cheshire, at Eaton Hall, 14 years planted, it is 20 ft. high. In Derbyshire, at Kedleston, are several trees, from 130 ft. to 150 ft. high, and girting from

1 ft. to 16 ft. In Denbighshire, at Llanbede Hall, 45 years planted, it is 50 ft. high. In Durham, at Stanwick Park, is one with a trunk 4 ft. in diameter. In Essex, at Audley End, 60 years planted, it is 50 ft. high, the diameter of the trunk 2 ft., and of the head 24 ft. In Hertfordshire, at Cheshunt, 20 years planted, it is 36 ft. high. In Leicestershire, at Donnington Park, 49 years planted, it is 72 ft. high. In Nottinghamshire, at Clumber Park, it is 80 ft. high, the diameter of the trunk 3 ft. 11 in., and of the head 44 ft. In Northamptonshire, at Wakefield Lodge, 16 years planted, it is 20 ft. high. In Northumberland, at Hartburn, 83 years planted, it is 138 ft. high, the diameter of the trunk 4 ft., and of the head 40 ft.; another is 96 ft. high, the diameter of the trunk 3 ft., and of the head 38 ft. These two trees, on account of being superior in height to all the trees around them, are here called the "Nod Queens." In Oxfordshire, in Tew Park, it is 110 ft. high, the diameter of the trunk 5 ft., and of the head 54 ft. In Radnorshire, at Maeslaugh Castle, it is 68 ft. high, the diameter of the trunk 2 ft. 4 in., and of the head 40 ft. In Shropshire, at Willey Park, 18 years planted, it is 30 ft. high; another, 9 years planted, is 30 ft. high; at Kinlet, 60 years planted, it is 80 ft. high. In Suffolk, at Finborough Hall, 14 years planted, it is 34 ft. high; at Stretton Rectory, it is 90 ft. high, with a trunk 4 ft. 6 in. in diameter. In Warwickshire, at Coombe Abbey, 60 years planted, it is 70 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 80 ft. In Worcestershire, at Croome, 50 years planted, it is 90 ft. high, the diameter of the trunk 2 ft. 4 in., and of the head 40 ft. In Yorkshire, at Castle Howard, it is 130 ft. high, the diameter of the trunk 3 ft. 6 in.; at Sudley, it is 96 ft. 6 in. high, diameter of the trunk 3 ft. 6 in., and of the head 50 ft. In Scotland, near Edinburgh, at Woodhouselee, the tree already mentioned, p. 2337.; at Hopetoun House, 100 years old, it is 90 ft. high, the diameter of the trunk 3 ft. 7 in., and of the head 45 ft.—South of Edinburgh. In Ayrshire, at Kilkerran, it is 90 ft. high, with a trunk 5 ft. in diameter; at Auchincruive, it is 80 ft. high, with a trunk 3 ft. 6 in. in diameter. In Berwickshire, at the Hiresl, 8 years planted, it is 15 ft. high. In Renfrewshire, at Erskine House, it is 70 ft. high, with a trunk 2 ft. 10 in. in diameter. In Roxburghshire, at Minto, 75 years planted, it is 90 ft. high, the diameter of the trunk 3 ft. 6 in.—North of Edinburgh. In Argyllshire, at Toward Castle, 13 years planted, it is 18 ft. high; at Roseneath Castle, 138 years old, it is 124 ft. high, the diameter of the trunk, at 3 ft. from the ground, 6 ft. 4 in., and of the head 74 ft.; another, of the same age, and about 120 ft. high, has a trunk 7 ft. in diameter at 1 ft. from the ground; there is also the remarkable tree figured in our last Volume. In Banffshire, at Gordon Castle, it is 54 ft. high, the diameter of the trunk 2 ft. 8 in., and of the head 45 ft. In Clackmannanshire, in the Garden of the Dollar Institution, 12 years planted, it is 26 ft. high. In Cromarty, at Coull, it is 70 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 90 ft. In Forfarshire, at Kinnaird Castle, 80 years planted, it is 85 ft. high, the diameter of the trunk 4 ft., and of the head 50 ft.; at Courtachy Castle, 102 years old, it is 85 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 32 ft.; at Gray, there are several specimens 80 ft. high, with trunks nearly 4 ft. in diameter. In Morayshire, at Ballindalloch, are two silver firs, one 78 ft. high, and 10 ft. 6 in. in girth at 1 ft. from the ground, and 8 in. at 10 ft. from the ground; the other is 96 ft. high, 13 ft. 4 in. in girth at 1 ft. from the ground, and 9 ft. 6 in. at 10 ft. from the ground. In Perthshire, at Dupplin, it is 55 ft. high, with a trunk 5 ft. in diameter; at Taymouth, it is 90 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 36 ft. In Stirlingshire, at Blair Drummond, 120 years old, it is 90 ft. high, the diameter of the trunk 3 ft., and of the head 36 ft.; at Airthrey, it is 80 ft. high, with a trunk 4 ft. in diameter; at Sauchie, 30 years planted, it is 26 ft. high; in Bannockburn Wood, it is 89 ft. high.

In Ireland. At Dublin, in the Glasnevin Botanic Garden, 35 years planted, it is 40 ft. high. In Kilkenny, at Woodstock, 80 years planted, it is 91 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 52 ft. In Down, at Mount Stewart, 50 years planted, it is 56 ft. high; at Moira, it is 90 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 46 ft.; at Tullymore Park, 60 years planted, it is 84 ft. high, the diameter of the trunk 3 ft., and of the head 60 ft.; at Ballylead, 60 years planted, it is 52 ft. high. In Fermanagh, at Florence Court, 20 years planted, it is 36 ft. high; at Castle Coole, 50 years planted, it is 80 ft. high, the diameter of the trunk 2 ft. 6 in. In Sligo, at Makree Castle, it is 86 ft. high, and the diameter of the trunk 3 ft. 6 in.

In Foreign Countries. In France, at Colomby, near Metz, 70 years planted, it is 69 ft. high, the diameter of the trunk 2 ft. In Hanover, at Harbeke, 40 years planted, it is 16 ft. high; in the Göttingen Botanic Garden, 40 years planted, it is 70 ft. high. In Bavaria, at Munich, in the English Garden, 50 years planted, it is 70 ft. high. In Prussia, near Berlin, at Sans Souci, 45 years planted, it is 40 ft. high; in the Pfauen Insel, 35 years planted, it is 36 ft. high. In Denmark, at Dronninggaard, 40 years planted, it is 100 ft. high. In Sweden, in the Botanic Garden at Lund, it is 30 ft. high. In Italy, at Monza, 70 years planted, it is 75 ft. high.

Commercial Statistics. Price of seeds, in London, 2s. 6d. per pound: plants, two years' seedlings, are 15s. per 1000; transplanted plants, 6 in. high, 20s. per 1000; from 9 in. to 12 in. high, 30s. per 1000; 1 ft. 6 in. high, 10s. per 100; 2 ft. high, 16s. per 100. At Bollwyller, plants are 3 cents each; *P. cinerea*, 4 francs each. At New York, plants of the species are 75 cents.

♀ 2. *P. (P.) PITCHA.* The Pitch Silver Fir.

Synonymes. *Pinus Pichta* Lodd. Cat., ed. 1836; *P. sibirica* Hort.; *Abies sibirica* Ledebour Icon. Pl. Fl. Ross., t. 499., Lindl. in Penny Cyc., No. 2.; *A. Pichta* Fischer; *Pichta*, Russ. Engraving. Led. Icon. Pl. Fl. Ross., t. 499.

Spec. Char., &c. Leaves solitary, tetragonal, dark green. Cones cylindrical, erect. Scales cuneate-obovate, rounded at the apex, quite entire, convex externally. A native of the Altai Mountains, at an elevation of 4000 ft., where it forms whole forests; towards an elevation of 5272 ft., it gradually becomes more rare. (*Ledeb.*) Introduced in 1820, and differing from a young silver fir, chiefly in having the leaves closer set on the branches, and not so silvery beneath. Professor Don suspects it to be only the Siberian variety of *Picea pectinata*, which ranges from the Atlantic to the Pacific. The tree in the Horticultural Society's Garden was, in 1837, after being 4 years planted, 2 ft. 6 in. high.

† 3. *P. BALSAMEA* L. The Balm of Gilead, or American, Silver Fir.

Synonymes. *Pinus balsamea* Lin. *Sp. Pl.*, 1421., *Syst.*, ed. Reich., 4. p. 176., *Smith in Rees's Cyc.*, No. 26., *Gron. Virg.*, 2. p. 152., *Wang. Beit.*, p. 40., *Lamb. Pin.*, ed. 2., t. 41., *Du Roi Harbk.*, ed. Pott., 2. p. 144.; *P. Abies balsamea* Marsh. *Arb. Amer.*, p. 102.; *Abies Taxii* folio, &c., *Hort. Angl.*, 2. p. 2., *Du Ham. Arb.*, 1. p. 3., *Pluk. Alm.*, 2. t. 121., *A. balsamea* N. Du Ham., 5. p. 295.; *A. balsamifera* Michx. N. Amer. *Syl.*, 3. p. 191.; Balsam Fir; le Baume de Giléad, le Sapin Baumier de Giléad, Fr.; Balsam Fichte, Balsam Tanne Ger.

Engravings. *Lamb. Pin.*, ed. 2., 1. t. 41.; *Pluck. Alm.*, 2. t. 121. f. 1.; N. Du Ham., 5. t. 83., f. 2.; Mich. N. Amer. *Syl.*, 3. t. 150.; and our fig. 2242. to our usual scale, and figs. 2240. and 2241. of the natural size.

Spec. Char., &c. Leaves solitary, silvery beneath, apex emarginate, or entire; somewhat recurved, and spreading. Cones cylindrical, violet-coloured; and pointing upwards. (*Michx.*)



2240

2241

Leaves $\frac{3}{4}$ in. long. Cones 4 in. to $4\frac{1}{2}$ in. long, and $\frac{1}{2}$ in. broad; scales from $\frac{5}{8}$ in. to $\frac{6}{8}$ in. broad, and $\frac{6}{8}$ in. long. Seed, with the wing, $\frac{6}{8}$ in. long, and $\frac{6}{8}$ in. broad. Seed very small, irregular; about half the size

of that of the common silver fir. Cotyledons,?. A tree, introduced in 1696. In Britain, seldom above 20 ft. high; flowering in May, and ripening its cones in autumn.

Variety.

† *P. b. 2 longifolia* Booth has leaves longer than the sheaths, with the branches somewhat more upright.

Description, &c. A pyramidal tree, in general appearance resembling the silver fir of Europe; but seldom found, even in America, above 20 ft. or 30 ft. in height, and not of more than the same number of years in duration. The trunk tapers from 1 ft. in diameter at the surface of the ground, to 7 in. or 8 in. at the height of 6 ft. When standing alone, it forms a regular pyramidal head, abundantly furnished with branches and cones. The leaves are 6 or 8 lines long; of a bright but dark green above, and a silvery white beneath. The male catkins are numerous, crowded round the shoots of the preceding season, and more persistent than in the silver fir. The cones are nearly cylindrical, of a darker purple than in the silver fir; 4 in. or 5 in. long, 1 in. in diameter, tapering towards the upper extremity, and generally sprinkled with resin, at least on one side. The bark is thickly interspersed with small vesicles, containing a clear limpid resin. The wood is light, yellowish, and slightly resinous. The rate of growth, in the climate of London, is rather more rapid than that of the silver fir, the tree attaining the height of $10\frac{1}{2}$ ft. in as many years, and arriving at maturity in 20 or 25 years; soon after which it dies, the symptoms of its decay being, as observed in Lawson's *Manual*, an apparent overflow of sap, and an unnatural thickening of the terminal shoots; which may probably arise from the richness of the soil and the warmth of the situation in which the tree is planted. The balm of Gilead fir was cultivated by Bishop Compton in 1697; and its seeds being generally imported, and sometimes ripened, in this country, it is easily procured in



the nurseries, and is frequent in ornamental plantations. The wood is but little employed in America, on account of its deficiency in size and strength; but it is sometimes used for the staves of casks for packing fish. The sap is extracted by means of incisions in the body of the tree, or collected from the exudations which take place on its bark, in the same manner as is done with that of the silver fir. It is sold, in the United States and in England, under the name of balm of Gilead, or Canada balsam; and, combined with spirits, Sir J. E. Smith observes, it makes a not unpleasant dram. The fresh turpentine is, however, acrid and inflammatory, and, applied to wounds, causes heat and acute pain, though it is considered of great efficacy in certain stages of consumption. It is a greenish transparent fluid, with a very penetrating taste. The true balm of Gilead is produced by the *Amyris gileadensis*. The largest of the specimens of the balm of Gilead fir in the neighbourhood of London are at Syon, Whitton, and Chiswick Villa, where it is from 30 ft. to 40 ft. high. The tree in the Horticultural Society's Garden, which, in 1837, had been 10 years planted, was 10 ft. high, and had produced cones. Throughout the country, there are numerous trees from 25 ft. to 30 ft. high. Price of seeds, in London, 2s. 6d. per oz.: plants, two-years' seedlings, 10s. per 1000; transplanted plants, 8 in. high, 40s. per 1000. At Bollwyller, plants are from 1 to 2 francs each; and at New York, plants 4 ft. high are 75 cents each.

† 4. *P. (B.) FRASERI* Pursh. Fraser's, or the double Balsam, Silver Fir.

Synonymes. *Pinus Fraseri* Pursh Fl. Amer. Sept., 2. p. 639., Lamb. Pin., ed. 2., 1. t. 42.; *Abies Fraseri* Lindl. in Penny Cyc., No. 5. Engravings. Lamb. Pin., ed. 2., 1. t. 42.; and our figs. 2243, 2244.



2243



2244

Spec. Char., &c. Leaves linear, emarginate, silvery beneath. Cones oblong, squarrose. Bracteoles somewhat leafy, obcordate, mucronate, half exserted, reflexed. (*Don* in *Lamb. Pin.*) This tree so closely resembles the preceding kind, that it is unnecessary to describe it. It is not noticed by Michaux; but Pursh found it on high mountains in Carolina, resembling, he says, *P. balsamea* in several respects, but differing, at first sight, in being a smaller tree, the leaves shorter and more erect, and the cones not one fourth the size. It was introduced into England by Mr. Fraser, in 1811; and the original tree is in the Hammersmith Nursery, where, in 1837, it was 15 ft. high, and had, for two or three years, produced cones, but no male catkins. This last circumstance has given rise to the idea that the male and female are produced by different trees, which is exceedingly improbable. There are two plants in the Horticultural Society's Garden: one, considered the male, in 1837, after being 3 years planted, was 2 ft. high; and the other,

supposed to be the female, of the same age, was 4 ft. high. Plants, in the London nurseries, are 5s. each; and at Bollwyller, 3 francs.

‡ 5. *P. GRANDIS* Dougl. The great Silver Fir.

Synonymes. *Pinus grandis* Dougl. MS., *Lamb. Pin.*, 3. t. 94.; *Abies grandis* Lindl. in *Penny Cycl.*, No. 3.; the great Californian Fir.

Engravings. *Lamb. Pin.*, 3. t. 94.; our fig. 2245 from Lambert's *Pinus*, vol. iii., and fig. 2246, from Douglas's specimens in the herbarium of the Horticultural Society, and the tree in the garden.

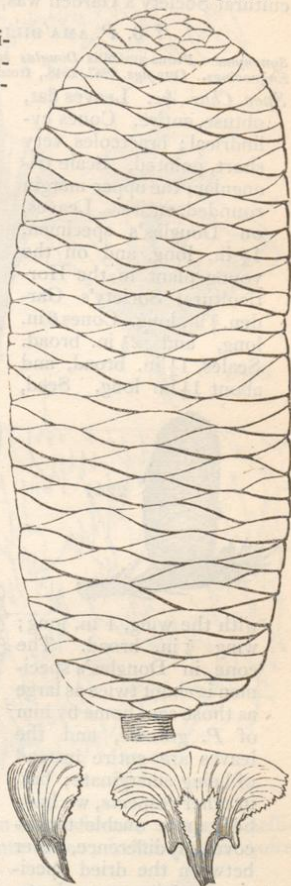
Spec. Char., &c. Leaves flat, obtuse, emarginate, pectinate, silvery beneath. Cones cylindrical; bracteoles ovate, acuminate, irregu-



2245

larly dentate, very short. (*Don in Lamb. Pin.*) Leaves from $\frac{3}{4}$ in. to 1 in. long. Cones, according to Lambert, $6\frac{1}{2}$ in. long and $3\frac{1}{2}$ in. broad; but in Douglas's specimens the largest cones are only $3\frac{1}{2}$ in. long, and 2 in. broad, the others being much smaller. Scale $\frac{3}{4}$ in. long, and $\frac{3}{8}$ in. broad. Seed small; with the wing, $\frac{3}{4}$ in. long, and $\frac{3}{8}$ in. broad. A native of the north-west of America; discovered by Douglas, and introduced by him in 1831.

Description. A noble tree, akin to *P. balsamea*, growing from 170 ft. to 200 ft. high, with a brown bark. Leaves pectinate and spreading, linear, roundish at the apex, emarginate, callous on the margin, quite entire; green and shining above, silvery beneath, somewhat dilated towards the apex; 1 in. long. Cones lateral solitary, cylindrical, obtuse, very similar to *P. Cædrus*, but larger, 6 in. long, of a chestnut-brown colour; scales transverse, very broad, lamelliform, deciduous, stalked, incurved on the margin, quite entire. Bracteoles ovate-acuminate, irregularly crenulate on the margin, much shorter than the scales, included. Seeds oblong, with a coriaceous testa; wing very broad, axe-shaped, truncate at the apex, slightly scarious and membranaceous, brittle, shining, pale. (*Lamb. and Dougl. in Comp.*



2246

Bot. Mag., ii. p. 147.) A native of northern California, in low moist valleys where it attains the height of 200 ft. The wood is soft, white, and of inferior quality, like *P. religiosa*, to which, according to Professor Don, it is nearly related. It resembles the cedar of Lebanon in the form and structure of its cones, which are three times the length of the leaves; with ovate-acuminate bracteas, much shorter than the scales. (*D. Don.*) The plant in the Horticultural Society's Garden was, in 1837, 1 ft. high.

† 6. *P. AMA'BILIS* Dougl. The lovely Silver Fir.

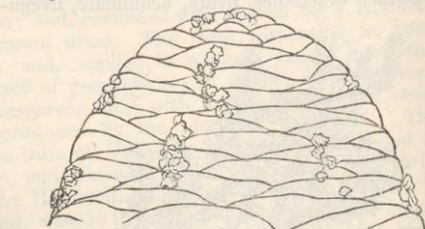
Synonymy. *Pinus amabilis* Douglas MS.

Engravings. Our figs. 2247, 2248., from Douglas's specimens in the herbarium of the Hort. Soc.

Spec. Char., &c. Leaves flat, obtuse, entire. Cones cylindrical; bracteoles very short, pointed. Scale triangular; the upper margin rounded, entire. Leaves, on Douglas's specimen, $1\frac{1}{4}$ in. long, and on the young plant in the Horticultural Society's Garden, $\frac{3}{4}$ in. long. Cones 6 in. long, and $2\frac{1}{2}$ in. broad. Scales, $1\frac{1}{2}$ in. broad, and about $1\frac{1}{4}$ in. long. Seed,

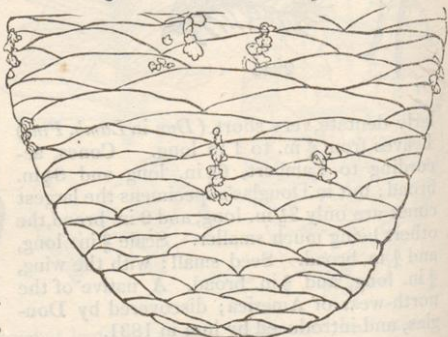


2247



2248

with the wing, 1 in. long; wing $\frac{5}{8}$ in. broad. The cone in Douglas's specimen is about twice as large as those sent home by him of *P. grandis*, and the leaves are entire instead of being emarginate; but, in other respects, we have been quite unable to discover any difference, either between the dried specimens, or the young plants, worthy of being considered specific. The cones were sent home by Douglas in 1831, without any further information than the name. As there are young plants in the Chiswick Garden, all that is here said must be considered as provisional, till these plants have shown some characteristic features by which they may be either distinguished from, or associated with, other species.



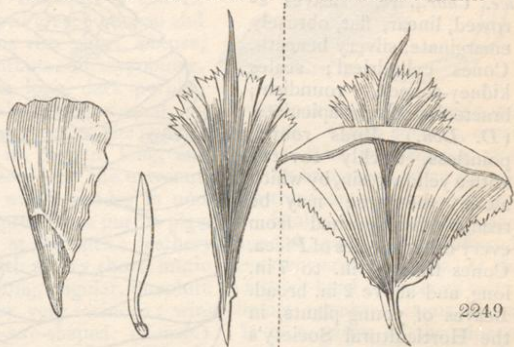
† 7. *P. NO'BILIS* Dougl. The noble, or large-bracted, Silver Fir.

Synonymes. *Pinus nobilis* Douglas MS., *Lamb. Pin.*, 2., last fig.; *A. nobilis* Lindl. in *Penny Cyc.*, No. 5.

Engravings. *Lamb. Pin.* Icon.; and our figs. 2249. and 2250., from Douglas's specimens in the herbarium of the Horticultural Society.

Spec. Char., &c. Leaves mostly on one side of the branches, falcate, short, acute, silvery beneath. Cones cylindrical; bracteoles elongated, spatulate,

gnawed, imbricated backwards (*Don in Lamb. Pin.*) Leaves $1\frac{3}{4}$ in. long. Cone $6\frac{1}{2}$ in. long, sessile; $2\frac{3}{4}$ in. broad. Scale triangular; without the bractea, $1\frac{1}{4}$ in. long, and the same in breadth; bractea $\frac{5}{8}$ in. long. Seed small, irregular; with the wing, $1\frac{1}{4}$ in. in length. Wing $\frac{5}{8}$ in. broad in the widest part. Cotyledons, ? Natives of the north-west of North America, where it was discovered by Douglas, and introduced in 1831.



2249



Description, &c.

A large tree, with cinnamon coloured bark. Leaves crowded, 2-rowed, linear, falcate, for the most part acute, compressed trigonal; flat above, marked with a depressed line; silvery beneath; scarcely 1 in. long. Cones solitary, lateral, cylindrical, thick; brownish; 6—7 in. long, and 8—9 in. in circumference: scales lamelli-form, stipulate, copiously covered with minute down; incurved and quite entire on the margin. Bracteoles much exerted, spatulate, adpressed backwards, imbricated; laminae dilated, membranaceous; points elongated, awl-shaped, rigid. Seeds oblong, with a coriaceous testa: wing broad, axe-shaped, thinly membranaceous, pale-coloured; nearly allied to *P. Fraseri*, but with cones five times as large. (*Lamb.*) According to Douglas (*Comp. Bot. Mag.*, ii. p. 147.), this is a majestic tree, forming vast forests upon the mountains of Northern California, and producing timber of excellent quality. "I spent three weeks in a forest composed of this tree," he says, "and, day by day, could not cease to admire it." The plant in the Horticultural Society's Garden



2250

was, in 1837, 1 ft. high. The finest plants of this species in the neighbourhood of London are at the Hendon Rectory, where, in October, 1837, one was 2 ft. high, and the other 1 ft. 8 in., both in pots. Price of plants, in the London nurseries, three guineas each.

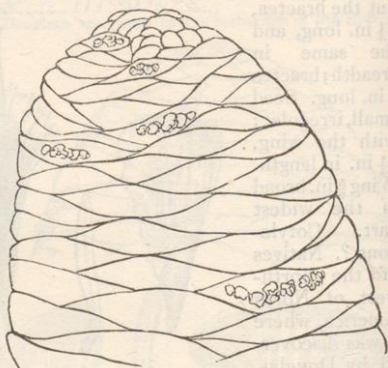
† 8. *P. WEBBIANA* Wall. Webb's purple-coned Silver Fir.

Synonymes. *Pinus Webbiæna* Wall. in Litt., Lamb. Pin., ed. 2., t. 44.; *P. spectabilis* Lamb. Monog., 2.; p. 3. t. 2.; *Abies Webbiæna* Lindl. in Penn. Cyc., No. 7., Royle Illust.; Chilrow, and the Oonum, or purple-coned fir, in the Himalayas.

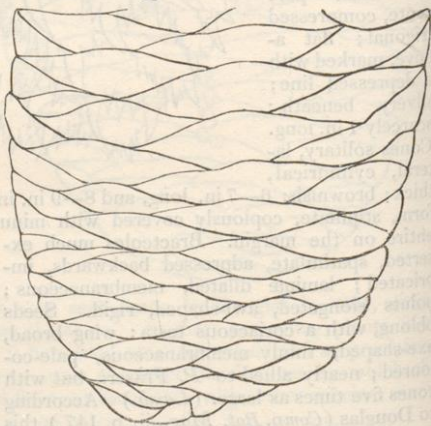
Engravings. Lamb. Pin., ed. 2., t. 44.; Monog., 2. t. 2.; and our figs. 2251. and 2252.

Spec. Char., &c. Leaves 2-rowed, linear, flat, obtusely emarginate, silvery beneath. Cones cylindrical; scales kidney-shaped, roundish; bracteoles oblong, apiculate. (*D. Don.*) Buds round, pointless, thickly covered with a yellow resin, by which alone the tree may be readily distinguished from every other species of *Picea*. Cones from $6\frac{1}{2}$ in. to 7 in. long, and above 2 in. broad. Leaves of young plants, in the Horticultural Society's Garden, from $1\frac{1}{2}$ in. to $2\frac{1}{4}$ in. long. Scale above 1 in. long, and $1\frac{1}{4}$ in. broad. Seeds, with the wing, $\frac{3}{8}$ in. long; wing $\frac{5}{8}$ in. broad in the widest part. Seeds $\frac{5}{16}$ in. long, and $\frac{3}{16}$ in. broad. In general they are smaller, but longer, and with a sharper point, than those of the common silver fir; and, like the seeds of the common silver fir, they are of a brownish purple colour. Cotyledons, ?. A tree, a native of Nepal, in which country it was discovered by Captain W. S. Webb. Introduced into England by Dr. Wallich, in 1822.

Description, &c. A large, handsome, pyramidal tree, from 80 ft. to 90 ft. high, with a trunk from 3 ft. to 4 ft. in diameter near the base. Branches numerous, spreading horizontally, much divided, densely clothed with leaves, disposed in whorls, covered with a pale ash-coloured, rough, scaly bark; bent upwards at the apex. Wood compact, whitish rose-colour. Leaves linear, solitary, crowded, 2-rowed, spreading, coriaceous, smooth, shining; $1\frac{1}{2}$ in. to 2 in. long, 2 lines broad; very dark green above; canaliculate, somewhat deflexed on the margin, quite entire;



2251

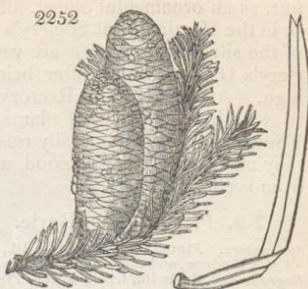


white beneath, emarginate at the apex. Catkins lateral, sessile; having at the base many, short, closely imbricated scales, round and membranaceous in the male, and broad ovate in the female. Male catkins numerous, cylindrical, slender, simple, springing from the lower side of the extremities of the branches: stamens monadelphous: anthers short, obcuneate, on short stalks, imbricated backwards, having at the apex a convex somewhat kidney-shaped crest; conical and 2-horned above; horns very short, obtuse, divaricate. Female catkins solitary, oblong, cylindrical, erect; 1 in. long, dark purple:

scales short, roundish, wedge-shaped, membranaceous on the margin, repando-denticulate, recurved at the apex, mucronate. Cones solitary, erect, obtuse, cylindrical; 4 in. to 6 in. long, and $1\frac{1}{2}$ in. to 2 in. in diameter, proceeding from the upper side of the extremities of the branches; of an intense purple; full of resin, which exudes in numerous transparent pendulous globules, yielding by expression a purple pigment. Scales short, broad-wedge-shaped, much dilated at the apex; leathery, roundish, quite entire, inflexed, densely imbricated, with a very short, mutic, persistent scale (bractea) at the base. Seeds oval-oblong, angular, obvolute in a thick hard coriaceous testa; taste acrid, and odour very resinous: wing slender, membranaceous, broad, quite entire, obovate-axe-shaped. (*Lamb.*) It is a native of the alps of Gossainthan in Nepal, and of the Himalayas, where it was discovered by Captain W. S. Webb, "a distinguished traveller, and a zealous investigator of natural history, deservedly known for his admirable survey of the Himalayan alps." Captain Webb gave the following account of the tree to Dr. Wallich:—

"This purple-coned pine attains a height of 80 ft. or 90 ft., with a diameter of the stem near the ground of from 3 ft. to 4 ft. The cone is produced on the extremity of the shoots. The leaves are about 1 in. long, of a beautiful light green, having a white stripe in the centre. The wood even equals, in the texture of its grain and in odour, the Bermudas cedar. The fruit is said to yield, at full growth, a purple pigment by expression. The silvery hue of the bark, the beautiful contrast of the leaves with the rich purple of the cone, glittering with globules of transparent resin, produce in combination one of the most striking objects which can well be imagined, and entitle the tree to precedence for ornamental purposes." Seeds were repeatedly sent to England, by Dr. Wallich, to Mr. Lambert and others; but none appear to have vegetated till about 1822; when some plants were raised in the Fulham Nursery. The largest of these, which is now at Dropmore, and of which our *fig.* 2253. is a portrait, to scale of 1 in. to 8 ft., was, in 1837, after being 10 years planted, 8 ft. high; and had a cone which on the 14th of July was $3\frac{1}{2}$ in. long, and on the 1st of October, was about 5 in. long. As the tree has produced no male catkins, no perfect seeds can be expected from this cone; but its intensely dark, and yet brilliant purple hue, amply justifies the description of Captain Webb. The plant, in the climate of England, appears rather more tender than the silver fir; being liable, from its vegetating very early in spring, to have its leading shoots pinched by the frost. After a series of years, however, and propagation from seeds ripened in this country, it will, in all probability, accommodate itself in a considerable degree to the peculiarities of our climate. When once the tree begins to bear cones, they may be fecundated with the male blossoms of the common silver fir, and thus a hybrid produced somewhat hardier than the female parent. As a timber tree, it is never likely to be of much value in this country; though, in India, its wood is said to equal in the texture of its grain, and in its odour, the Bermudas cedar;

2252



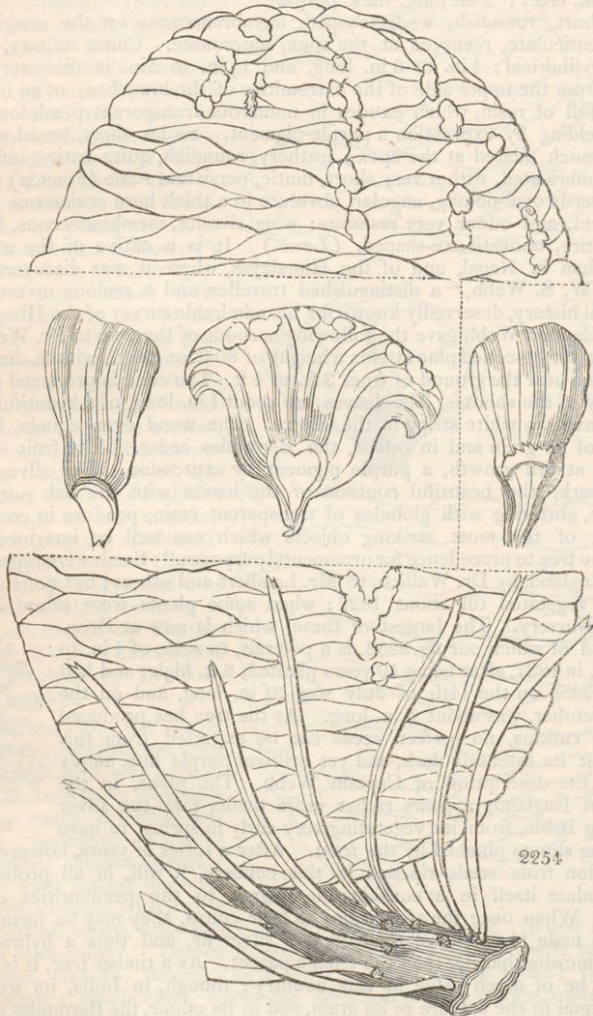
2253

but, as an ornamental object, all who have seen the tree, either at Dropmore or in the Horticultural Society's Garden, must allow that it is one of the finest of the silver firs. There are very handsome plants in the Horticultural Society's Garden, which, after being 6 years planted, were, in 1837, nearly 6 ft. high. At the Hendon Rectory, there are several plants in pots, from 3 ft. to 4 ft. high. Price of plants, in the London nurseries, 2 guineas each. These plants are generally raised from cuttings; but, notwithstanding this, they make apparently as good and as erect-growing plants as those raised from seeds.

† 9. *P. PINDROW* Royle. The Pindrow, or tooth-leaved, Silver Fir.

Synonymes. *Pinus Pindrow* Royle Ill., t. 86., Lamb. Pin., 3. t. 92.; *Taxus Lambertiana* Wall. Cat.; Pindrow, and sometimes *Morinda*, in the Himalayas.

Engravings. Royle Ill., t. 86.; Lamb. Pin., 3. t. 92.; our fig. 2254. and 2255., from Royle.



Spec. Char., &c. Leaves 2-rowed, linear, flat, of the same colour on both sides; sharply 2-toothed at the apex. Crest of the anthers 2-horned. Cones oval; scales trapezoideo-cordate; bracteoles roundish, emarginate, irregularly crenulate. (*Don in Lamb. Pin.*) Leaves 3 in. long. Cone $4\frac{3}{4}$ in. long, $3\frac{1}{2}$ in. broad, of an intense purple. A tree of Kamaon, discovered by Captain Webb and Drs. Govan and Royle, and introduced by Dr. Royle in 1837.

Description, &c. A large tree. Trunk straight, covered with an ash-grey bark, 80 ft. to 100 ft. high. Branches verticillate, spreading, leafy. Leaves 2-rowed, spreading, scattered in insertion, twisted at the base, linear, flat, acutely bidentate at the apex (teeth callous, connivent, and often unequal); obtuse and quite entire on the margin; of the same colour on both sides; shining, marked above with a somewhat depressed line, rather silvery beneath; when young, having an elevated roundish midrib, 2 in. and more in length, and about 1 line broad. Male catkins lateral, scattered, cylindrical, 1 in. long, imbricated with many very short, obtuse, concave, dark yellow scales; scarious on the margin. Stamens crowded, imbricated. Filaments very short, distinct. Anthers linear wedge-shaped, dark yellow, 2-celled; crest very short, coriaceous, rigid, 2-lobed (lobes divergent, horned); cells inserted beneath, swelled, membranaceous, opening by an oblong fissure; one of the cells sometimes abortive, and hence the anther 1-celled. Cones lateral, solitary, erect, oval, very obtuse, 5 in. long, greyish brown: scales trapezoid-heart-shaped, somewhat square, coriaceous, rigid, striated; superior margin roundish, incurved, quite entire; angles dilated, recurved, roundish, membranaceous, ragged: stalk angled, very short, keeled on both sides, prolonged above the base: bracteas very short, roundish, emarginate, irregularly crenulated on the margin.

Seeds small, angled, brown, shining; exterior testa (primine) disjoined on the inner side, from the growth of the ovule, lengthened into the large, quite entire, axe-shaped, pale brown wing; interior (secundine) closely investing the nucleus, terminated by a very short, paler, irregularly crenulated wing. (*D. Don.*) *P. Webbiæna* differs in having leaves only half as long, obtusely emarginate, silvery beneath; cones cylindrical, longer; scales kidney-shaped, roundish; bracteoles oblong, apiculate; and finally in the seeds and wing being of a pale bright brown. (*Id.*) Professor Don observes that *P. Pindrow* is liable to be confounded with *P. Webbiæna*; but that the former is readily distinguished from the latter by its longer and acutely bidentated leaves, of nearly the same colour on both surfaces; and by its shorter and thicker cones, with trapezoid-formed scales, and rounded notched bracteoles. Dr. Royle, who appears to have been the only botanist who found the tree either in flower or in fruit, states that it grows to a large size, varying from 80 ft. to upwards of 100 ft. in height, with widely spreading branches; and that he met with it at an elevation of 1000 ft. above the level of the sea. From cones presented by Dr. Royle to the Horticultural Society, one or two plants were raised, in 1837, by the care and attention of Mr. Gordon. It is difficult to decide in the case of any species of *Abietinæ* from very young seedling plants; nevertheless, from those in the Horticultural Society's Garden, and especially from the incipient bifurcations of the leaves at the apex, we feel disposed to consider *P. Pindrow* as only a variety of *P. Webbiæna*.



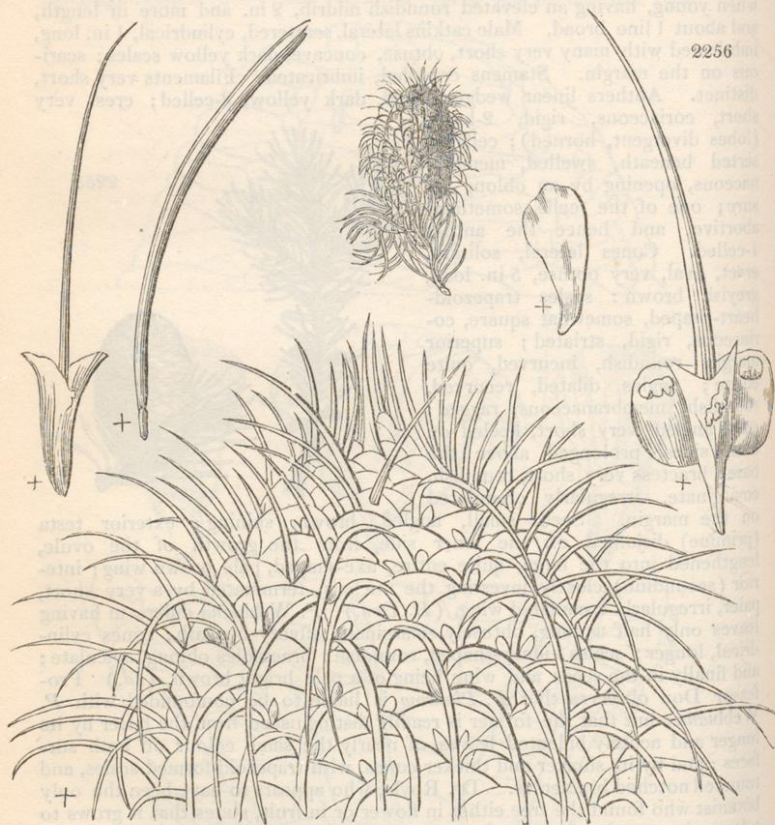
♣ 10. *P. BRACTEATA* D. Don. The leafy-bracted Silver Fir.

Synonymes. *Pinus bracteata* Lin. *Trans.*, 17. p. 413, *Lamb. Pin.*, 3.; *P. venusta* Dougl. in *Comp. to Bot. Mag.*, 2. p. 152.

Engravings. *Lamb. Pin.*, 3. t. 91.; and our fig. 2256. from Lambert.

Spec. Char., &c. Leaves 2-rowed, linear, mucronate, flat, silvery beneath. Cones ovate. Bracteoles 3-lobed; the middle division very long, leaf-like, recurved. (*D. Don.*) Cones 4 in. long. Bractea nearly 2 in. long. Leaves 2 in. long. A large tree, a native of California, discovered by Douglas in 1832, and about the same period by Dr. Coulter, but not yet introduced.

Description, &c. An elongated pyramidal tree. Trunk very straight and slender, 120 ft. high; scarcely 1 ft. in diameter at base; only the upper third covered with branches. Bark chestnut-brown. Branches verticillate, spreading; lower ones slightly decumbent. Leaves crowded, scattered in insertion; but 2-rowed, linear, mucronate, flat, coriaceous, rigid; 2 in. to 3 in. long, 1 line broad; light green, and shining above, marked with a depressed line; silvery beneath, slightly revolute on the margin; midrib and apex callous. Cones on adult branches only, solitary, lateral, almost sessile, erect, ovate turgid; 4 in. long, and 2 in. in diameter; with numerous, ovate-oblong, acute, scarious, torn, bright brown, revolute, persistent scales, at the base; scales kidney-shaped, roundish, concave, stalked, thick, indurated; pale brown, incurved on the margin, crenulate, glaucous externally; stalk sharply keeled above, shorter than the disk. Bracteas wedge-shaped, adpressed, coriaceous, rigid; of the



same colour as the scales, but shorter; adnate and callous below, 3-lobed at the apex: lobes lateral, very short, roundish, irregularly dentate; middle one recurved, 1½ in. long, resembling true leaves in every respect, but only half the breadth. Seeds wedge-shaped, oblong, tetragonal; exterior testa (primine) greyish brown, disjointed, and open at the interior angle, where the nucleus is exposed, with the apex extended into the unequally sided, obovate, quite entire, thinly membranaceous, flat, reticulated wing. Nucleus included in a crustaceous, dark brown, proper testa (secundine), crowned at the apex by a very short, membranaceous ragged wing. (*Don* in *Lin. Trans.*) This curious and interesting species of fir was discovered by Douglas, in March, 1832, on the high mountains of Colombia. Dr. Coulter found it on the sea side range of Santa Lucia, about 1000 ft. lower than *P. Coulteri*. The trunk rises to the height of 120 ft.; is very slender, not exceeding 2 ft. in circumference; and as straight as an arrow. The upper third of the tree is clothed with branches, giving it the appearance of an elongated pyramid. The branches are spreading; the lower

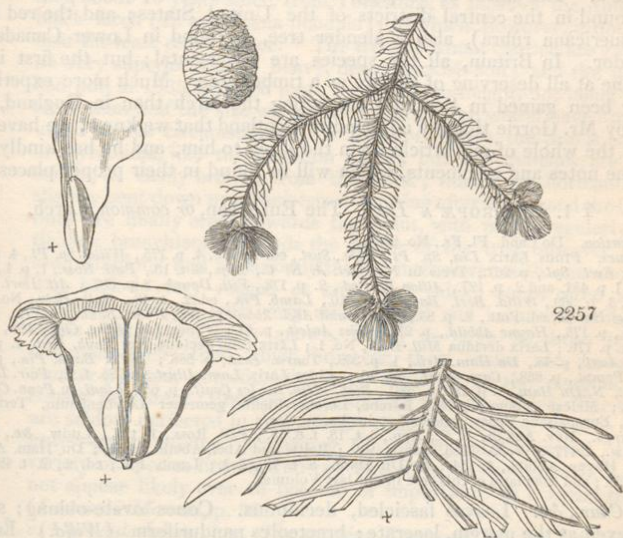
ones are decumbent. The bractees are low and recurved, and but little changed from the ordinary leaves, which gives the cones a singular appearance." (*Lamb. Pin.*, vol. iii.) "When on the tree, being in great clusters, and at a great height withal, the cones resemble the inflorescence of a *Banksia*, a name I should like to give this species, but that there is a *P. Banksii* already. This tree attains a great size and height, and is on the whole a most beautiful object. It is never seen at a lower elevation than 6000 ft. above the level of the sea, in lat. 36°, where it is not uncommon." (*Dougl. in Comp. to Bot. Mag.*, 2. p. 152.) From the singular appearance of the cones, and general beauty of the tree, this seems to be a most desirable species for introduction.

‡ 11. *P. RELIGIOSA* *Humb. et Kunth*. The sacred Mexican Silver Fir.

Synonymes. *Pinus religiosa* *Humb. et Kunth Nov. Gen. et Sp. Pl.*, 2. p. 5., *Schiede et Deppe in Schlecht. Linnaea*, 5. p. 77., *Lamb. Pin.*, 1. t. 43.; *A'bies religiosa* *Lindl. in Penny Cyc. Engravings.* *Lamb. Pin.*, 1. t. 43., and vol. 3. t. 95.; and our *fig.* 2257.

Spec. Char., &c. Leaves linear, acute, quite entire, somewhat pectinate. Cones roundish-oval; scales trapezoido-cordate, lamelliform; bracteoles the length of the scales, spatulate-oblong, sharply dentato-serrate; wings of the seed plicate. (*Don in Lamb. Pin.*, iii.) Leaves 1½ in. long. Cones 2½ in. long, and 2¼ in. broad. Seed small and irregular. Cotyledons, 2.

Description, &c. A tall tree. Branches covered with a brown bark. Leaves scattered in insertion, but 2-rowed, somewhat pectinate, linear, acute; obtuse on the margin, quite entire, coriaceous, glabrous; 1 in. long, marked above with a depressed line, silvery beneath, especially when young; afterwards both sides of the same colour. Cone like that of the cedar, somewhat trapezoidal; heart-shaped at the base; acute; quite entire and incurved on the margin; angles lengthened, coriaceous, rigid; stalk very short, wedge-shaped, keeled on both sides, the under angle more elevated. Bracteoles about the length of the scales, spatulate-oblong, obtuse, membranaceous, sharply and irregularly



dentato-serrate. Seeds of a pale bright brown, wedge-shaped, a little compressed; exterior testa widely disjoined on the inner side; wing axe-shaped, thinly membranaceous, somewhat transparent, folded lengthwise. Nucleus entirely covered with the interior testa, obliquely crowned with a very short wing. (*Lamb.*) This is a tall and elegant tree, found by Humboldt on the lower hills of Mexico, between Masantla and Chilpancingo, at an elevation of 4000 ft. Deppe and Schiede found it upon the cold mountains of Orizaba, at the highest limit of arborescent vegetation. The leaves are larger, and the branches more slender than those of any other of the silver fir tribe; and they are used by the Mexicans for adorning their churches. The flowers have not yet been described by European botanists. It is easily recognised from every other species of silver fir by the shortness of its cones, which, in form and structure, bear a marked resemblance to those of the cedar of Lebanon, although they are considerably smaller. From the elevated situation on which it grows, there can be little doubt of its proving perfectly hardy in Britain; and the botanists now exploring Mexico will, no doubt, soon send home seeds of it.

? *P. hirtella*; *A'bies hirtella* *Lindl. in Penn. Cyc.*, No. 11.; *Pinus hirtella* *Humb. et Kunth*, l. c.; has the young branches covered with hairs. Leaves arranged in 2 rows, flat, acute, glaucous beneath; about 1½ in. long. Flowers and cones unknown. Found on the mountains of Mexico at an elevation of 8600 ft. or 9000 ft. A low tree, from 18 ft. to 20 ft. high; not yet introduced.

GENUS IV.



LARIX Tourn. THE LARCH. *Lin. Syst.* Monœ'cia Monadélphia.

Identification. Tourn. Inst., 586; Bauh. Pin., 493; Bellon. Arb. Conif., p. 23. 25.; Tab. Icon., 940.

Synonymes. Pinus of Lin. and others; A'bies Rich.; Melèze, Fr.; Lerchenbaum, Ger.; Laricio, Ital.

Derivation. From *lar*, fat, Celtic; the tree producing abundance of resin.

Description. Deciduous trees, some of them of large dimensions; natives of the mountainous regions of Europe, the west of Asia, and of North America; highly valued for the great durability of their timber. The common larch is found extensively on the alpine districts of the south of Germany, Switzerland, Sardinia, and Italy; but not on the Pyrenees, nor in Spain. The Russian larch (*L. e. sibirica*) is found throughout the greater part of Russia and Siberia, where it forms a tree generally inferior in size to *L. europæa*. The black, or weeping, larch (*L. americana pëndula*) is a slender tree, found in the central districts of the United States; and the red larch (*L. americana rubra*), also a slender tree, is found in Lower Canada and Labrador. In Britain, all the species are ornamental; but the first is the only one at all deserving of culture as a timber tree. Much more experience having been gained in Scotland respecting the larch than in England, and more by Mr. Gorrie than by any man in Scotland that we know, we have submitted the whole of our article upon the larch to him, and he has kindly sent us some notes and comments, which will be found in their proper places.

‡ I. *L. EUROPEA* Dec. The European, or common, Larch.

Identification. De Cand. Fl. Fr., No. 2064.

Synonymes. Pinus *Larix* Lin. *Sp. Pl.*, 1420, *Syst.*, ed. Reich., 4. p. 175., *Willd. Sp. Pl.*, 4. p. 503., *Hunt. Evel. Syl.*, p. 267., *Tree in Nov. Act. A. N. C., App.*, 3. t. 13., *Pall. Ross.*, 1. p. 1., *Pall. Hin.*, 1. p. 451. and 2. p. 127., *Allion Fl. Ped.*, 2. p. 178., *Vill. Dauph.*, 3. p. 807.; *Ait. Hort. Kew.*, ed. 1., 3. p. 369., *Willd. Berl. Baumz.*, p. 210., *Lamb. Pin.*, ed. 2., t. 48., *Hall. Helv.*, No. 1158., *Du Roi Herb.*, ed. Pott., 2. p. 85., *Reitter und Abel. Abbild.*, t. 96., *Willd. Baum.*, p. 274., *Hayne Dend.*, p. 175., *Hayne Abbild.*, p. 211., *Höss Anleit.*, p. 15.; A'bies Lin. *Hort. Cliff.*, 450., *Gmel. Sib.*, 1. p. 176.; *Larix decidua Mill. Dict.*, No. 1.; *Larix folio deciduo, &c. Bauh. Hist.*, 1. p. 265., *Hort. Angl.*, p. 43., *Du Ham. Arb.*, 1. p. 332., *Tourn. Inst.*, p. 586.; *Larix Bauh. Pin.*, p. 493., *Dod. Pempt.*, p. 868., *Cam. Epit.*, 45, 46.; A'bies *Larix Lam. Illust.*, t. 785. f. 2., *Poir. Dict.*, 6. p. 571., *N. Du Ham.*, 5. p. 287. t. 7961., *Rich. Mém. sur les Conif.*, p. 65., *Lindl. in Penn. Cyc.*, 1., p. 32.; *Melèze commune, Fr.*; *Lärche, Lorcher-Fichte, gemeiner Lerchenbaum, Terbentinbaum, Europäische Ceder, weisser Lerchenbaum, Ger.*

Engravings. *Nov. Act. A. N. C., App.*, 3. t. 13. f. 8. 28.; *Pall. Ross.*, 1. t. 1.; *Ludw., &c.*, t. 86.; *Blackw.*, t. 477.; *Wood. Med. Bot.*, t. 210.; *Reitt. und Abel. Abbild.*, t. 96.; *Du Ham. Arb.*, 1. t. 1.; *Hayne Abbild.*, t. 154.; *N. Du Ham.*, 5. t. 79., f. 1.; *Lamb. Pin.*, ed. 2., 2. t. 48.; our fig. 2258.; and the plates of this tree in our last Volume.

Spec. Char., &c. Leaves fascicled, deciduous. Cones ovate-oblong; scales reflexed at the margin, lacerate; bracteoles panduriform. (*Willd.*) Leaves linear, soft, 1 in. long. Cone from 1 in. to 1½ in. long, erect. A tall pyramidal tree, a native of the alps of the south of Europe; in cultivation in Britain since 1629; flowering in March or April.

Varieties. All the larches in cultivation are, probably, only different forms of the same species; but, as the American larches, which have small fruit, come tolerably true from seed, we shall treat them as one species, and the European larch as another. The latter is characterised by large cones, rapid growth, and robust habit; and the former by small cones, slow growth, and slender habit.

‡ *L. e. 1 communis* Laws. Man., p. 386., *the common European Larch*, has branches "aspiring towards their points; branchlets very numerous, and forming a dense conical or pyramidal top; foliage of a light grassy or vivid green, and bark rather more rugged than that of *L. e. 2 laxa*."

- ‡ *L. e. 2 laxa* Laws., l. c. *The loose-headed European Larch*.—"True specimens of this variety may easily be distinguished from the others when in nursery rows, by their more rapid growth, more horizontal and less crowded branches, and by the darker green, or somewhat glaucous, colour of the foliage. When the trees advance to a more mature age, they, besides their greater size and the preceding peculiarities of the foliage, are easily distinguished by their larger, thinner, more graceful and somewhat pendent branches; cones also larger, more tapering, pointed, and less compact, than those of the common sort. These remarks are merely from observation of the trees in a young state; but it would be a matter of some importance to ascertain the difference, if any, in the value of their timber." (*Laws. Man.*, p. 386.)
- ‡ *L. e. 3 compácta* Laws., l. c. *The compact, or crowded-branched, Larch*.—This name is applied, in Lawson's *Manual*, to a very distinct kind of larch, without any regard as to whether it should be allowed to rank only as a variety of *Làrix europæa*, or form a different species. Specimens of the cones and branches of *L. e. 3 compácta* were received from Mr. A. Gorrie, Annat Gardens, who had the seeds sent him, about 20 years since, from Yorkshire, as those of the American black larch (*L. americana péndula*); to which, however, it does not bear the least resemblance. "The trees at Annat Garden are growing on very superior, rather heavy, deep, blackish soil; and the largest had not, in 1835, attained more than 16 ft. in height, not being much more than half the size which the common larch would have attained under similar circumstances. In habit of growth, the tree is conical or pyramidal, like the common larch; but its branches are very brittle, or easily broken from the trunk; numerous, horizontal, or slightly bent down near their base; aspiring afterwards, and the larger ones are finally erect towards the point, with pretty regularly verticillate branchlets; towards the centre of the tree, however, these are pendulous, and remarkably thickly interwoven with one another. The bark is very rugged or scaly, and thick; cones often small, irregularly shaped, with very much waved and incurved, or folded, scales; but, when fairly grown, nearly as large as those of the common larch; than which, however, their scales are smoother, blunter-pointed, considerably more incurved at the margins, and equally persistent. Bractæas much shorter than the scales. The seeds are seldom perfected in this country; and the foliage is of a light grassy-green colour. Regarding the quality of the wood of this variety or species little is known; but, from its slow growth, it does not appear likely ever to become of importance as a forest tree." (*Lawson's Manual*, p. 387.)
- ‡ *L. e. 4 péndula* Laws., l. c. *The weeping European Larch*; the weeping Larch from the Tyrol, *Hort. Trans.*, vol. iv. p. 416.—This, Mr. Lawson observes, is rather a scarce variety, and very distinct. There are large trees of it in the Duke of Athol's plantations at Dunkeld, raised from seeds received from the Tyrol. The tree is distinguished by the very pendulous habit of its branches, which somewhat resemble those of *L. americana péndula*; from which, however, it differs in the greater length of its leaves, and the larger size of its cones.
- ‡ *L. e. 5 repens* Laws. l. c.—A tree with this name in the Horticultural Society's Garden, received from Lord De Roos, has a tendency to extend its lower branches along the ground, rather more than the common larch. It is of luxuriant growth, and, from its leaves and cones, evidently belongs to *L. europæa*. It was, in 1837, after being 12 years planted, 16 ft. high; and the branches covered a space upwards of 20 ft. in diameter.

- ‡ *L. e. 6 flore rubro.* The common Larch, with red or pink Flowers, Hort. Trans., iv. p. 416. — This variety is the most common in extensive plantations of larches. The flowers vary in shade of red or pink, and some of them are more or less mixed with yellow. The cones are also red, or reddish yellow. The majority of the trees in the Duke of Athol's plantations at Dunkeld and Blair have red flowers.
- ‡ *L. e. 7 flore albo.* Larch from the Tyrol, with white Flowers, Hort. Trans., l. c. — The leaves of this variety are not different from those of the common larch; but the shoots are said to be much stronger; and the cones white, as well as the flowers.
- ‡ *L. e. 8 sibirica*; *L. sibirica Fisch.*; ? *L. archangelica Laws. Man.*, p. 389.; *L. rossica Sab.* in Hort. Soc. Gard.; *Pinus L. sibirica Lodd. Cat. The Russian Larch*, Hort. Trans., iv. p. 416. — There are trees of this variety in the Duke of Athol's plantations, raised from seeds procured from Archangel in 1806. The appearance of the tree is said to be coarser than that of *L. e. communis*: it is of much slower growth than the larches of the Tyrol; and the leaves come out so early in spring, that they are liable to be injured by frost. The female catkins do not expand their flowers till some time after those of the European larch appear. The cones are like those of the American larch. The bark is quite cinereous, and not distinctly scarred, as in the common larch. This variety, Professor Pallas informs us, is found in cold mountainous places, from the Ural Mountains northwards, through Siberia and Kamtschatka, to the Pacific Ocean. It delights in a middle station on the sides of mountains, where it is sheltered from the north, and exposed to the east wind, growing in a gravelly or rocky soil. In valleys and marshes, or on the very tops of mountains, it never occurs. It extends as far north as lat. 68°, where it forms a trailing shrub; but, in the south of Siberia and Russia, it grows to the same height and bulk as the European larch. In the north, it has more the habit of the American larch; but it differs, he adds, from that species very essentially. (*Fl. Ross.*, part i. p. 2.) The Siberian hunters of ermines, Gmelin observes, when their yeast or leaven, which they carry with them to make the acid liquor which they call quass, is spoiled by the cold, scrape off the soft wood, under the bark of the larch, which is very juicy and sweet; digest it with water over the fire during an hour; make it into dough with their rye meal, which they bury in the snow; and, after twelve hours, they find it in a state of fermentation, and ready for use. Baudrillart states that an officer employed in the management of the Russian woods informed him that ships of war, of even 120 guns, were built of larch at Archangel; and, of course, other smaller vessels. In consequence of a similar report, the late Duke of Athol procured seeds from Archangel, which he sowed among his plantations of the common larch. The young plants grew vigorously at first; but, in the course of a few years, they were found very far inferior to the common larch, and, when cut down, to be of very little value. The Siberian larch was introduced into England by Messrs. Loddiges, to whom the seed was sent by Professor Pallas, about the end of the last century. The plant in the Horticultural Society's Garden, after being five years planted, is 4 ft. high, with a peculiarly stunted appearance.
- ‡ *L. e. 9 dahurica*; *L. dahurica Laws. Man.*, p. 389.; *the Dahurian Larch*; is said to be a stunted, bushy, and irregular-growing tree. It is a native of Dahuria, and was first introduced into Britain in 1827. It is generally propagated by cuttings or layers, which will account for its stunted appearance.
- ‡ *L. 10 intermedia*; *L. intermedia Lawson*, p. 389.; *Pinus intermedia Lodd.*

Cat., ed. 1836. *The intermediate*, or Altaian, *Larch*. — According to Lawson, this variety “seems naturally possessed of a very strong luxuriant habit of growth, with pendulous branches, and very large leaves; but, like many more Siberian or northern Continental plants, it produces its leaves on the first approach of spring, and is therefore very liable to be injured by the cold changeable weather to which this country, in the earlier part of the season, is so liable.” (*Laws. Man.*, p. 389.) We have only seen the plant at Messrs. Loddiges’s, which is 5 ft. high, with longer leaves than the species, but stunted and unthriving in its general appearance. It was introduced in 1816, or before.

Other Varieties. *L. Fraseri* is included in *Comp. Bot. Mag.*, vol. ii. p. 304., in a list of North American plants discovered and introduced by J. Fraser and his son between 1785 and 1817; but we know nothing farther of the plant.

Description. A tree, rising, in favourable situations on the Alps, and also in Britain, from 80 ft. to 100 ft. in height, with a trunk from 3 ft. to 4 ft. in diameter; and having a conical head. It is well described in Lawson’s *Manual*, as having the “branches subverticillate, and spreading horizontally from the straight trunk; occasionally, however, rather pendulous, particularly when old. Branchlets also more or less pendulous. Leaves linear, soft, blunt, or rounded at the points, of an agreeable light green colour; single or fasciculated; in the latter case, many together round a central bud; spreading and slightly recurved. Male catkins without footstalks, globular or slightly oblong; of a light yellow colour; and, together with the female catkins, or young cones, appearing in April and the beginning of May; the latter varying from a whitish to a bright red colour. Cones of an oblong-ovate shape, erect, full 1 in. in length, and of a brownish colour when ripe; scales persistent, roundish, striated, and generally slightly waved, but not distinctly notched on the margin; bractees generally longer than the scales, particularly towards the base of



2258

the cones. Seed of an irregular or ovate form, fully $\frac{1}{8}$ in. long, and more than half-surrounded by the smooth, shining, persistent pericarp. Cotyledons 5 to 7.” (*Laws. Man.*, p. 383.) The cones are ripened abundantly in most parts of Britain, and the tree in many situations in Scotland disseminates itself as if it were a native, almost as freely as the Scotch pine. The tree, in its native habitats, is of a remarkably healthy and vigorous constitution, and particularly so, De Candolle remarks, in the trunk. Larches are, he says, rarely attacked by the *Dermestes* (*Hylurgus*, see p. 214.), which is so formidable to pines and firs. (*Quart. Journ. of Agr.*, v. p. 405.) The wood of the larch is compact, and of a reddish or brown tinge; and, on favourable soils, is said to be fit for every useful purpose in 40 years’ growth; while that of the pinaster requires 60 years, and the Scotch pine 80 years. The greatest drawback to the wood of the larch is its liability to warp. At Blair Adam, Ballindalloch, and other places, the tree springs up from seeds

ripened and shed in the plantations. (See *General Report of Scotland*, vol. iv. p. 476.)

The Rate of Growth of the Larch, in the climate of London, is from 20 ft. to 25 ft. in 10 years from the seed; and nearly as great on the declivities of hills and mountains in the Highlands of Scotland. In the course of 50 years, the tree will attain the height of 80 ft. or upwards; and, in its native habitats, according to Willdenow, it lives from 150 to 200 years. Dr. Bain planted between 500 and 600 acres of larches on his estate at Heffleton in Dorsetshire, between 1798 and 1808. Three of these trees, after being 12 years planted, were respectively 17 ft., 18 ft., and 20 ft. high, and 2 ft. 5 in., 2 ft. 8 in., and 3 ft. in circumference at the ground. Three larches, also planted in 1798, and measured in November, 1810, but on land of a better quality, were, respectively, 23 ft. 11 in., 23 ft. 9 in., and 24 ft. 6 in. high, and 2 ft. 5 in., 2 ft. 6 in. and 3 ft. in circumference. Dr. Bain obtained the gold medal of the Society of Arts for this plantation. (See *Transactions, &c.*, vol. xxix., p. 25.) The increase of a larch 22 years' old, in the New Forest, Hampshire, Mr. Davis of Portway House informs us, was as follows:—It was planted in 1805; in 1813, the trunk, at 1 ft. from the ground, measured 1 ft. 9½ in. in circumference; in 1816, it measured 2 ft. 6¾ in.; in 1820, 3 ft. 3¾ in.; and in 1827, 4 ft. 2¼ in. The increase of timber during the last seven years, of a portion of the trunk 12 ft. in length, is, to the increase in the first seven years, as 11 is to 7. The annual increase of the larch, in Scotland, has been ascertained to be at the rate of from 1 in. to 1½ in. in circumference, at 6 ft. from the ground, on the trunks of trees from 10 to 50 years of age. (*Communications to the Board of Agriculture*, vol. i. p. 5.) In Perthshire, larches at 47 years' growth, measured 30 in. in diameter, or 942 in. in circumference, at 5 ft. from the ground; thus giving rather more than 2 in. of annual increase from the first planting. (*Perthshire Report*.) A larch at Blair Drummond, near Stirling, at 54 years of age, measured 78 in. in circumference at 6 ft. from the ground; giving an annual increase from the first planting of near 1½ in. Being measured again 18 years afterwards, it was found to measure 88 in. at the same height, having gained in that period little more than ½ in. annually. (*Gen. Report of Scotland*, vol. ii. p. 256.) At Athol and Dunkeld, the average growth of the larch, at 8 years from the seed, is 11 ft.; and the average annual growth, till the 50th, is 6 in.; and, after that period, 10 in. per annum for 22 years longer; so that the average of trees 72 years of age is 93 ft. 4 in., which agrees with actual experience. The larch differs from the spruces and silver firs in growing rapidly when it is young, and slowly after it has attained the height of 40 ft. or 50 ft.; while the spruces and silver firs grow slowly when they are young, and rapidly after they have attained from 15 to 20 years' growth. The growth of the larch has been remarkably rapid at different places in Inverness-shire and Morayshire. The following tabular view of the progress made by six trees, in the course of 70 years, at Ballindalloch, in the latter county, has been obligingly communicated to us by Macpherson Grant, Esq., the proprietor.

Girls of Larches at Ballindalloch, planted in 1767, and measured in August, 1837.

No.	At 1 Foot.	At 6 Feet.	At 12 Feet.	At 18 Feet.	At 24 Feet.	At 30 Feet.	At 36 Feet.	At 42 Feet.
1.	9 ft. 6½ in.	8 ft. 5 in.	8 ft. 4¾ in.	6 ft. 6½ in.	6 ft. 6½ in.	5 ft. 1 in.	4 ft. 7¼ in.	
2.	8 7½	7 1	6 4	6 0	5 4½	4 11	4 9	4 ft. 1½ in.
3.	10 6	8 4	7 1	6 6½	5 9	4 11	4 4	4 2
4.	8 2½	7 0	6 7¼	5 3	5 0	4 6	4 1	
5.	9 1	7 3	6 5	6 4½				
6.	8 6	6 10½	6 5	6 0	5 6	4 9	4 1	

The rate of growth of the larch, as compared with that of the silver fir, and the platanus, is thus given by the Earl of Fife, in February, 1803:—"A silver fir, a larch, and a platanus, were planted in the park at Duff House, near the river, in the year 1758. The larch, which stood in the middle, was overcome by its two powerful neighbours, and was in a declining state.

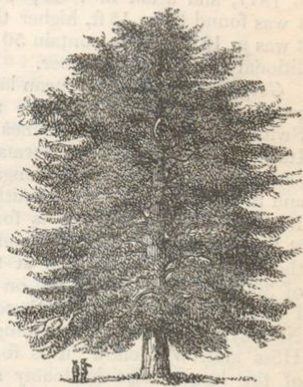
I then desired it might be cut down, but not sold. My carpenter cut it into deals that measured 10 ft. in length, and 1 ft. 10 in. in breadth, and made out of it a dining-table large enough for fourteen people, and two very good breakfast-tables. It is very little inferior in appearance to mahogany. The silver fir measured at 18 in. from the root, is 7 ft. 10 in. in circumference, and its height is 65 ft. The platanus, at the same distance from the root, measures 7 ft. 3 in. in circumference, and at 6 ft. above, 6 ft. 5 in. Its height is 55 ft." (*Trans. Soc. Arts*, vol. xxi, p. 102.)

The finest Larches in the neighbourhood of London are at Kenwood and Syon; at both which places they are upwards of 90 ft. in height; but the largest in Britain are supposed to be those at Dunkeld and Monzie, planted in 1738. The largest larch at Kenwood is drawn up among other trees, as will be seen by the portrait of it in our last Volume; but those at Syon preserve the drooping character of the trees, as will be seen by *fig. 2259*. (to a scale of 1 in. to 50 ft.), taken from one of those trees, by Mr. Le Jeune, in the summer of 1837. The largest of the larches at Dunkeld was accurately measured by Mr. Blackadder, in 1831, when the tree had been 95 years planted, and found to be 100 ft. high, the circumference of the trunk 10 ft. 6½ in. at 5 ft. from the ground, and the cubic contents 368 ft. *Fig. 2260*. is a portrait of this tree, to a scale of 1 in. to 50 ft. The same year (1831), Mr. Blackadder saw the larches at Monzie; and the tallest of these he considered to be about 90 ft. high, and to contain about 250 cubic feet of timber. According to a statement in a newspaper, the tallest of these trees is now (1837) 102 ft. high; and its branches cover a space of above 100 ft. in diameter. A larch cut down at Blair, from which the coffin was made of that celebrated Duke of Athol who planted the larch so extensively at Dunkeld and Blair, measured 106 ft. in length. (See *Gard. Mag.*, vol. xi. p. 176.) One cut down near the cathedral of Dunkeld, about the year 1810, after it had been 60 years planted, was 110 ft. high, and contained 160 cubic feet of timber. At Dalguise, about 5 miles north from Dunkeld, are a few larches of the same age as those at Monzie and the large trees at Dunkeld. The measurement of one, taken by Mr. Tyrie, forester there, on the 20th November, 1837, is: circumference, at 3 ft. from the ground, 9 ft. 11 in., and at 30 feet, 6 ft. 10 in.; height, 95 ft. The soil is a dead sand. The oldest larches in Scotland are those

at Dalwick, the seat of Sir John M. Nasmyth, near Peebles. (See p. 94.) There are nine larches at Dalwick, all of which were planted in 1725, by the grandfather of the present baronet; and the most remarkable of these is a singularly picturesque tree, which had one of its principal limbs shattered by lightning in 1820. Of the remains of this tree, known as the Great, or Crooked, Larch, *fig. 2261*. is a portrait, to a scale of 1 in. to 20 ft., taken from a drawing kindly lent to us by Sir John Nasmyth in 1836. The height of the tree is only between 40 ft. and 50 ft.; but the girth of the trunk above the roots is 19 ft.; immediately under the two great limbs, 15 ft.; and about the middle, 13 ft. *Fig. 2262.*, to a scale of 30 ft. to 1 in., is the portrait of another of the nine old larches at Dalwick, which is upwards of



2259



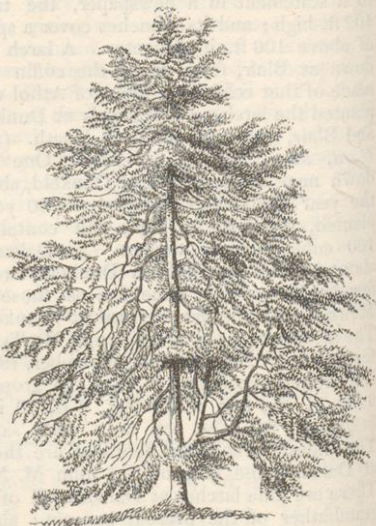
2260

2261



80 ft. high, and 15 ft. in circumference above the roots, and which is called the Tall Larch. A larch at Kippenross, near Dumblane, in Stirlingshire, was measured by Mr. Blackadder in 1817, and again in 1832; when it was found to be 15 ft. higher than it was in 1817, and to contain 50 additional cubic feet of timber.

Geography. The European larch grows on the Alps of France and Switzerland, on the Apennines in Italy; on the mountains of Germany, principally in the Tyrol; in Hungary, and in different parts of the south of Russia. On the Alps, it is found at the elevation of 5000 ft., and on the Carpathian Mountains at that of 3000 ft. It is not found on the Pyrenees; nor in Spain, Sweden, Norway, or Britain. According to Höss and Willdenow, it is found of the largest size in loamy soil, formed from the debris of granitic or slaty rocks; but it is also found of large size in calcareous soil; where the surface is kept cool by moisture. In ascending the Simplon from the Italian side, a part of the road passes



2262

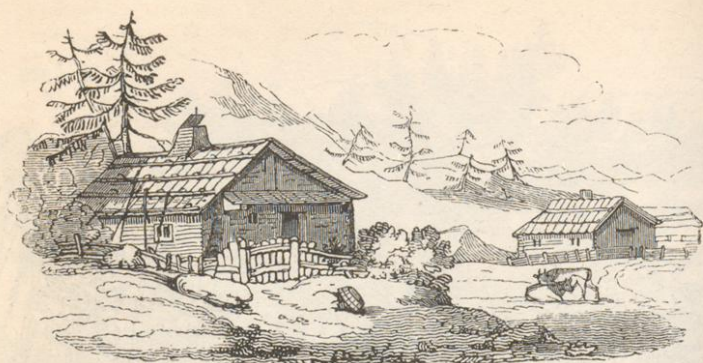
through a larch forest, in which there were some immense trees in 1819, growing on the steep sides of the mountains; and in Mr. Brockedon's grand and picturesque views of the Tyrol, from which *figs.* 2263. and 2264. are copied, the larch is, in all elevated and rocky situations, the prevailing tree.

History. The larch does not seem to have been known to the Greeks, as it is not mentioned by Theophrastus, or any Greek writer on plants, unless it be, as some suppose, the Greek *pitus*, though this does not appear pro-



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bable. Pliny frequently mentions the larch; and, in his 16th book, has given the description of it which we have already quoted (see p. 2112.). In another place, he tells us that larch timber is not corruptible like that of any other pine; and that, when set on fire, it burns more like a stone than a piece of wood, never causing flame. (Lib. xvi. c. 40.) He also says the tree never flowers. These exaggerated assertions have occasioned doubts to be expressed as to whether Pliny was really acquainted with the larch; but we find so many similar exaggerations and fabulous relations in his work respecting other trees, that we see no sufficient reason to doubt it. When Tiberius Cæsar built his Naumachia, or aquatic amphitheatre, for exhibiting a naval action as a public spectacle, an enormous larch was brought to Rome, which measured 120 ft. in length, and 2 ft. in diameter at the smallest end. This tree, of which Pliny says, "*Amplissima arborum ad hoc ævi existimatur Romæ visa*," Tiberius admired so much, that he would not permit it to be used as timber, but had it preserved as a curiosity for public admiration. Nero, however, had it cut up for an amphitheatre erected by him. The Forum of Augustus was built with larch wood, as were several bridges in Rome. Vitruvius mentions the larch, and attributes the decay of the buildings of Rome, erected in his day, to the circumstance of this wood being no longer used in their construction, the forests of the larch in the neighbourhood of Rome having been exhausted, and the builders not choosing to be at the expense of bringing the timber from a distance. He also says that the wood is so ponderous, that it will sink in water; and he repeats the assertions of Pliny as to its incorruptibility and incombustibility; adding that Julius Cæsar, wishing to set fire to a wooden tower, placed before the gates of a castle in the Alps, called Larignum, which he was besieging, heaped up logs of larch wood around it, which he attempted to ignite, but in vain. It is probably, in



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allusion to this, that Cæsar, in his *Commentaries*, speaks of the larch as "robusta larix, igni impenetrabile lignum." Several other wonders relating to the larch, and taken from ancient writers, are mentioned by Evelyn; one of which is, that the wood is so transparent, "that, in the dark night, when cabins made of the thin boards have lighted candles in them, people who are at a distance out of doors would imagine the whole room to be on fire!" (*Hunt. Evel.*, i. p. 310.) Evelyn also quotes from Witsers (a Dutch writer on naval architecture) an account of a ship made of larch wood and cypress, which was found in the Numadian sea, 12 fathoms under water; and which, though it had lain 1400 years submerged, was yet quite hard and sound. In latter times, the wood of the larch appears to have been much used in Venice, both for piles and houses; and, in some very old mansions in that city, beams of larch have been found of enormous size, and showing no symptoms of decay.

The larch is mentioned, and very well described, both by Tusser and Gerard; but the first account we have of larch trees growing in Britain is in Parkinson's *Paradisus*, in 1629, where he speaks of the tree as "rare, and nursed up but with a few, and those only lovers of variety." Evelyn, in 1664, mentions a larch tree of "goodly stature, growing at Chelmsford, in Essex;" but the tree appears to have been still rare in his time. Miller, in the first edition of his *Dictionary*, published in 1731, says, "This tree is now pretty common in English gardens;" adding that there were then some large trees at Wimbledon, which produced annually a great quantity of cones. In the edition of 1759, he says that "the larch was then very plenty in most of the nurseries in England;" and, "of late years," there had been "great numbers of the trees planted;" adding that those which had been planted in "the worse soil and situations" had "thriven best." In confirmation of this, Mr. Gorrie informs us that, "on the rich and fertile soils on the braes of the Carse of Gowrie, Perthshire, which consist of strong black loams, yielding, with ordinary culture, five quarters of wheat per acre, the larch does not thrive nearly so well as farther north, on both sides of the Tay, where the soil is gravelly, or poor, inert, and somewhat moist sand; and hence there are no fine larch trees in that fertile district." Harte, in 1764, and again in 1770, in his *Essays on Husbandry*, speaks very highly of the larch, and strongly recommends its culture as a timber tree; a proof that then plantations were, at least, not common. In the *Account of the Larch Plantations on the Estates of Athol and Dunkeld*, published in the *Transactions of the Highland Society*, &c. (vol. xi. p. 169.), it is stated that Goodwood, the seat of the Duke of Richmond, near Chichester, was probably the first place where the larch was planted as a forest tree, and even there it was only in small numbers. In 1782, a very extensive plantation of larch was formed at Hafod. In 1786, we find the Society of Arts

awarding a premium to Mr. Thomas White, landscape-gardener, of Retford, Nottinghamshire, who had made a large plantation of forest trees (more than one half of which were larch) at Batsfield, in the county of Durham. (*Trans. Soc. Arts*, vol. iv. p. 5.) ; and, in 1788, the Society of Arts offered three gold medals, and a premium of 30*l.*, for planting the larch, and making known the useful properties of its timber. In consequence of the public attention being thus called to the tree, it has been more extensively planted in Britain, particularly since the commencement of the present century, than any other timber tree whatever, not even excepting the oak.

The introduction of the larch into Scotland is involved in some uncertainty. The crooked larch at Dalwick (see p. 2356.) is said to have been planted in 1725 ; but, according to Dr. Walker, whose attention to the history of exotic trees in Scotland is well known, the first larches were planted at Dunkeld in 1727. Sir Thomas Dick Lauder tells us that the popular account is, that the first larches introduced into Scotland were sent to the father of the late Duke of Athol in 1727 ; and the plants having arrived at Dunkeld along with some orange trees, and a number of other exotics, natives of Italy, they were all treated in the same way, and placed in a hothouse. The larches soon withered under this treatment ; and, being supposed to be dead, were thrown out on a heap of rubbish in the garden. Being there covered with dead leaves and other rubbish, and aided by a wet season, they revived, and, sending forth shoots, soon became vigorous-growing trees. In the *Highland Society's Transactions*, vol. xi. p. 165., already mentioned, the following account is given of the introduction of the larch into Scotland :— “ In the year 1738, Mr. Menzies of Migenny, in Glenlyon, brought a few small plants of the larch in his portmanteau from London, five of which he left at Dunkeld, and eleven at Blair in Athol, for Duke James,” the grandfather of the celebrated Duke of Athol already mentioned. It is probable that this account, of which one version states that the servant of Mr. Menzies carried the larches before him on his saddle, is quite incorrect ; for we can hardly suppose that Dr. Walker would give the date of 1727 as that of the first planting of the larch at Dunkeld, without some positive evidence of the fact. Whatever may be the exact date of the introduction of the larch into Scotland, there can be no doubt that it was first extensively planted in that country by the Dukes of Athol at Dunkeld and Blair ; and we shall here give a short account of these plantations to the reader, extracted from that in the *Highland Society's Transactions*, before referred to :— “ Between 1740 and 1750, Duke James planted 350 larches at Dunkeld, at an elevation of 180 ft. above the level of the sea ; and 873 at Blair, among limestone gravel, in a sheltered situation, which was worth from 20*s.* to 30*s.* per acre, at an elevation above the sea not exceeding 560 ft. All these larches were planted in the ornamental grounds around Dunkeld House and Athol House, the two residences of His Grace. So situated, and in regular rows wide apart, they were evidently intended more as a trial of a new species of trees than for forest timber. But, in 1759, Duke James planted 700 larches over a space of 29 Scotch acres, intermixed with other kinds of forest trees, with the view of trying the value of the larch as a timber tree. This plantation extended up the face of a hill from 200 ft. to 400 ft. above the level of the sea. The rocky ground of which it was composed was covered with loose and crumbling masses of mica slate ; and was not worth above 3*l.* a year altogether. This may be considered the first attempt at mountain planting in Scotland. According to the fashion of the time, the trees were arranged in rows, and the rows converged towards a small piece of water in the centre, like radii. This concluded the whole attempts at planting of Duke James. Before he died, however, in January, 1764, he had tried the quality of the larch as timber, and was quite satisfied of its superiority over other firs, even in trees of only eighteen or nineteen years old.”

John Duke of Athol succeeded Duke James in 1764. “ It was he who first conceived the idea of planting larch by itself as a forest tree, and of

planting the sides of the hills about Dunkeld. The former of these ideas was put into execution in 1768, by the planting of three acres with larches alone on Craigvinian, above the wood which Duke James planted on the same hill in 1759, at an altitude of from 100 ft. to 200 ft. above it; or 500 ft. or 600 ft. above the level of the sea, on soil that was not worth 1s. per acre. The latter idea of Duke John was effected by the enclosing of a considerable extent of ground for the planting of mixed wood at Dunkeld, and of near 300 acres at Blair, forming a total of 665 acres. Of these he finished the planting of 410 acres before his death in 1774.

"The greatest obstacle to the progress of the Duke John's planting was, the scarcity, and consequent dearness, of the larch plants. He had raised a few plants himself from cones gathered from some trees at Blair, which began to bear fruit at the commencement of his operations; but this supply did not exceed 1000 plants in a season. At the same time, three and four years transplanted larches were selling in the nursery grounds as high as 6*d.* per plant. All that could therefore be obtained for planting did not exceed fifty plants per acre in the large plantations; and the rest of the quantity, amounting to 4000 plants per Scotch acre (that being the allowance of plants to the acre at that time), were made up of the Scotch pine, and the different kinds of hard wood. The larch was planted at a height not exceeding 600 ft., and the Scotch pine at 900 ft., above the level of the sea. Another difficulty which the Duke John had to encounter was from the broom, furze, juniper, and heath, which flourished abundantly in the region allotted to the larch, and which had not been entirely eradicated before the planting began. The broom, though indicative of a good soil for larch, is a troublesome plant to young trees; its long switch-like elastic twigs whipping their tops violently in windy weather; and the furze, with its thick-set prickly branches, smothers, or draws up prematurely, the young plants. These, and many other obstacles, would no doubt have been removed by the Duke John, had he had leisure to attend to planting only; but, having been obliged to be frequently in London regarding his title, and the affairs of the Isle of Man, his attention was otherwise occupied for the greater part of the short time which he enjoyed his property. Such were the state and extent of the larch plantations at Dunkeld and Blair, when the late duke succeeded his father in 1774.

"The first object of this duke was to plant the 225 acres which formed a part of the plantations that were left unfinished by his father at his death in 1774. This, with some larches planted about the Loch of the Lows, occupied him till the year 1783. This delay was owing to the difficulty of obtaining larch plants, all the number that could be obtained during that time amounting only to 279,000.

"Observing the rapid growth and hardy nature of the larch tree, the duke determined on extending the sphere of its occupation to the steep acclivities of mountains of greater altitude than any that had yet been tried. Hitherto the larch had chiefly been planted along with other trees; but the duke enclosed a space including 29 acres, on the rugged summit of Craig-y-barns, and planted a strip consisting entirely of larch, among the crevices and hollows of the rocks, where the least soil could be found. At this elevation, none of the larger kinds of natural plants grew, so that the ground required no previous preparation of clearing. After 1774, larch plants fell in price from 6*d.* a plant to 3*s.* per thousand, two and three years transplanted, and ranging from 2 ft. to 3½ ft. in height. The expense of enclosing and planting at this time was the same as in the time of Duke John; namely, 1*l.* 1*s.* 1½*d.* per acre. This alpine plantation was formed in 1785 and 1786.

"From 1786 to 1791, the duke planted 480 acres at Dunkeld, the greater part of which was only sprinkled with larch from 6 ft. to 30 ft. asunder, owing to the difficulty of procuring a sufficient number of plants; and 200 acres at Blair, which were planted wholly of larch, at 6 ft. apart. The number of larch plants consumed in these plantations in the five years was 500,000. Wages rising at this period, and there being a greater substitution

of larch for Scotch pine, the expense of planting was considerably increased. That, with the enclosing, amounted to 2*l.* 10*s.* 6*d.* per acre. The pitting alone cost 10*s.* 6*d.* per acre.

“ In the eight years from 1791 to 1799, the duke still continued to diminish the number of Scotch pines in his plantations, and to increase that of the larch. During this time, the banks of the Bruar Water, extending to 70 Scotch acres around the beautiful waterfall, were planted. It is not unlikely that the humble petition of Bruar Water, —

“ To shade its banks wⁱ towering trees,
And bonnie spreading bushes,”

so well expressed in the words of the poet, might have had the effect of drawing His Grace's attention the sooner to the embellishment of this delightful spot. At Logierait, Inver, and Dunkeld, the space altogether planted extended to 800 acres, 600 of which were entirely of larch, but only planted so thinly, from a paucity of plants, as to leave after merely a scanty thinning, only a sufficient number of trees for naval purposes. The duke's desire to extend his plantations solely with the larch, in elevated situations, had to struggle very severely and painfully against the scarcity of plants that prevailed in the country, even at this period, when the value of the larch tree was begun to be appreciated. The expense of planting this piece of ground was the same as the last, and though the number of larch plants consumed in it only amounted to 800,000, even this number was obtained with great difficulty.

“ Observing with satisfaction and admiration the luxuriant growth of the larch in all situations, and its hardihood even in the most exposed regions, the duke resolved on pushing entire larch plantations still farther to the summits of the highest hills. The Scotch pine, that was planted at 900 ft. above the sea, had the vacancies occasioned by deaths or accidents filled up, ten years afterwards, by the late duke, with larch, as an experiment. In 1800, when the duke was anxious again to extend his larch plantations, the effect of this experiment confirmed him in an opinion which he had previously conceived of the very hardy nature of the larch. These Scotch pines, in a period of nearly forty years, had only attained a height of five or six feet; while the larches, which had been planted among them ten years after, were from 40 ft. to 50 ft. high. Nine hundred feet was an elevation at which it was before supposed that the larch was incapable of vegetating. A favourable circumstance, too, happened in 1800, which concurred with the result of the above experiment to give an impulse to the commencement of a great undertaking in planting. In that year, several of the farms at Dunkeld fell out of lease; and, as they were all in miserable condition, His Grace took them into his own hands, to improve them, and to build suitable farm-houses and offices on them. This circumstance gave the duke the command of a range of mountains, extending from the edge of Craig-y-barns, over a space of ground of 1600 Scotch acres. This space included a common, the rights of which the duke bought up. It formed the background to the farms which the duke had taken into his own hands. It was situated from 900 ft. to 1200 ft. above the level of the sea. Its soil, presenting the most barren aspect, was strewed over thickly with fragments of rocks, and vegetation of any kind scarcely existed upon it. ‘ To endeavour to grow ship-timber,’ remarks His Grace, ‘ among rocks and shivered fragments of schist, such as I have described, would have appeared to a stranger extreme folly, and money thrown away; but, in the year 1800, I had for more than twenty-five years so watched and admired the hardihood and the strong vegetative powers of the larch, in many situations as barren and as rugged as any part of this range, though not so elevated, as quite satisfied me that I ought, having so fair an opportunity, to seize it.’

“ During the same period in which the duke planted this mountain range, he also planted 400 acres in other situations; making a total of 2409 Scotch acres, 1800 of which consisted solely of larch, and 300 acres of this occupied a region far above the growth of the Scotch pine. These plantations, in enclos-

ing and planting, occupied the long period of years from 1800 to 1815. This delay arose greatly from the difficulty of obtaining larch plants, and which only permitted them to be planted to a thickness of from 1500 to 1800 per acre. From a different mode of planting being adopted, however, and the selection of plants of an earlier age (an account of both of which will be hereafter given), the cost of fencing and planting this extensive range of ground did not exceed 10s. 6d. per acre.

“ Having now no doubt whatever of the successful growth of the larch in very elevated situations, the duke still farther pursued his object of covering *all* his mountainous regions with that valuable wood. Accordingly, a space to the northward of the one last described, containing 2959 Scotch acres, was immediately enclosed, and planted entirely with larch. This tract, lying generally above the region of broom, furze, juniper, and long heath, required no artificial clearing. An improved mode of planting was employed here, that of using young plants only, two or three years’ seedlings, put into the ground by means of an instrument invented by the duke, instead of the common spade. This change of arrangement facilitated the operation, and, at the same time, greatly increased the supply of the plants, so as to enable the whole ground to be planted in three years, from the 4th of December, 1815, to the 2d of December, 1818. The increased number of plants per acre, and the high price of the plants, enhanced the cost to 16s. 8d. per acre, for enclosing and planting this forest of Loch Ordie, so named from a beautiful sheet of water in it, of 100 acres in extent.

“ In 1824, the growth of the larch in Loch Ordie Forest having greatly exceeded the sanguine hopes and expectations of the duke, he determined on adding to it an extensive adjoining tract, consisting of 2231 Scotch acres, denominated Loch Hoishnie. The preparations of fencing, clearing (where that was necessary), making roads, and procuring plants from different nurserymen, occupied the time till October, 1825, when the planting commenced, and was carried on in such good earnest, that the whole was finished by December, 1826. The fencing and planting cost 15s. per acre. There was no plantation which His Grace had executed that gave him so much satisfaction in the work, as that of the Forest of Loch Hoishnie.

“ The planting of this forest appears to have terminated the labours of this duke in planting; and the following table will show at a glance the extent of the larch plantations executed by the different noble dukes, and which will form a summary of what has been stated above:—

	Number of Larches, exclusive of the other plants mixed with them.	Number of Larches planted without mixture.	Acres of entire Larches.
Duke James planted, at Dunkeld and Blair, in 1738	16		
.. .. . to 1750	350		
.. .. . to 1759	1,575		
Duke John planted, at Dunkeld and Blair, from 1766 to 1774,	11,400		
The late Duke John, 1774 to 1783,	279,000		
.. .. . 1783 to 1786,	- - -	43,500	29
.. .. . 1786 to 1791,	20,000	480,000	450
.. .. . 1791 to 1799,	560,000	240,000	600
.. .. . 1800 to 1815,	250,000	2,250,000	1800
.. .. . 1816 to 1818,	- - -	5,922,000	2961
.. .. . 1824 to 1826,	- - -	4,038,880	2231
	1,122,339	12,974,380	8071

“ The total amount of larch plants, mixed or unmixed with other kinds, will thus amount to the enormous number of 14,096,719 plants; and, if we allow 2000 plants per acre for the amount that was mixed with other kinds of trees, these would occupy a space, if planted alone of larch, of 533 acres, so that the whole extent of ground occupied by larch amounts to 8604 Scotch acres, or 10,324 acres imperial.

“ There is no name that stands so high, and so deservedly high, in the list of successful planters, as that of the late John Duke of Athol. His Grace planted, in the last years of his life, 6500 Scotch acres of mountain ground *solely with the larch*, which, in the course of seventy-two years from the time of planting, will be a forest of timber fit for the building of the largest class of ships in His Majesty’s navy. Before it is cut down for this purpose, it will have been thinned out to about 400 trees per acre. Each tree will contain at the least 50 cubic feet, or one load of timber; which, at the low price of one shilling per cubic foot (only one half of its present value), will give 1000*l.* per acre; or, in all, a sum of 6,500,000*l.* sterling. Besides this, there will have been a return of 7*l.* per acre from the thinnings, after deducting all expense of thinning, and the original outlay of planting. Further still, the *land* on which the larch is planted is not worth above from 9*d.* to 1*s.* per acre. After the thinnings of the first thirty years, the larch will make it worth at least 10*s.* an acre, by the improvement of the pasturage, upon which cattle can be kept summer and winter.”

On this passage Mr. Gorrie remarks:—“ The prospective value of the timber and improved pasturage, as here stated, will seldom be realised, even on the best mountains or moorlands in Scotland; but larch is certainly by far the best improver of heath or moor pasturage yet known in this country. To effect such improvement in little time, the plants should at first stand so close as to choke the heath and coarser grasses; when this is accomplished, as may be done in from 10 to 15 years, gradual thinning will be followed by the *Festuca ovina* and *duriuscula*, *Cynosurus cristatus*, *Agróstis vulgaris*, *Poa compressa*, &c. &c., with the foliage possessing a softness and luxuriance not acquired in open situations. Seeds of the *Poa nemoralis*, scattered over the ground after removing the first thinnings, would wonderfully improve the pasture.”

About the year 1777, Dr. Anderson, under the name of Agricola, strongly recommended the larch as a timber tree; and, in consequence of the popularity of his writings, the tree began, before the end of the last century, to be planted in the north as much as, or more extensively than, the Scotch pine, which had till then been the principal tree planted in Scotland. One of the greatest planters, at this time, in Scotland, was the Earl of Fife, as may be seen by the various letters written by His Lordship respecting his plantations, in the early volumes of the *Transactions of the Society of Arts*; and he also planted a great many larches. At the present time, as Sir Thomas Dick Lauder has remarked, Scotland is preeminently the country for the larch; and at Dunkeld, Blair, Monzie, and Gartmore, in Perthshire; at Alloa, in Stirlingshire; at Panmure and Brechin Castle, in Forfarshire; at Cullen House (Lord Fife’s), in Banffshire; at Gordon Castle, Ferness, and Tarnawa, in Morayshire; at Ballindalloch, in Inverness-shire; at Dalwick, in Peeblesshire, and at many other places in Scotland; larches are to be found which have all the boldness of character of the tree in its native Alps.

Early in the present century, the larch, both in England and Scotland, was, in many places, attacked in its foliage by a white woolly aphid, commonly known as the *Aphis laráicis*; and, from 1820 to the present time, it has been found that, when larches have grown on certain soils, the wood is apt to decay, and become hollow at the heart; a disease which, in Scotland, is called pumping, from the trunks of trees affected by it conveying the idea from their hollowness, of their being fit for pumps, or pipes for conveying water under ground. The insects have long since disappeared; but the decay of the timber at the heart continues, and has led to much more attention being paid to the soil in which the tree is planted; the disease having rendered it evident that the larch is, perhaps, more powerfully affected by soil and situation than any other timber tree. In order to ascertain how far the effect of change of seed might prevent this disease, the Highland Society of Scotland have offered premiums for the greatest quantity of seed imported from the native larch forests of Switzerland and the Tyrol; and many trees, raised from seeds so imported

by Messrs. Lawson and Son of Edinburgh, have been planted in different parts of the country. The larch, ripening abundance of seeds in Britain, is now raised in larger quantities by the Scotch nurserymen than any other timber tree; and there is scarcely any Scotch proprietor, of the mountainous districts more especially, in whose plantations the larch is not the prevailing species. In Ireland, it is also a favourite tree in the elevated regions; though the extent to which it has been planted in that country is trifling, when compared with either Scotland or England.

In France, the larch does not appear to have been planted to any considerable extent; though De Candolle mentions having seen flourishing plantations of this tree in the Vosges. Malesherbes, in 1778, having seen some houses in the Vallais, which had been constructed of this wood 240 years previously, examined the timber, and found it not only perfectly sound, but so hard that he could not penetrate it with the point of a knife. In 1798, M. Boissel de Monville conveyed a number of trunks of larch to Toulon, with a view to their being used in the construction of ships for the French navy; and they were examined for that purpose by the Commissioners of the Marine, on the 6th of August in that year. The result, as reported by Desfontaines, in his *Histoire des Arbres, &c.*, was: 1. That the wood was more resinous than that of *P. Laricio*, though, at the same time, it was much lighter, in the proportion of 25 or 26 to 29: 2. That the fibres of the larch were very strong, and well able to resist twisting: and, 3. That branches clear from knots might be used for topmasts; but that trees must not be chosen for this purpose which were either standing singly, or in thin plantations; because, in the one case, their trunks were likely to be strained by the wind, and in the other to be injured by the multiplicity of branches causing knots. Notwithstanding the favourable nature of this report, it appears from Malesherbes and others, that all the previous experiments made with regard to using the larch for the masts of large vessels were unsuccessful; principally because the tree, when of sufficient height, was never found of sufficient thickness. To remedy this defect, Varennes de Fenille suggested the thinning of the native forests, to allow the trees to acquire greater bulk of trunk; but it was found that, instead of this being the case, it encouraged them to throw out branches, and the wood, consequently, became full of knots. Baudrillart, in 1825, warmly recommends planting the larch in the forests of the north and middle of France, and especially in mountainous situations; quoting from Martyn's *Miller* what had been done in Scotland by the Dukes of Athol and others. Delamarre, in 1831, acknowledges his own want of experience in this tree; and states that in Normandy, in his neighbourhood, the larch had been planted to some extent; and that, after 40 years' trial, the rate of growth was not satisfactory; and that the trees had the great disadvantage of not disseminating themselves by their seeds, like the pine and fir tribe. Near Coutances, in Normandy, M. le Comte de Rambuteau has formed a plantation of larches on a grand scale, with a view to study the value of that species as a timber tree. In Germany, the larch has been introduced into plantations in Wirtemberg, Bavaria, and some other states; but, as it is indigenous in several districts, as well as in Poland, it is less planted than might have been expected. De Candolle mentions that M. De Charpentier expresses admiration of the magnificent plantations of larches at Moritzburg and at Thorauz, near Dresden, which are only 238 ft. above the level of the sea. They grow in sands almost pure, nor marshy, but habitually and moderately moistened by the filtrations from large ponds in the neighbourhood; and, at 40 or 50 years' growth, they rival in size the most beautiful larches of the Vallais.

Poetical Allusions. These are very few. The larch does not appear to have been mentioned by any of the Greek poets, and by few of the Roman ones. A supposition has, indeed, been broached, that the trees into which Ovid describes the sisters of Phaethon to have been turned were neither poplars nor alders, but larches. This supposition appears to have been founded on the circumstance of a Roman medal having been found with three larches on

it; and on the following lines in Ovid, which seem to allude to some resinous tree, —

“ The new made trees in tears of amber run,
Which harden into value by the sun.”

Lucan tells us that the “gummy larch” was one of the articles burnt to drive away serpents. Among the British poets, Ben Jonson mentions the larch. A witch says, —

“ Yes, I have brought to help your vows
Horned poppy, cypress boughs,
The fig tree wild that grows on tombs,
And juice that from the larch tree comes.” *Masque of Queens.*

Properties and Uses. The wood of the larch, according to Hartig, weighs 68 lb. 13 oz. per cubic foot when green, and 36 lb. 6 oz. when dry; and according to Kasthoffer, it lasts four times longer than that of any other species of *Abiétinæ*. That of trees produced in a good soil is of a yellowish white; but that of trees grown in a cold and elevated situation is reddish or brown, and very hard. In a suitable situation, the timber is said to come to perfection in 40 years, while that of the pinaster requires 60 years, and that of the Scotch pine 80 years. (*Trans. Soc. Art.*, vol. xxix. p. 25.) Though the wood of the larch ignites with difficulty, and a fire made of it will, if not attended to, extinguish itself before the wood is half-consumed, yet, if properly managed, the wood of old trees is capable of producing an intense heat; and M. Hartig ranks it, in comparison with that of the beech, as 1248 to 1540. The charcoal of the larch, according to M. De Werneck, is more rich in carbon than that of either the spruce or the silver fir, but less so than the pine or the beech; being as 6409 to 7299 for the pine, and 6409 to 7871 for the beech. The charcoal of the larch is very heavy, and weighs 16½ lb. (7½ kilogrammes) per cubic foot: it is said to be excellent for iron founderies. The bark of young larches is astringent, and it is used in the Alps for tanning leather; where the leaves and young shoots are sometimes given to cattle. The only objections which have been made to the wood of this tree in Britain are, according to Monteath, its being so remarkably hard to season, that it is almost impossible to keep it from bending and twisting; and that, when it is properly seasoned, it is so very hard, that it is difficult to work, and more especially to be smoothed on the surface with the plane. To remedy the evil of twisting, some adopt the method of steeping it (whilst in the log) in water for twelve months, and then taking it out, and drying it for twelve months more, before cutting it up. Steaming has also been resorted to for the same purpose; but Monteath prefers a practice which has been often recommended, though but little employed, viz. that of barking the tree standing, and then leaving it a year before it is cut down.

The Uses of the Wood of the Larch in France and Switzerland. According to Varennes de Fenille, the disposition of the fibres of the wood resembles that of the silver fir; and each annual layer consists of a zone of very hard wood of dark orange, and a zone of softer wood which is of a pale orange or yellow. The *Président de la Tour d'Aigues*, who has written copiously on the uses of the larch, says: “The wood is not filled with knots, like that of the spruce fir: it is excellent for carpentry; beams made of it are very strong, and not subject to rot; it may be employed safely in damp places, as, for instance, in cellars; and it will remain sound and uninjured, even when resting on the earth.” According to Rozier: “Every one who knows the larch agrees that it is the best of all the different kinds of wood, whether for the carpenter or the cabinet-maker. Its strength is at least equal to that of the oak. The Germans make casks of it, which may be said to last for ever, and from which the spirituous particles of the wine are hardly ever found to have evaporated. In Upper Dauphiné, Savoy, and the Pays de Vaud, houses are built of it, by placing squared trunks, of the thickness of 1 ft., one upon another, in the manner of building log-houses. (See p. 2123.) The heat of the

sun melts the resin contained in the wood, which, running down the sides, fills up the interstices between the logs; and the edifice, thus rendered impenetrable to air and moisture, will last for centuries without alteration." This tree, says Malesherbes, "is the highest, the straightest, and the most incorruptible of all the Swiss indigenous woods. It is excellent for all purposes; and is so much sought after, that, in several cantons of Switzerland, a piece of larch wood costs double the price of a piece of oak wood of the same dimensions." Notwithstanding this, the same author adds that, after many experiments, the wood of the larch has been found unsuitable for masts. (See p. 2364.) No wood remains uninjured by water longer than the larch; and, for this reason, it is in general use, in France and Switzerland, for water-pipes. At Aix, Marseilles, and throughout the greater part of Provence, where the land is frequently irrigated, the pipes used to convey the water to the ground are always of larch. In Provence, it is also much used by the cabinet-makers, as, from the closeness of its grain, it takes a fine polish. (*Nouv. Du Ham.*) Desfontaines, in his *Histoire des Arbres et Arbrisseaux*, gives a very interesting report made by M. Boissel de Monville on the uses of the larch. This account confirms what previous writers had asserted respecting the durability of the cottages in the Vallais; and adds that larch wood is much used, in Switzerland, for shingles to cover the roofs of the houses, and for vine props. For the latter purpose, it is found the most durable of all kinds of wood: the vine props made of it are never taken up; they remain fixed for an indefinite succession of years, and see crop after crop of vines spring up, bear their fruit, and perish at their feet, without showing any symptoms of decay. In most cases, the proprietors of the vineyards are perfectly ignorant of the epoch when these props were first placed there: they received them in their present state from their fathers, and in the same state they will transmit them to their sons. Props made of the silver fir, and used in the same soil for the same purpose, would not last more than ten years. In traversing the forests of the Alps, continues M. Boissel, "I found frequent proofs of the excellence of the wood of the larch. The lightning often strikes and shatters these trees, the winds break them, and the effects of time cause them to perish by old age; all these modes of destruction, and many others, made me find a great number of mutilated and dead trees in these forests. Those which were mutilated had not perished on that account. The branches which remained uninjured were still growing with vigour; the heart wood was sound and unchanged; and the tree continued to live during a long series of years. The wood, even of those quite dead, showed no signs of decay, and had evidently remained in the same state a great number of years. I gathered several of the branches, and divided some of the trunks of the dead trees; and, though some of the branches were become so brittle as to break easily with the fingers, and the wood of the trunks so dry as to separate into scales, neither showed the least signs of rottenness. The silver fir, on the contrary, when broken or shattered by lightning, soon perishes; and the wood of dead trees, in the course of a few years, becomes quite rotten." (*Hist. des Arb.*, &c., ii. p. 603.) The fine grain of the larch wood, its durability, and its not being subject to crack, have long made it used by painters for their palettes, and even to paint their pictures on. According to Pliny, it was employed for this purpose by the ancients (lib. xvi. c. 39.); and Evelyn tells us that several of the paintings of Raphael are on larch wood.

The resinous Products of the Larch are, Venice turpentine, and the manna de Briançon; and both are used in the state in which they are procured from the tree. To obtain the turpentine, trees are chosen which are neither too young nor too old; as only full-grown trees, not yet in a state of decay, will yield good turpentine. When the sap begins to be in motion in spring, if a few drops of turpentine are seen exuding from the bark, it is a proof that the tree is full of resinous juice; and, if the trunk were split, there would be found, 5 in. or 6 in. from the heart of the tree, and 8 in. or 10 in. from the

bark, several depots of liquid resin, contained in cavities which are sometimes 1 in. thick, 3 in. or 4 in. broad, and as much in height. In a trunk of 40 ft. in length, as many as six of these large reservoirs of liquid resin have been found, and several smaller ones. When the wood of a tree cut down in this state is sawed up, a cut with a hatchet will make the turpentine flow abundantly; and the sawyers often find the movement of the saw impeded by it. Young and vigorous larches have none of these reservoirs, which appear not to be formed till the tree has attained its full growth; and it is consequently in this state only that the tree is in a fit condition for being pierced for the extraction of its resin. The peasants of the Valley of St. Martin, in the Pays de Vaud, use augers nearly an inch in diameter, with which they pierce the full-grown larches in different places, beginning at 3 ft. or 4 ft. from the ground, and mounting gradually to 10 ft. or 12 ft. They choose, generally, the south side of the tree, and, where practicable, the knots formed by branches which have been broken or cut off, and through which the turpentine is seen exuding naturally. The holes are always made in a slanting direction, in order that the turpentine may flow out of them more freely; and care is always taken not to penetrate to the centre of the tree. To these holes are fixed gutters made of larch wood, which are $1\frac{1}{2}$ in. wide, and from 15 in. to 20 in. long. One of the ends of each gutter terminates in a peg, through the centre of which is bored a hole about $1\frac{1}{2}$ in. in diameter. This end of the gutter is forced into the hole made in the tree, and the other end is led into a small bucket, or trough, which receives the turpentine. In the countries where larches are abundant, says Du Hamel, particularly in the Briançonnais and the Vallais, may be seen, in the fine weather of spring, a prodigious quantity of little buckets at the foot of the trees, each attached to a tree by a slender tube, or gutter, through which the clear limpid turpentine, glittering in the sun, trickles down, and soon fills the bucket; while every morning and evening, the peasants hasten from tree to tree, examining their buckets, taking away or emptying those that are full, and replacing them with empty ones. This harvest, if so it may be called, continues from May till September; and the turpentine requires no other preparation, to render it fit for sale, than straining it through a coarse hair cloth, to free it from leaves, or any other accidental impurities that may have fallen into it. When a hole made in a tree does not produce turpentine, or when the turpentine ceases to flow, the hole is stopped with a peg, and not opened for a fortnight or three weeks. When these holes are reopened, the turpentine is generally found to flow from them in greater abundance than from the other holes in the tree, and they continue to give still more and more, till the flow of the sap is stopped in autumn by the cold. A full-grown healthy larch, if tapped when of the proper age, will yield 7 lb. or 8 lb. of turpentine every year, for 40 or 50 years.

The wood of a tree from which the resin has been extracted is never used for building purposes: it is, indeed, only good to burn; and the charcoal made from it is very much lighter than, and very inferior in every respect to, that made from larches which have not been deprived of their resin. The turpentine of the larch is called Venice turpentine, because it used formerly to be sent to England and the north of Europe only from that commercial city. It should be clear, transparent, free from all impurities, of the consistence of a thick syrup, with a bitter taste, and a strong disagreeable smell. It is employed in medicine, and particularly in veterinary surgery; and it is reckoned excellent to draw out thorns, splinters, &c., and to cure ulcers and old wounds which appear to be in danger of gangrene. It is used in the formation of what are called drawing plasters, and also for making several kinds of varnish. It is sometimes distilled with the addition of water, like the turpentine of the pinaster; but its essential oil, colophony, &c., are very inferior to those produced by distilling the turpentine of any other of the pine and fir tribe.

The *Manna of Briançon* is a kind of sap of a sweetish but insipid taste,

which, towards the end of May, and during the months of June and July, exudes, according to some, during the night, from the bark of the young shoots; but which, according to others, transpires from the buds and leaves, on which it coagulates in the form of little white glutinous grains, which are easily scraped off. In the morning, young larch trees, before they are struck with the rays of the sun, will be found covered with it; but the grains, if not gathered, will soon disappear. Very cold winds prevent the formation of this substance, which is called *manne de Briançon*, because it is found in most abundance in that country. It resembles the manna of the flowering ash (*O'rnus rotundifolia*, see p. 1242.), but is less purgative. It is not much used, as but very little is produced, except in Briançon; and, even there, it is very difficult to collect before it melts.

The *Leaves* of the larch, Kasthoffer considers as less injurious to pasture than those of any other pine or fir; and, for the same reason, he says that they are better worth collecting as a manure. They are eaten in Switzerland by cattle and sheep, but less eagerly than those of the evergreen pines and firs; because they, being deciduous, are only to be found in an eatable, that is green, state, when the more palatable food of grass is abundant.

Uses of the Larch in Britain. Public attention was first drawn to the uses of this tree, as we have already observed, by Dr. Anderson, in 1777, when the oldest larch trees in Scotland could not have been above 50 years old, and, doubtless, none of them had been cut down; as the earliest notice of one of the Athol larches having been felled is in that year. (See *App. to Gen. Rep. of Scot.*, vol. iv. p. 493.) Dr. Anderson's sources of information, therefore, must have been foreign authors, the more important of whom have been already quoted. The first British author who treats of the value of the wood of the larch at length, and from his own experience, is Pontey; who, in his *Forest Pruner*, the first edition of which was published in 1805, states that the larch excels foreign fir in all the following respects:—

“1. It is much clearer of knots, provided a very small degree of attention be paid to it, during the first twenty years of its growth.

“2. It is more *durable*; for though it produces dead knots, when neglected, still it produces no rotten ones, or what carpenters call cork-knots. The fact is, that not only the heart and sap of the wood, but even the bark, are so durable a nature, that we know no means of estimating when any one of them will decay, except under some species of mismanagement. There is a particular criterion by which larch is distinguishable from any other wood, which is, at the same time, a decisive proof of its durability; viz. the dead knots, or branches, wood and bark, being always found fast *wedged*, as it were, in the timber; so that every knot of that description has a sort of ring round it nearly black. Any person who has larches growing, of some tolerable age, may convince himself of their durability, by examining their dead branches; which, whether great or small, *are never found rotten*.

“3. Larch is much less liable to shrink than foreign deal. It is well known that the latter is exceedingly liable to that defect, in the first instance; and the joiners tell us that, when a board of it has been twenty years in use, if planed over again, it will again shrink; but not so with larch; for, if well dried at first, it never shrinks at all.

“A piece of *larch wood*, split from the root end of a slab, was weighed at different periods. The tree having been cut down in August preceding, and sawn up a few days previous to the first weighing, gave the following results:—

Date when weighed.	lb. oz.	Date when weighed.	lb. oz.
“1799, 1st October - -	12 11	“1799, 9th December, - -	7 11
19th October - -	10 4	30th December, - -	7 9
25th October - -	9 0	1800, 31st January, - -	7 9
13th November, - -	7 13		

“The weighing has often been repeated since, but no variation was found while it was in the same place; namely, a dry room over one where a good fire was kept. The piece is nearly all sap wood. From which we gather

this important information; the larch may be perfectly seasoned in three months, with a very moderate heat, and probably much sooner, as the next circumstance to be noted seems to show. When wood can lose no more weight, we take it for granted it is perfectly seasoned; and, as this is so soon attained by the larch, there can remain no just apprehensions of its shrinking.

"4. Larch will not crack, with any degree of heat that can be called tolerable, when in plank or boards, or when the poles are split as rails. When in bulk (that is not sawn up), the case is not different, provided the bark remains upon it; but if *that* be taken off while the wood is green, it cracks considerably, as will be noticed under the seventh head.

"5. Larch is much more tough than foreign deal. It splits with great difficulty, and never in any length with the grain. Foreign deal being so exceedingly apt to split, can seldom be used very thin; but the larch may be used as thin as the sawyers can cut it, without any danger on that head.

"6. It has two properties, the first of which the foreign deal does not possess, and the second but in a very inferior degree; namely, its beautiful colour, and its capability of receiving a degree of polish equal to any wood yet known, and much superior to the finest *mahogany*.

"7. It may be used in situations where the best foreign deal proves of very short duration; namely, as posts for every description of fencing."

The knotty tops of some larch trees were sawn, in 1800, into scantlings of about $1\frac{1}{2}$ in. square, for the purpose of staking and tying up plants in Mr. Pontey's nursery. On examining their condition four years afterwards, the whole of them were perfectly sound above ground, the only symptoms of decay appearing on the sappy parts of the wood, that had been in the ground. A larch post, which, in 1800, had been in the ground upwards of 20 years, was perfectly sound above ground, and not decayed under it deeper than the sap wood; and, where the bark was not removed under ground, even the sap wood was uninjured. (*For. Prun.*, ed. 4., p. 83.)

Matthew is the next British author who writes on the uses of the larch from his own experience; and his work *On Naval Timber* is dated 1831. The larch, compared with pines and firs, he says, has the timber much stronger when young, and even when the trunk is under a foot in diameter, than when old and large. Near the top of the tree, the timber is very inferior, and deficient in toughness, to what it is at the root. The wood is finer grained, and has fewer large knots, than that of the Scotch pine. A thin larch board, when dried, is at once strong, tough, durable, and extremely light. It is difficult to split larch even by wedges; which is owing to the netted structure of the fibres of the wood: whereas the wood of the Scotch pine, as of other pines, is easily split, owing to its reedy structure, the longitudinal fibres running parallel to each other, with comparatively very few transverse ones. Some experiments conducted at Woolwich, which will be hereafter given, show the strength of Highland larch to be to that of the Riga pine as 1000 to 804; and to that of white American pine (*P. Ströbus*), as 1000 to 824. In Scotland, it is universally allowed to be stronger than the Scotch pine; as a proof of which, the sawyers employed to cut it up have one fourth more pay when cutting larch, than when cutting pine. The larch, compared with any other of the Coniferæ, *Matthew* justly observes, "has comparatively smaller and more numerous branches; and, consequently, the timber is freer from large knots, and has more equable strength, as well in small spars, as when large and cut into joists and beams; provided the timber be not too far up the tree." (*On Naval Timber*, p. 105.) The larch, says *Mr. Sang*, will arrive at a useful timber size in one half or a third part of the time, in general, which the Scotch fir requires; and the timber of the larch, at 30 or 40 years old, when placed in soil and climate adapted to the production of perfect timber, is in every respect superior in quality to that of the fir at 100 years old. (*Plant. Kal.*) The price of the wood of the larch, in Scotland, at the present time (1837), varies from 2*d.* to 4*d.* per cubic foot more than that of the Scotch pine.

"The larch," Sir Thomas Dick Lauder observes, "is unquestionably by much the most enduring timber we have. It is remarkable, that, whilst the red wood, or heart wood, is not formed at all in the other resinous trees till they have lived for a good many years, the larch, on the other hand, begins to make it soon after it is planted; and, whilst you may fell a Scotch fir of 30 years old, and find no redwood in it, you can hardly cut down a young larch large enough to be a walking-stick, without finding just such a proportion of red wood, compared to its diameter as a tree, as you will find in the largest larch in the forest compared to its diameter." (*Laud. Gilp.*, i. p. 153.)

For Naval Purposes, Matthew observes, the larch, from its general lateral toughness (particularly the root), and from its lightness, seems better adapted for the construction of shot-proof vessels, than any other timber." It has been used for ship-building in the Tay, he says, since 1810; and there were, in 1830, several thousand tons of shipping constructed of it. "The Athole frigate, built of it about 1818; the Larch, a fine brig, built by the Duke of Athole several years earlier; and many other vessels, built more recently; prove that larch is as valuable for naval purposes as the most sanguine had anticipated. The first instance we have heard of British larch being used in this manner was in a sloop repaired with it about 1808. The person to whom it had belonged, and who had sailed it himself, stated to us, immediately after its loss, that this sloop had been built of oak about 36 years before; that at 18 years old her upper timbers were so much decayed as to require renewal, which was done with larch; that 18 years after this repair, the sloop went to pieces on the remains of the pier of Methel, Fifeshire, and the top timbers and second foot-hooks of larch were washed ashore as tough and sound as when first put into the vessel, not one spot of decay appearing. The owner of a larch brig, who had employed her for several years on tropical voyages, also assures us that the timber will wear well in any climate, and adds that he would prefer larch to any other kind of wood, especially for small vessels; he also states that the deck of this brig, composed of larch planks, stood the tropical heat well, and that it did not warp or shrink, as was apprehended.

"Larch knees are possessed of such strength and durability, and are of such adaptation by their figure and toughness, that, were a sufficient quantity in the market, and their qualities generally known, we believe that none else would be used for vessels of any description of timber, even for our war navy of oak. The knees of vessels have a number of strong bolts, generally of iron, passing through them to secure the beam-ends to the sides of the ship. Larch knees are the more suited for this, as they do not split in the driving of the bolts, and contain a resinous gum, which prevents the oxidation of the iron.

"In all places where larch has become known, it has completely superseded other timber for clinker-built boats, surpassing all others in strength, lightness, and durability. For this purpose, young trees of about 9 in. in diameter, in root-cuts from 10 ft. to 20 ft. in length (for as you ascend the tree, the timber deteriorates greatly), with a gentle bend at one end, such as the larch often receives from the south-west wind, are the most suitable. The log should be kept in the bark till used; and, in dry weather, the boards put upon the boat's side within two or three days from being sawn out, as no timber we are acquainted with parts sooner with its moisture than larch; and the boards do not work or bend pleasantly when dry. When dried, the thin larch board is at once strong, tough, durable, and extremely light.

For rural Purposes generally, larch is incomparably the best adapted timber, especially for rails, fences, or out-door fabrics exposed to wind and weather. It is also getting into use for implements of husbandry, such as harrows, ploughs, and carts. We have seen a larch upright paling, the timber of which, with the exception of the large charred posts, had only been eight years in growing, standing a good fence, sixteen years old, decked out by moss and lichen in all the hoary garniture of time.

"In the Construction of Buildings, larch is valuable only for the grosser parts, as beams, lintels, joists, couples. For the finer boarded part, it is so much disposed to warp, and so difficult to be worked, as generally to preclude use. It is, however, asserted that, if larch be seasoned by standing two years with the bark stripped from the bole before being cut down, the timber becomes manageable for the finer house-work."

The Durability of the Larch, when alternately exposed to Water and Air, was proved by an experiment made in the river Thames, at the suggestion of the Duke of Athol. "Posts," Sir Thomas Dick Lauder observes, "of equal thickness and strength, some of larch and others of oak, were driven down facing the river wall, where they were alternately covered with water by the flow of the tide, and left dry by its fall. This species of alternation is the most trying of all circumstances for the endurance of timber; and, accordingly, the oaken posts decayed, and were twice renewed, in the course of a very few years; whilst those which were made of larch remained altogether unchanged. "We had ourselves," says Sir Thomas Dick Lauder, "occasion to erect a foot-bridge to a pleasure walk over a sunk road, and this we ordered to be constructed of two long stretching beams, covered transversely with larch planks. In 14 or 15 years afterwards, we discovered symptoms of decay in the bridge, and ordered the carpenter to new plank it; but, when he came to carry our directions into execution, he discovered that the whole planks were quite sound, with the exception of three; and that these three, which were rotten almost to powder, were Scotch fir planks, which had been taken in a hurry, at the time the bridge was built, to supply a deficiency in the original number of the larch planks." (*Laud. Gilp.*, i. p. 154.)

In Mill-work, and especially for mill axles, where oak only used formerly to be employed, larch has been substituted by the Duke of Athol, in 1806, with the best effect. In the winter of that year, in cutting up an old decayed mill wheel, His Grace found those parts of the water cogs which had been repaired with larch in 1786, though black on the surface, on the hatchet being applied, as sound and fresh as when put up.

In Railroads, it is found to form excellent sleepers, and so great was the demand for it in 1836 and 1837, for this purpose, that it could scarcely be supplied even with the extensive plantations in Scotland.

As Hop Poles and Stakes for Plants, no wood whatever equals the larch. For these purposes, it ought to be planted close, so as to be drawn up with trunks of the requisite degree of slenderness; for, when planted thin, the stems are apt to become disproportionately thick below, as Cobbett describes to be the case with the sweet chestnut. (See p. 1996.) We have seen the larch, at 3 ft. apart, drawn up to the height of between 40 ft. and 50 ft., with clear straight stems, admirably adapted for hop-poles, and for poles for ornamental purposes in gardens; such as staking roses, forming arches and rustic work for training creepers, espaliers for fruit trees, &c. Even the young trees, which have been allowed to attain the height of 4 ft. or 5 ft. in nursery lines, make excellent props for the more delicate plants; and, when used with the bark on, will last, for an indefinite period.

As Guards for single Trees and small Groups, the larch possesses the advantages of strength to resist the rubbing of cattle; of durability at the surface of the ground, where it is alternately wet and dry; and of economy, because, when the bark is kept on, the expense of painting or Kyanising is unnecessary.

As live and as dead Fences, the larch possesses peculiar properties, bearing the shears apparently as well as the spruce. (See p. 2306.) Sir Thomas Dick Lauder once saw a very pretty larch fence in a gentleman's pleasure-ground near Loch Lomond. "The trees were planted at equal distances from each other; and, being clipped, were half cut through towards the top, and bent down over each other. In many instances, the top shoot of the one had insinuated itself into that adjacent to it, so as to have become corporally united to it; and, strange as it may seem, we actually found one top that had so inserted itself, which, having been rather deeply cut originally by

the hedge bill, had actually detached itself from the parent stock, and was now growing grafted on the other, with the lower part of it pointing upwards into the air!" (*Laud. Gilp.*, i. p. 157.)

A Larch Hedge, which immediately became a Fence, was formed, in the spring of 1831, to enclose a four-acre field of high, dry, and rather poor land, in the following manner:— A ditch was dug, 4 ft. wide, in the direction of the fence; and Mr. Gorrie having some plantations of larches, of nine years' standing, on an adjacent eminence, which required thinning, it occurred to him that it might be possible to construct of them a live fence that would have immediate effect; and, with this view, he had them taken up carefully, as marked out for thinning, about the beginning of March. He employed two other men in planting them among the earth thrown out of the 4-ft. ditch; he holding the tree, and giving it the intended position. It occurred to Mr. Gorrie that wind-waving was one principal preventive of the growth of larches transplanted at that age, which would be avoided by laying the trees in a slanting direction; besides, fewer trees would form an efficient fence, than if standing perpendicularly. "The trees were from 10 ft. to 12 ft. long, and were laid at about an angle of 30° with the horizon, the tops inclining a little over the ditch to the interior of the field, whence the danger from cattle attempting to break through was to be apprehended; the surface of the ditch bank being about from 1 ft. 8 in. to 2 ft. above the ordinary level of the ground, and the upper part of the roots about 3 in. below that surface, when the earth was dressed off. The plants were well feathered to the bottom with side branches, which were all allowed to remain on the trees; and at the surface the roots were from 2 ft. 6 in. to 3 ft. distant, but the stems, or centres, of the trees, from the sloping direction given them, were only from 1 ft. 3 in. to 1 ft. 6 in. distant, centre from centre, which, with the branches, presented an obstruction apparently more formidable than really so; and which had the effect of preventing any of the enclosed horses or cattle from making an attempt at taking a leap. The expense of digging the ditch and planting did not exceed 1s. per Scotch fall (18 ft. 6 in.); and thus an effective live fence was put up, at less than would have erected a 3-railed paling, the decay of which would commence the day on which it was erected; while the living larches, that otherwise would have been almost useless, will acquire yearly strength, which will soon present an insurmountable barrier to the passage of live stock; besides affording immediate shelter, which will be annually increasing. This year I find (as was to be expected) the leading shoot begins to assume a perpendicular direction; and every fourth or fifth tree, I intend to allow to grow to full maturity, when the proprietor of future times may find it convenient to have them cut up for naval timber. I did not expect that every plant transplanted at that age should grow; and the dry weather which followed in the summer of 1831 was by no means favourable to their success: about 80 plants died of 760. These I, this spring, interlined with young plants of about 3 ft. in length, transplanted larches from the nursery, inserted under the back-gone plant, the dead branches of which gave the young plant, with a little assistance, the proper direction. In order to make assurance doubly sure, I planted a row of young transplanted larches from the nursery at about 1 ft. apart, and 1 ft. separate from the old plants, to which they had a contrary direction given them. Here I should have taken blame to myself, if I had to record the death of a single plant. The whole are now in a thriving condition; and I can, with some degree of confidence, recommend the process to those who may have upland fences to form, and thinnings of larches of 9 or 10 years' standing to spare.— *Arch. Gorrie. Annat Gardens, Oct. 1. 1832.*" Mr. Gorrie informs us (December, 1837) that these larches have thriven amazingly, and that the trees placed in a slanting position now form most beautiful curves.

Dead Fences of larch branches, wattled between large stakes, have been tried in different parts of Scotland, and found to last many years. Young larch trees have also been planted (after being killed by being left several months out of the soil) in the form of a hedge, for shelter in a garden; and found to

have the advantage of producing shelter and shade without exhausting the soil by their roots, as in the case of live hedges.

The Bark of the Larch has long been used for tanning in its native Country (see p. 2365.), and it seems first to have been employed for that purpose in Britain, by Thomas White, Esq., of the Woodlands, near Durham, about the beginning of the present century. (See *Gen. Rep. of Scotland*, vol. iv. p. 501.) According to Monteath, when the best oak bark is 12*l.* 12*s.* per ton, the best larch bark is 5*l.* 5*s.* In general, he considers the bark of the larch to be equal to that of the birch; which, as it is well known, is generally used for the purposes of tanning in Sweden and Russia.

As a Nurse Tree, we have already mentioned, when treating of the spruce (p. 2305.), that the larch can be by no means recommended. By its vigorous growth, it robs the soil of what ought to nourish the trees to be protected; and, by its long, flexible, spiny shoots, it not only overtops them, but lashes and injures the leading shoots of the young trees.

Mr. Gorrie tells us, however, that "an exception may be taken in favour of the larch, as a nurse to the oak, the roots of which descend below the range of those of the larch. Its openness accords with the hardy nature of the oak in winter, and thus allows the tree to acquire protecting properties, before the nurses are removed. I have always found the oak to thrive, and acquire vigour, when nursed by larches. Of course, lashing and overtopping must be prevented, but this is easily done."

The Improvement of the Soil in which the Larch grows is one of those important results first discovered by the Duke of Athol, and is thus described:—"The lower and stronger branches meet together in six or seven years after planting, so as to form a complete matting over the ground. The air and light being excluded by them, all plants that are under them die. At the same time, the annual deposit of leaves from them, by means of decomposition, forms, in the course of time, a soil of considerable depth. At the age of 24, the larches lose the spines on the lower branches altogether, and that is the natural mark of their being ready to be removed by thinning, to a considerable extent. On the air being readmitted by the removal of the trees, the surface of the new-made soil wherever it has been formed, even among the rocks, becomes immediately covered with natural grasses, among which the *Hóleus móllis* and *H. lanátus* seem to predominate. These grasses continue to grow, and to thicken into a sward, by the annual top-dressing which they receive from a continued deposition of leaves. The improvement of the natural surface of the ground for pasturage, by means of the larch, appears to be a property peculiar to this tree. This pasturage is quite capable of improving the condition of cattle either in winter or summer." (*Higl. Soc. Trans.*, vol. xi. p. 188.) The grasses here mentioned, Mr. Gorrie observes, "are bad pasture grasses, and should be discouraged; but, as already observed (p. 2363.), finer grasses will grow under these trees."

As an ornamental Tree, the larch is generally considered to produce a very good effect, particularly in hilly scenery. It is admired, says Baudrillart, "for its pyramidal shape and spiry head; for the tender green, and peculiar disposition of its foliage; and for its female catkins, which spread over the tree, and, seen at a little distance, resemble wood strawberries in their form, colour, and size; contrasting strongly with the pale green of the beautiful tufts of leaves with which the branches are uniformly furnished. Placed singly on a lawn, or rising from a group of other trees, this species is rarely surpassed in beauty." The opinions of some English writers of acknowledged taste are, however, very different from this. Gilpin says: "The larch we have in England, compared with the larch of the Alps, is a diminutive plant. It is little more than the puny inhabitant of a garden, or the embellishment of some trifling artificial scene. The characters of grand and noble seldom belong to it. It is, however, an elegant tree; though, in our soil at least, it is too formal in its growth. Among its native steeps, its form, no doubt, is fully picturesque, when the storms of many a century have shattered its

equal sides, and given contrast and variety to its boughs." (*For. Scen.*) Wordsworth, in his *Description of the Scenery of the Lakes*, says: "It must be acknowledged that the larch, till it has outgrown the size of a shrub, shows, when looked at singly, some elegance in form and appearance; especially in spring, decorated as it then is by the pink tassels of its blossoms: but, as a tree, it is less than any other pleasing. Its branches (for boughs it has none) have no variety in the youth of the tree, and little dignity even when it attains its full growth. Leaves it cannot be said to have; and, consequently, it affords neither shade nor shelter. In spring, the larch becomes green long before the native trees; and its green is so peculiar and vivid, that, finding nothing to harmonise with it, wherever it comes forth a disagreeable speck is produced. In summer, when all other trees are in their pride, it is of a dingy lifeless hue; in autumn, of a spiritless unvaried yellow; and, in winter, it is still more lamentably distinguished from every other deciduous tree of the forest; for they seem only to sleep, but the larch appears absolutely dead." (*Description, &c.*, p. 93.) There is great truth in Wordsworth's description. The circumstance of the tree having no boughs, but only branches, doubtless detracts from its contrast and variety of form as a picturesque object; but the smallness of these branches, by never absorbing the wood of the trunk, renders it peculiarly valuable as a timber tree. Its chief beauty, therefore, consists in its powerful unity of expression as a timber tree. When its leading shoot is broken, and one or more of the side branches take the character of boughs, (as in the Dalwick tree, fig. 2261. p. 2356.; a tree at Knowle, in Kent; and some others that might be mentioned;) it then becomes as varied and picturesque as Gilpin or Wordsworth could desire. Its death-like character during winter is very remarkable, and almost peculiar to the tree. The *Gymnocladus canadensis*, or stump tree of the French (see p. 656.), conveys the same death-like expression, but by a totally different form. After all, the larch can only be seen in its characteristic beauty on the steep sides of the mountains of Switzerland; or, projecting from the rocky precipices of the Tyrol. (See fig. 2263. in p. 2357.) It will, doubtless, have something of the same expression on the mountains of the Highlands of Scotland; but there its picturesque effect must be greatly diminished, from the uniformity with which the surface is covered, and the trees being comparatively equidistant, and all of the same age and size. At least, this was the case in the neighbourhood of Dunkeld, the last time we were in that romantic country, in 1806. "To produce an ornamental larch, it should be carefully nursed, removing the nurses gradually, to allow air enough to encourage the lower branches, but affording shelter enough to produce length of stem. I do not know a more beautiful object on a lawn in the early summer months, though not picturesque, than a tree so treated, forming a delicate pea-green cone, from the grass to the height of 50 ft. or 60 ft. If properly managed, the lowest branches will live as long as the tree." We fully acknowledge the justice of this remark, and have felt it ourselves, when seeing even the young larches in the Horticultural Society's Garden, and some of the fine old specimens at Syon, Whitton, and Pain's Hill, the lower branches of which sweep the ground.

Soil and Situation. The larch will grow rapidly upon almost any soil, and in any situation, for the first 20 or 30 years; but it is only in a clear dry atmosphere, on a cold-bottomed soil, somewhat moist on the surface, that its timber is brought to perfection. In plains, and near the sea, it grows rapidly for 30 or 35 years; but, when felled in such situations, the wood is found rotten at the heart, and unfit for any purpose except fuel. This decay of the wood is much aggravated, when the larches are planted thick, so as to expose but a small portion of their foliage to the sun, and to retain among their lower branches an atmosphere surcharged with moisture. The larch will grow, and become valuable timber, at a much greater elevation above the sea than the Scotch pine, thriving at the height of 1800 ft. in the Highlands, where the Scotch pine does not attain a timber size at a greater elevation

than 900 ft. In Switzerland, Kasthoffer informs us, it is found in the highest perfection in soil composed of the debris of calcareous rocks, as well as in granitic, argillaceous, and schistose soils.

The following admirable remarks by Professor De Candolle show the necessity of a clear and dry atmosphere, and a soil somewhat moist on the surface, to the prosperity of the larch as a timber tree:—"Amongst all the general circumstances which have an effect on vegetation, that which appears to me most necessary to the larch is, that it have at the same time its roots in a soil habitually, but moderately, damp, and its top exposed to the direct rays of the sun, so that the evaporation of water, and the decomposition of carbonic acid, may go on with activity. I support this opinion, 1st, on general observation of the places where I see the larch prospering; 2dly, on theory. The larch has fine and minute leaves, and, of all trees which shed their leaves, it must present a less surface; consequently, the action of these surfaces must be greater to produce the same results. Larches generally thrive on the declivities of our mountains, seldom on flat places; because on declivities there is always a little dampness in the earth, descending from the surface above; and, at the same time, the trees, on account of the inequality of their bases, have more space at their tops, and are better exposed to the light; whereas flat places are often too dry, and the trees, being all of the same height, overshadow each other. Among declivities, those which are connected with summits covered with perpetual snow are those where larches grow best; because there they are slightly and continually watered by the gradual melting of the snow during summer, and, at the same time, their heads are well exposed to the sun. Declivities, and, in general, elevated countries, suit larches best; because the action of the light is more intense there than in low countries: yet the larch succeeds well enough in situations only a little elevated above the level of the sea, provided the atmosphere be not obscured by fogs and constant cloudiness. If the larch seems to like to have its roots in a soil moderately damp, it likes also to avoid the dampness of the atmosphere. On that account, it grows badly near lakes, rivers, cascades, and under the shade of rocks, even in those countries where, in other situations, it would flourish. We are here (Geneva) very near the countries where the larch grows beautifully. We are at a height superior to that where we know of fine larches existing; yet it does not thrive in our valley, particularly near the lake and the river. The constant dryness of the air of the Alps is also one of the causes which makes it prosper there. The dampness of the air tends to diminish the evaporation of the leaves, which is so necessary to the health and vigour of the tree. It has been remarked that the larch does not grow well near the sea, which proves what I have just advanced. The sea produces an increase of dampness in the air in two ways: 1st, like the surface of fresh water, it exhales much moisture into the atmosphere; 2dly, the watery particles which are thrown out by the waves are carried here and there, and deposited on all solid bodies; and, when the moisture they contain evaporates, it leaves behind a certain quantity of salt, more or less deliquescent (muriates of lime and soda), which constantly attracts dampness.

"In Switzerland, the larch grows better in those parts exposed to the north than to the south. The difference is sometimes so striking, that in the valleys parallel to the equator, it is not rare to see all the side to the north covered with larches, and none at all to the south. I am inclined to believe that this arises from the irregularity of our spring, which causes the buds of the larches to be too precocious on the southern declivities; and, consequently, they are frequently killed by the frost. In the latitude of Great Britain, where the spring is more regular, I think this cause will not operate; and I should say that, if the southern declivities be not too dry, the larches will succeed better there than here." (*Quart. Journ. of Agr.*, vol. v. p. 409.)

Sang mentions it as a fact ascertained by experience, that the larch thrives best in inland and elevated situations. It will not, he says, "grow up to perfection, even in the best soils, and in situations most favourable to trees in

general, if these be low ; and, where oak, chestnut, elm, and ash have produced wood perfectly sound, the larches in the same soil and situation have had their trunks quite hollow a good way upwards." (*Plant. Kal.*, p. 93.) At Raith, at Leslie, and at other places in Fifeshire, the larch had, in 1812, attained a great size on rich banks and in warm situations ; but, in nearly 1000 trees which were cut down at that time, there was scarcely one in which the trunk was not beginning to decay at the heart. (*Ibid.*, p. 59.) The fitness of soil for larch, Matthew observes, "seems to depend chiefly upon the ability the soil possesses of affording an equable supply of moisture ; that is, upon its mechanical division, or on its powers of absorption or retention of moisture ; and its chemical composition would seem only efficacious as conducive to this." Throughout Scotland, he says, wherever he has observed the decay of larch wood, it has resulted almost solely from unsuitableness of soil. "We have witnessed," he continues, "the tree as much diseased on our highest trap hills, 1000 ft. in altitude, as on a similar soil at their base." (*Ibid.*, p. 78.) "The larch," Sir W. Jardine observes, "is very soon lost when planted above a substratum of red sandstone. In the vale of the Annan, wherever the sloping banks have a substratum of this rock, or one composed of a sort of red sandstone, shingle, or gravel, the outward decay of the tree is visible at from 15 to 25 years of age. The internal decay commences sooner, according to the depth of the upper soil, in the centre of the trunk at the root, in the wood being of a darker colour, extending by degrees in circumference, and up the stem, until the lower part of it becomes entirely deprived of vegetation, and assumes a tough and corky appearance. This extends to the whole plant, which gradually decays and dies. On the same soil, the oak grows and thrives well." (*Sir W. Jardine*, in his notes to *White's Nat. Hist. of Selborne*.) Mr. Matthew divides soils and subsoils into two classes : the first, where larch will acquire a size of from 30 to 300 solid feet, and will generally be found free of rot ; the second, where it reaches only from 6 to 20 solid feet, and, in most cases, becomes tainted with rot before it is 80 years old. As this subject is of great importance to the planter of the larch, and as Mr. Matthew is an author whose science and practical knowledge may be relied on, we quote his observations on the subject at length :—

"CLASS I. *Soils and Subsoils proper for the Larch.*—1. *Sound Rock*, with a covering of firm loam, particularly when the rock is jagged or cleft, or much broken, and mixed with the earth. In such cases, a very slight covering or admixture of earth will suffice. We would give the preference to primitive rock, especially micaceous schist and mountain limestone. Larch seldom succeeds well on sandstone or on trap, except on steep slopes, where the rock is quite sound, and the soil firm. We have had no experience of larch, except very young, growing on chalk and its affinities. Primary strata are generally well adapted for larch, except where the surface has acquired a covering of peat moss, or received a flat diluvial bed of close wet till, or soft moorish sand, or occupies too elevated or exposed a situation ; the two latter exceptions only preventing the growth, not inducing rot.

"2. *Gravel*, not too ferruginous, and in which water does not stagnate in winter, even though nearly bare of vegetable mould, especially on steep slopes, and where the air is not too arid, is favourable to the growth of the larch. The tree seems to prefer the coarser gravel, though many of the stones exceed a solid yard in contents. The straths, or valleys, of our large rivers, in their passage through the alpine country, are generally occupied, for several hundred feet of perpendicular altitude up the slope, by gravel ; which covers the primitive strata to a considerable depth, especially in the eddies of the salient angles of the hill. Every description of tree grows more luxuriantly here than in any other situation in the country. The causes of this are : 1. the open bottom allowing the roots to penetrate deeply, without being injured by stagnant moisture ; 2. the percolation of water down through the gravel from the neighbouring hill ; 3. the dryness of the surface not producing cold by evaporation, and the ground, on this account, soon heating in spring ; 4. the moist

air of the hill refreshing and nourishing the plant during the summer heats, and compensating for the dryness of the soil; 5. the reverberating of the sun's rays between the sides of the narrow valley, thus rendering the soil comparatively warmer than the incumbent air, which is cooled by the oblique currents of the higher strata of air, occasioned by the unequal surface of the ground. This comparatively greater warmth of the ground, when aided by moisture, either in the soil or atmosphere, is greatly conducive to the luxuriance of vegetation.

"3. *Firm dry Clays, and sound brown Loam.* Soils well adapted for wheat and red clover, not too rich, and which will bear cattle in winter, are generally congenial to the larch.

"4. *All very rough Ground,* particularly ravines, where the soil is neither soft sand nor too wet; also the sides of the channels of rapid rivulets. The roots of most trees luxuriate in living or flowing water; and, where it is of salubrious quality, especially when containing a slight solution of lime, will throw themselves out a considerable distance under the stream. The reason why steep slopes and hills, whose strata are nearly perpendicular to the horizon, are so much affected by larch and other trees, is, because the moisture in such situations is in motion, and often continues dripping through the fissures throughout the whole summer. The most desirable situation for larch is where the roots will neither be drowned in stagnant water in winter, nor parched by drought in summer; and where the soil is free from any corrosive mineral or corrupting mouldiness. Larch, in suitable soil, 60 years planted, and seasonably thinned, will have produced double the value of what almost any other timber would have done in the same time and situation; and, from its general adaptation both for sea and land purposes, it will always command a ready sale." (*On Naval Timber*, p. 85.)

CLASS II. *Soils and Subsoils where Larch takes the Dry Rot.*—The same experienced and scientific author has enumerated the situations, soils, and subsoils in which the larch, if planted, though it will grow freely, is subject to the rot, or to other diseases.

1. *Situations (steep Slopes excepted) with cold Till Subsoil, nearly impervious to Water.* The larch succeeds worst when moorish dead sand, alone or with an admixture of peat, occupies the surface of these retentive bottoms. Where the whole soil and subsoil are one uniform, retentive, firm clay, the larch will often reach considerable size before being attacked by the rot. When this heavy clay occupies a steep slope, the larch will sometimes succeed well, owing to the more equable supply of moisture, and the water in the soil not stagnating, but gliding down the declivity. In general, soils the surface of which assumes the appearance of honeycomb in time of frost, owing to the great quantity of water imbibed by them, will not produce large sound larch.

"2. *Soft Sand Soil and Subsoil.* Sand is still less adapted for growing larch than clay, the plants being often destroyed by the summer's drought before they attain sufficient size for any useful purpose: the rot also attacks them earlier on sand than on the clay. It appears that light sand, sloping considerably on moist back-lying alpine situations, covered towards the south by steep hills, will sometimes produce sound larch; whereas, did the same sand occupy a dry front or lowland situation, the larch would not succeed in it. The same moist back situation that conduces to produce sound larch in light dry soils, may probably tend to promote rot in the wet. The moisture and the less evaporation of altitude may also, in some degree, diminish the tendency to rot in dry light sand, and increase it in wet clay. Larch will sometimes succeed well in sharp, dry, alluvial sand left by rivulets.

"3. *Soils incumbent on brittle dry Trap, or broken slaty Sandstone.* Although soil the debris of trap be generally much better adapted for the production of herbaceous vegetables than that of sandstone or freestone, yet larch does not seem to succeed much better on the former than on the latter. The deeper superior soils generally incumbent on the recent dark red sandstone,

are better suited for larch than the shallow inferior soils incumbent on the old grey and red sandstone.

"4. *Ground having a Subsoil of dry rotten Rock, and which sounds hollow to the Foot in Time of Drought.*

"5. *Rich Earth, or Vegetable Mould.* Independently of receiving ultimate contamination from the putrid juices or exhalations of this soil, the larch does not seem, even while remaining sound, to make so much comparative progress of growth in it as some of the hard-wooded trees, as elm, ash, and sycamore.

"6. *Black or grey moorish Soils, with Admixture of Peat Moss.* Although the soils specified in this class will not afford fine large larch for naval use, yet they may be very profitably employed in growing larch for farming purposes, or for coal-mines, where a slight taint of rot is of minor importance. The lightness of larch, especially when newly cut (about one third less weight than the evergreen *Coniferæ*), gives a facility to the loading and carriage, which enhances its value, independently of its greater strength and durability. Those larches in which rot has commenced are fully as suitable for paling as the sound: they have fewer circles of sap wood, and more of red or matured wood. When the rot has commenced, the maturing or reddening of the circles does not proceed regularly, reaching nearest the bark on the side where the rot has advanced farthest." (*Ibid.*, p. 88.)

Gathering the Cones and extracting the Seeds. The cones may be gathered any time during the winter season, and kept in a dry place till a week or two before the time of sowing, which generally takes place in April. Boutcher found that, though the cones of the larch are at their full size in autumn, yet the greatest part of the seeds they contain are not then arrived near their maturity, and that they ripen hanging on the trees, during even the coldest winter months. He therefore defers gathering the cones till the month of March or April, when they easily part from the tree, and many of them drop from it. The seeds, when kept in the cones, will retain their vitality for four or five years; but, when taken out of them, they lose it in a few months. De Candolle attaches no great importance to the choice of seeds; though it cannot be denied, he says, that trees growing from seeds taken from diseased trees must be more liable to those same diseases. He cautions such as procure seeds from the Tyrol against a practice which he has heard prevails there, of placing the cones near a large fire to make them open; by which the seeds must be greatly injured, if not totally deprived of their vitality. The cones gathered in the Vallais, he says, are generally opened by the heat of the sun, or over a slow fire; and the seeds from that quarter are preferred by the cultivators of France and Germany. Cones ripened in Britain may either be dried on the kiln, without previous preparation, in the manner already directed for the *Abiétinæ* in general (see p. 2131.); or each cone may be split before putting it into the kiln, which is a safer method, and less likely to injure the seeds. The operation of splitting, Mr. Sang informs us, "is performed by a small, flat, triangular spatula, sharpened at the point and cutting-angles, and helved like a shoemaker's awl. The cone is held by the fore-finger and thumb of the one hand, upon a flat piece of wood; while with the other, by the splitter, it is split up from the thick end; and afterwards each half is split up the middle, which parts the cone into four divisions. This affords occupation, in wet or stormy weather in the winter season, for the workmen of a place, or for boys or girls, or old people; and is by far the best and least destructive to the seeds of any methods we know; because the cones so split, when exposed to the heat, are suddenly opened, and readily discharge the seeds; which, consequently, are less injured by the fire heat than they would be if the cones were longer exposed to it; which, if not split, they would require to be, to cause them to open." Besides the above method of splitting, there are others. "Some people," Sang continues, "use a cone mill, which has large sharp teeth in a concave cylinder, and others fixed in a corresponding roller. The mill is worked by turning the roller with a handle

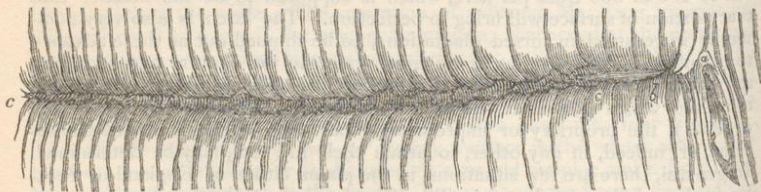
resembling that of a common winnowing-machine. The cones are let into the mill through a hopper. This instrument is very difficult to work, and bruises the seeds very much, many of which are, of course, destroyed. We have several times made use of the improved bark mill, for separating the seeds from larch cones; but the cones are thus so much compressed and bruised, that the seeds suffer exceedingly; and we would by no means advise its use. Indeed, among all the methods which we have known adopted, to perform the painful and laborious work of extracting the seeds of the larch, the plan of splitting the cones singly, as above described, is infinitely the best and safest for the seeds, and ought to be adopted by every one who has occasion to use only small quantities of seed." (*Plant. Kal.*, p. 827.)

Nursery Culture. The seeds may be sown in April, on finely prepared soil, and so as to rise about the same thickness as the Scotch pine, that is, at about a quarter of an inch distant from each other. Mr. Sang recommends sowing the larch on ground from which a crop of two years old seedling Scotch pines has been removed. No preparation of the soil, he says, can equal that of the roots of seedling Scotch pines; and the next best preparation is a crop of two years' seedling larch. In either case, the seedlings are supposed to be removed in September, and the soil dug over several times between that month and the April following, so as to expose it thoroughly to the winter's frost. When the soil is manured, new dung from the stable or cow-house must be carefully avoided, as proving highly pernicious to the young plants; but old rotten dung may be used with advantage. After the seeds are sown, previously to covering them, a light roller should be drawn over the bed, to press the seeds firmly into the earth. The covering should be from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in thickness, according as the soil is sandy or loamy. The plants may remain two years in the seed-bed, and afterwards be planted out into nursery lines, or in plantations where they are finally to remain. The season for transplanting is the autumn, or very early in spring, because the larch vegetates earlier than most other trees, and suffers more than any other when removed after it has begun to grow.

Culture in Plantations. In general, very little preparation of the soil, except draining, is required for a larch plantation; partly, because the larch is generally planted on declivities, the soil of which, if loosened by digging or trenching, would be washed away by rains; and partly because such declivities are generally so rocky, or covered with large stones, as to render digging or trenching impracticable. In all the extensive plantations of the larch made in Scotland, two years' seedlings, or strong one year's seedlings, one year transplanted, are made use of; and the mode of planting adopted is the slit manner, already recommended for the Scotch pine. (See p. 2179.) The larch, where the object is clean straight timber, should be planted in masses by itself, at the rate of from 3000 to 4000 plants to the acre; to be thinned out to 400 or 500 trees per acre, which is supposed to be the number that that portion of surface will bring to perfection. The larch is also very commonly introduced in mixed plantations, to be thinned out as these advance to maturity; young larches being more valuable for country purposes than any other young tree whatever. From what has been already said on the influence which soil and situation have on the wood of the larch (see p. 2376.), the propriety or impropriety of allowing larches in mixed plantations, or, indeed, in any other, to attain their full size, may be determined. In general, there are few situations, in the plains either of England or Scotland, where full-grown larches will be found sound at the heart; but, at the same time, perhaps none where any tree will prove so valuable as the larch, when it is to be cut down just as the rot is beginning to appear. The larch is also sometimes planted as a nurse; though for this purpose it is found far inferior to the Scotch pine and the spruce fir, as already mentioned (p. 2305.). It has, however, the advantage of being more valuable than the Scotch pine when cut down. The great value of the larch is as a mountain tree; and on

this subject we refer to the history of the larch plantations at Athol and Dunkeld, given at the end of this article.

Thinning and Pruning. Where the object is timber of large size, the trees ought to be thinned out soon after the branches at the lower part of the trunk interfere with one another to such an extent as to destroy all vegetation on the surface of the ground beneath them; but, where they are intended for poles, fencing, or other minor country purposes, they ought to be allowed to stand thick, so as to be drawn up clean, slender, and straight. De Candolle thinks the plantations of larches in Britain much too close. The trees are generally at the distance of 3 ft. or 4 ft. from each other, which is much closer than the Continental practice; and he recommends double, or even triple, that distance. Air and light would thus penetrate better among the trees, and would correct the defects arising from the want of evaporation, and the decomposition of the carbonic acid. You should not, he adds, "begin planting at the distance of 10 ft.; but you should begin thinning out gradually, so as to bring your trees to the distance of 10 ft. apart when 20 years old. Considering the atmospherical circumstances of Britain, larch trees should be at a greater distance than they are in Switzerland, and yet they are at considerably less; he therefore strongly recommends thinning; and this recommendation, he says, is supported by the judgment of the most judicious observers, viz., M. De Charpentier and Emmanuel Thomas (the latter a nurseryman and seed dealer at Berg, in the Canton de Vaud, and the former the author of a work on the Pyrenees). These persons propose the distance of 15 ft., instead of 10 ft., from observing what takes place in the Alps, where the larches generally make forests very far from close. (*Quart. Journ. of Agr.*, vol. v. p. 409.; and *Bibl. Univ. de Genève*, Feb. 1835.) Very little pruning is required for the larch. According to Mr. Sang, the pruning of larch trees growing in masses, and intended to attain a timber-like size, should be commenced about the sixth year of their growth; and no more than one, or at the most two, tiers of branches should be removed at a time, otherwise the trees will be much retarded in their growth. After this, a tier of branches may be cut off annually, taking care that, in all larches 20 years old and upwards, not more than two thirds of the trunk should be clear of branches. The branches should be cut off close to the stem, in order that the wound may be speedily healed over by the bark. The time of pruning is the winter season, when the sap is in its least active state. The larch trees at Dunkeld seem scarcely to have been pruned at all; and, indeed, the tree having naturally only small branches, which never attain a timber size, less pruning is required for it in a state of art than for any other trees, except, perhaps, the spruce and the silver firs. Mr. Pontey has shown, in his *Forest Pruner*, ed. 4., p. 71., by a diagram, of which *fig. 2265.* is a reduced copy, that even the dead branches of the larch, when



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enclosed in the trunk of a tree, remain sound in it; and, consequently, when the wood is sawn up into boards, it does not produce rotten knots, as is frequently the case when dead branches have been enclosed by growing over in the evergreen *Abiétinæ*; and as always happens in similar cases with the common broad-leaved trees. *Fig. 2265.* represents a piece of larch board, taken from the root end of a tree above 2 ft. in diameter: *a* shows the core

or centre of the trunk, and the origin of a branch; *b* the part which was the outside of the tree when the branch died, and likewise some remains of the woody part of the branch. The dark space from *c* to *c* is the cavity made in the wood by enclosing the branch with the bark upon it, after it was dead; "part of the bark still remaining in it, as the saw has accidentally gone exactly in the line between that and the wood. If we count the annual circles of the wood, or curved lines, we find it remained in that state at least 32 years upon the tree; but how much longer we cannot say, as the wood has not all the sap wood left upon it. It must have been sound all the time, otherwise the pressure of the wood, in enclosing, would have displaced it; and, from its size, it could not be otherwise than mostly of sap wood. It is also worthy of remark, that the board is from the root end of the tree; the situation of the branch having evidently been within 1 ft. of the ground, and, of course, more exposed to moisture than one more elevated." (*Forest Pruner*, p. 72.)

In the *Highland Society's Transactions*, vol. xii. p. 141., published in December, 1837, is a digest of five essays on the pruning of forest trees, sent to the Society by well-known practical writers. On the pruning of the Coniferæ generally, these writers seem to differ considerably in opinion; the majority appearing to think as we do, that no branch ought to be cut off till it begins to show indications of decay. On the subject of the larch, Mr. Grigor of Forres, a communication from whom has already been given, p. 2181., has the following observations:—

"The larch may be pruned with advantage at the time it sheds its leaves. As it naturally advances in a fine figure, pruning is unnecessary until it attains a height of from 10 ft. to 14 ft. The strongest of the lateral branches should then be regularly lopped off, about 2 ft. from the stem, with a pruning knife or bill. In two years after, these should be removed close to the stem, and those farthest advanced in size among the upper branches should be shortened as above described, it not being safe to allow those most vigorous to be at once cut off close by the trunk. In this manner the tiers should be gone over every two years. The healthiest larches produce cones sparingly. Nothing marks the little progress of growth more than a great crop of seed; and when once the growth is impeded by such, the tree commonly continues to yield abundantly. In such cases, pruning is particularly advantageous. In exposed places the tree should not be wholly cleared of branches to a certain height. The weakest should be allowed to remain, which serves to keep the tree more steady in rough weather" (*Highland Soc. Trans.*, xii. p. 162.). Mr. Gorrie, speaking of the pine and fir tribe generally, says that pruning may be ventured on in open situations, where length and soundness of stem are required; but that no branch intended to be pruned off, for the purpose of producing a clear stem, should be allowed to exceed $\frac{3}{4}$ in. in diameter. Mr. Gorrie adds this important remark: "When trees of the pine and fir tribe that have been thus attended to in their growth are sawn into deal, the wounds have decayed and present a fresh and compressed bird's-eye-like appearance." (*Ibid.*)

Bending and kneeling the Larch for Ship Timber. This practice has been urgently recommended by Mr. Matthew; who says that, in all larch plantations on proper soil, not too far advanced, a proportion of the trees intended to remain as standards should be bent. The operation, he says, should be commenced when the plants are 3 ft. high, or upwards. The plants, the first season, should be bent to an angle of from 40° to 60° with the horizon; and the next brought down from 10° to 6°, or lower, according to the size of the plant, or the curve required. The same practice of bending the larch, and for the same objects, has been recommended by Billington, ourselves, and various others. Billington recommends tying the trees to one another, or to stakes driven firmly into the ground; and South, in the *Bath Society's Transactions*, Montearth, Pontey, &c., recommend bending by the proximity of other larger trees with spreading heads, which are to be afterwards cut away. For example under the spreading branches of an elm, willow, or poplar, of ten or twelve years' growth, plant four or five larches at equal distances from one another,

immediately under the line formed by the circumference of the branches of the centre tree. As the larches advance in growth upwards, the branches of the elm or other tree will extend horizontally, and force the former to take a bent position outwards. To us, it appears that this is too servile an imitation of nature, and that a more effective mode would be, to bend down the trees as recommended by Mr. Matthew, or to cut them over, and treat them in such a manner as to encourage a lateral branch to become the leader, as shown in the portrait of the Great Larch at Dalwick (fig. 2261. p. 2356.) Another method, which has been recommended by South and Matthew, where it is wished to grow crooked timber, is, to undermine the trees, so as to throw them over to one side, when they have attained a certain height, say from 10 ft. to 20 ft. or 30 ft.; and leave them in that position to recover the perpendicularity of their leading shoots, by their annual growths.

Probing the Roots of the common Larch, and laying bare those fitted for Knees for Ship-building. Mr. Matthew finds, from experience, that the roots of larch form the best of all knees; and that they might be much improved by culture, though the practice does not seem to have been attempted or thought of. The following are his very ingenious, original, and rational directions, for attaining this object; and we would strongly recommend them to the attention of all possessors of larch plantations, where the timber is likely to become fit for ship-building:—"To form the roots of the larch properly into knees, should the plants be pretty large, the planter ought to select those plants which have four main roots springing out nearly at right angles, the regularity of which he may improve a little by pruning; and he should plant them out as standards in the thinnest driest soil suited for larch, carefully spreading the roots to equal distances, and in a horizontal position. To promote the regular square diverging of these four roots, he should dig narrow gutters, about 1 ft. deep and 3 ft. long, out from the point of each root, and fill them in with the richest of the neighbouring turf, along with a little manure. When the plants are small, and the roots only a tuft of fibres, he should dig two narrow gutters about 8 ft. long, crossing each other at the middle at right angles, fill these as above, and put in the plant at the crossing; the rich mould of the rotted turf, and its softness from being chopped, will cause the plant to throw out its roots in the form of a cross along the trenches. When the plants have reached 5 ft. or 6 ft. in height, the earth may be removed a little from the root; and, if more than one stout root leader have run out into any of the four trenches, or if any have entered the unstirred earth, they ought all to be cut except one, the stoutest and most regular in each trench. In a few years afterwards, when the plants have acquired some strength, the earth should be removed gradually, baring the roots to from 2 ft. to 5 ft. distance from the stool, or as far as the main spurs have kept straight; and cutting off any side shoots within the distance, should it be found that such late root-pruning does not induce rot. This process of baring the roots will scarcely injure the growth of the trees, as the roots draw the necessary pabulum from a considerable distance; nor, if done carefully, will it endanger their upsetting; and the roots, from exposure to the air, and freedom from the pressure of the soil, will swell to an extraordinary size, so as to render them, ere long, the firmest-rooted trees in the wood. The labour of this not amounting to the value of sixpence each tree, will be counterbalanced thrice over by the ease of grubbing the roots for knees; and the whole brought to the shipwright will produce more than double the price that the straight tree alone would have done." On this passage, Mr. Gorrie observes, that "cutting the roots of a growing larch is dangerous, and will inevitably produce rot." Mr. Matthew continues:—

"The forester should also examine and probe the roots of his growing larch, even those of considerable size, in sound ground; and, when several strong horizontal spurs, not exceeding four, are discovered nearly straight, and from 2 ft. to 5 ft. long, he ought to bare the roots to that distance, that they may swell, carefully pruning away any small side roots, and reserve these plants as valuable store,

taking good heed that no cart-wheel, in passing, or feet of large quadruped, wound the bared roots. In exposed situations, the earth may be gradually removed from the roots.

"The rot in larch taking place in the part appropriate to knees, the forester cannot be too wary in selecting the situations where there is no risk of its attack, for planting those destined for this purpose. It is also desirable, if possible, to have the knee timber in ground free of stones or gravel, as the grubbing in stony ground is expensive, and the roots often embrace stones which, by the future swelling of the bulb, are completely embedded and shut up in the wood, particularly in those places between the spurs where the saw section has to divide them for knees. Were the roots carefully bared at an early period, it would tend to prevent the gravel from becoming embedded in the bulb. Nothing can be more annoying to the shipwright, when he has bestowed his money, ingenuity, and labour, upon an unwieldy root, and brought his knees into figure at the cost of the destruction of his tools by the enveloped gravel, to discover stains of incipient rot, which render the intended knee mere lumber.

"As the larch, unlike the oak, affords few or no crooks naturally, excepting knees, the artificial formation of larch crooks is of the utmost consequence to the interest of the holders of larch plantations now growing. In order to obtain a good market for their straight timber, it is absolutely necessary to have a supply of crooks ready as soon as possible to work the straight up. This would increase the demand, and then enhance the price of the straight more than any one not belonging to the craft could believe. In good soil many of the crooks would be of sufficient size in 20 years to begin the supply, if properly thinned out. In a forest of larch, containing many thousand loads, and which had been untouched by any builder, we have seen the greatest difficulty in procuring crooks for one small brig. It is only on very steep ground, and where the tree has been a little upset after planting, that any good crooks are found. From the rather greater diameter required of larch timbers, and also from the nature of the fibre of the wood, we should suppose that steam-bending of larch timbers would scarcely be followed, even as a *dernier ressort*."

Felling. The larch is a remarkably easy tree to fell, from having no large boughs to interfere with the adjoining trees. The best season for performing the operation is winter, and the trunk may either be severed from the root, or otherwise, according to the object in view. If the ground among the remaining trees is to be kept as grass, root-felling is obviously to be preferred; as will generally be the case when the roots are of any value as fuel. In order to season the wood of the larch, as we have already seen, p. 2365, Mr. Monteath recommends barking the trees standing, and leaving them in that state for one, or even two, summers, before they are cut down. A number of larch trees on Dunnipace estate, in Stirlingshire, were barked by Mr. Monteath, and stood in the peeled state two summers, before they were cut up, and the wood made into paneled doors; which stood perfectly without warping or twisting. He has since frequently himself used, and seen used by others, the timber of larch trees, after having stood twelve months with the bark taken off, then cut down, and immediately cut up into battens for flooring; and also made into paneled doors and window frames, for the better sort of houses, with equal success. (*Forest Guide*, ed. 2., p. 240.) It has been remarked, that the roots of the larch, when left in the ground, decay much sooner than those of the Scotch pine; the former being liable to the attacks of an insect which does not prey upon the latter.

Accidents, &c. From the larch having only small branches, and from its leaves being deciduous, it is liable to few accidents, either from wind or snow. A fall of snow, the Duke of Athol observes, "will destroy in one night, and break and tear down, sometimes more than one third of a Scotch pine plantation, at all ages. High winds also destroy pines in numbers; but the

larch is never broken by snow; and very seldom torn up by winds, and then only in single trees." (*Gen. Rep.*, &c., vol. iv. p. 500.)

Diseases. The larch De Candolle considers as the alpine tree which is less liable to disease than any other. "There is," he says, "a peculiarity which all persons accustomed to observe these trees have been struck with; namely, that the trunks are remarkably healthy. They are, in particular, rarely attacked by the *Dermestes* (*Hylurgus*), which is so formidable to pines. Sometimes, but very seldom, we see a small caterpillar devouring the leaves, but no damage results from it. M. De Charpentier has even seen, in the Vallais, in July, 1820, all the trees, from the Valley of Conches to the bottom of that of Ferset, bereft of their leaves through the same cause; but none of these trees perished. Sometimes, also, we see the larches having a wound of resinous cancer; but this seems to proceed from some accidental cause, such as a blow or knock, which the tree may have received when it was in full sap. All these observations incline me to think that the cause of the diseases which attack the British larches," De Candolle continues, "must be sought for in some difference existing in the physical nature or in the culture of your trees and ours. The want of a sufficiently intense light, owing to the obliquity of the solar rays, and to the opacity of the atmosphere, and the over damp state of the latter, appear to me permanent causes which, in your climate, must predispose the larches to a state of watery plethora, which is probably the cause of the destruction remarked in the heart of the wood. This cause has little or no effect during the youth of the tree, because then its vegetation is vigorous; but it goes on increasing until the tree arrives at the age when, in all trees, vegetation begins to be feebler."

The Larch Blight (*Coccus lárícis*). This insect, according to Sang, was first observed by him on the larch, at Raith, in Fifeshire, about 1785; but did not appear to have done any great injury to the trees. The Duke of Athol saw it first on his trees in 1795, many of which, growing in low situations, it destroyed; which was also the case, the Duke of Portland informs us (*Quart. Journ. of Agri.*, vol. iv. p. 548.), in low damp situations in the neighbourhood of Wellbeck, in Nottinghamshire. The season at which it was most prevalent, the frosts were very severe, late in the spring, and the clouds of frost-fog, which rested on the larch on calm mornings, when the trees were just coming into leaf, were supposed by the duke to have "produced the blight." His Grace did not find trees above 25 ft. or 30 ft. in height affected by it; neither did it appear at all on the high grounds, where a slight breeze of air could shake the trees. (*Gen. Rep.*, iv. p. 500.) According to Mr. Webster (40 years gardener at Munches), the trees affected with this blight appear to have their foliage covered over with a whitish substance, which adheres to the fingers when touched, and consists of small globules. When the trees infested shed their leaves, they appear covered with blackish stains, both on the trunk and branches, and especially on the side most washed by the rains; and this blackness is so conspicuous, that Mr. Webster says he could always point out, in winter, the trees that had had their leaves infested the preceding summer. (See *Quar. Jour. Agri.*, vol. v. p. 536.) Pontey judiciously observes that the insect is always most abundant upon trees which have been previously in an unhealthy state; and that, in elevated situations, it is comparatively rare. Both he and Sang agree that the multiplication of the insect depends greatly on the languor or vigour of the tree; and, as these are much affected by the seasons, two or three fine summers and severe winters, in succession, generally so reduce the numbers of the insect, as to render the injuries it commits of no account. These insects appear to have been most abundant from 1802 to 1806; but have since gradually disappeared; and, from 1815 to 1837, have scarcely been noticed as injurious by planters. The coccus, however, is an insect which is found on various trees, indigenous and exotic; and, as it can never be wholly eradicated from the country, it may be expected to make occasional reappearances. In the Duke of Devonshire's plantations, made in 1816, at Low Plains, near Penrith, the roots of the larch, wherever it was

planted upon dry soil, were attacked by a small insect, resembling the wire-worm, from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. in length. From 10 to 20 worms, and sometimes more, have been observed at the root of one tree. (*Trans. Soc. Arts*, vol. xxxviii, p. 6.)

Fungi. The European larch, and also the Russian variety, when old, or when the trunk is beginning to decay, will produce the *Bolëtus lárícis*, which is called by some authors *Agáricus púngens*, and which is used in Russia, and some other parts of the north of Europe, as an emetic in intermittent fevers. It is also the agaric of the larch of the shops. The body of this fungus is saponaceous; and, Pallas informs us, is used by the women in some parts of Siberia to wash themselves and their linen. The Tungouses dye the hair of their reindeer with it and the roots of *Galium vèrum*, of a deep red colour. For other *Fungi* growing on the larch, see the general article on the *Fungi* of the *Abiétinæ*, p. 2146.

The Rot in Larch Wood is a disease which has hitherto baffled every attempt of physiologists and planters to ascertain its cause. It seems to have been first observed about the beginning of the present century, when some larch trees growing in fertile soils were cut down and sawn up for use. We are not aware of any record of the disease earlier than that given in our *Treatise on Country Residences*, published in 1806. In Sang's *Planter's Kalendar*, the first edition of which was published in 1812, several instances are given of the rot having appeared in Fifeshire, apparently from the trees having been planted in too rich a soil, and too warm a situation. Pontey does not notice the rot in larch, though he does that of timber trees in general; but Matthew treats of it at some length. In the *Gardener's Magazine*, the subject is discussed by Mr. Gorrie and Mr. Munro; and there are several articles on the subject in the *Quarterly Journal of Agriculture*; one of which, written in answer to certain questions put by the editor of that journal to Professor De Candolle of Geneva, we have already quoted from. From all these sources, and some other incidental ones, we are only able to give the following unsatisfactory account:—

The rot attacks trees at various ages, and in different soils and situations. There are instances, in Scotland, of larch trees of 8 or 10 years' growth having the interior of their stems tainted with the rot; but, in general, both in England and Scotland, it does not attack the trees till they are from 20 to 30 years of age. It generally commences at the root, and proceeds upwards, rotting the heart of the trunk; but, in some instances, it has been found to commence at the top of the tree, and proceed downwards. In a majority of cases, Matthew observes, the rot commences in the roots which have struck down deepest into the earth; especially those immediately under the trunk of the tree. Thence, the corruption proceeds upwards in the centre of the trunk; which, when much diseased, swells considerably for a few feet above the ground; evidently, Mr. Matthew observes, from the new layers of sap wood forming thicker there, to afford necessary space for the fluid to pass upwards and downwards; the matured wood, through which there is no circulation, approaching, at the lower part of the trunk, to within one or two annual layers of the bark. The disease can scarcely be detected by the external appearance of the tree; but, when it is cut down, the interior of the trunk is found brown and rotten to a greater or less extent; and, in trees which have been subject to the disease for some years, the centre is so entirely rotten as to have become hollow, like a pipe or wooden pump; and hence, as before observed, the name of pumping has been applied to this disease. Sections of trees, of different ages and sizes, affected in this manner, have been sent to us by Mr. Gorrie and Mr. Munro. (See *Gard. Mag.*, vol. ix. p. 551.; and vol. x. p. 554.) *Fig.* 2266. *a* shows a section of a larger-sized tree, in which the pumping has only just commenced, though the rot has extended itself so as to discolour the whole of the heart wood; and *fig.* 2266. *b* a section of a young tree in which pumping has begun early, and extended very considerably, in proportion to the diameter of the trunk. In some soils, the rot commences as

early as seven or eight years after planting, and in all it seems to proceed with the greatest rapidity; sometimes destroying the trees entirely, between 15 and 25 years old, on soils in which the oak prospers. (See p. 2376.) With regard to the cause of this



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disease, it is by most planters attributed to the soil and situation; and by some to improper management. The latter seems to be supposed to consist chiefly in improper pruning, that is, cutting off part of its roots in the process of planting, or depriving the tree of part of its branches in the early stages of its growth. The rot in the larch, Mr. Gorrie observes, "has been found to prevail on rich deep soils, and in poor shallow soils, on retentive and porous subsoils, on soils incumbent on freestone, limestone, and whin, or green, stone; and, also, on all these descriptions of soil and subsoil, the larch has been found tolerably free from this hidden disease. This being the case, we are led to suppose that the rot in larch takes its rise from something accidental, rather than from any natural property in the soil. It has been a common practice to follow a crop of Scotch pine with this more lofty and promising plant; and the writer of this has recently discovered, in numerous instances, that, where this has taken place, the rot uniformly commences in fearfully numerous instances. This effect is produced as soon as 7 or 8 years after planting; while plantations of the same plant, on the same estate, planted at the same period, and in every respect similarly circumstanced to the other, with the important exception that they did not follow the Scotch pine, continue entirely free from the rot. In old plantations, too, where the Scotch pine and larch had been mixed together, and where the disease was by no means prevalent, the new crop of larch was completely affected; giving room to infer that the rotting roots of the *Pinus sylvestris*, or Scotch pine form, at least, one powerful agent in promoting this disease." (*Gard. Mag.*, vol. vii. p. 574.) In the *Quart. Jour. of Agri.*, vol. v., Mr. Gorrie repeats the above observations, and adds: "In this opinion I am supported by my esteemed friend, Mr. James Young of Pitfour, whose sound judgment and practical skill place him high in the estimation of his professional brethren." Mr. Gorrie then gives some extracts from a communication by Mr. Young, from which it appears that Mr. Young, when thinning out a plantation of young larches, (which had been planted as nurseries to oaks, and had succeeded a crop of Scotch pines,) found the proportion of decaying plants about 6000 to 50; while larches in the neighbourhood, on similar soil, but not succeeding the Scotch pine, were found, when cut down at 60 years' growth, "to be of excellent quality, only one in six or eight showing slight symptoms of the disease." Mr. Young adds that he cannot bring himself to believe that there is anything deleterious in the soil naturally; but that he thinks it possible that the Scotch pine "roots, in the course of decay, after the trees have been cut down, may have communicated some poisonous quality to the soil, which promotes or originates this disease in the larch." Mr. Webster observes that the disease is most prevalent in plantations of the larch where the trees are planted so closely together as not to admit a free circulation of air. Mr. Munro thinks it probable that an extensive annual deposit of albumen, when the tree is young, is the cause of the rot. (*Gard. Mag.*, vol. ix. p. 555.); but Mr. Gorrie has shown (*Ibid.*, vol. x. p. 546.) that this is not likely to be the case. Mr. Matthew, finding the rot in trees which had been chilled in wet cold clays, and in others which had been starved in dry sand, and, again, in the most luxuriant-growing plants, in open situations,

branched to the ground, and growing in deep soil free from stagnating water, concludes that there must be "some constitutional tendency to corruption in the larch," which is excited by a combination of circumstances; and that we must limit our knowledge, for the present, to the fact that certain soils, perhaps slightly modified by other circumstances, produce sound, and others unsound, larch. According to Mr. Munro and a writer in the *Quarterly Journal of Agriculture*, the rot has even made its appearance in the mountain plantations of Dunkeld, in many situations, more especially in those which are moist.

Canker. It has been found, at Athol and Dunkeld, that, when larch is planted on soil that has borne crops of corn, it cankers; and this is the case, also, when it is planted in wet situations. Among the larch plantations formed since the commencement of the present century, Mr. Munro informs us, a malignant distemper has broken out, which resembles the canker in apple trees. "First a branch gives way; then a black liquid issues from the point of union with the trunk, the regular ascension of the sap seems to be impeded, and the albumen is disposed in rather large quantities on each side of the affected part, which gives the tree a very unsightly and gibbous appearance." (*Gard. Mag.*, vol. ix. p. 553.) Any attempt to cure this disease by external application, Mr. Munro holds to be ineffectual; but he thinks it may be prevented by using transplanted plants, and carefully planting them. This disease is not mentioned by any other writer, unless it be the blister mentioned by the editor of the *Quarterly Journal of Agriculture*, and in the editor's letter to Professor De Candolle (*Bibliothèque Universelle*, February, 1835, p. 115.), as "another disease incidental to the larch, which threatens to involve larch plantations in serious consequences." (*Quart. Journ. Agr.*, vol. v. p. 404.)

Culture and Management of the Larch on the Estates of Athol and Dunkeld. We have thought it better to give the mode of culture practised on these estates in a connected relation, than to separate it into fragments, and place it under the different heads already given; because the practices employed, and the results obtained, will in this manner be better understood, and more likely to lead to useful deductions by the reader. John Duke of Athol gave a short notice of his plantations to the Commissioners of Naval Revision in May, 1807, which was published in the *General Report of Scotland*, vol. iv. p. 498.; but by far the most complete account is that published in the *Highland Society's Transactions*, drawn up from papers and documents communicated by His Grace's trustees to the Highland Society of Scotland; from which we have already quoted the history of the Athol and Dunkeld plantations. The following abridged quotations will describe the mode of culture pursued, and the results obtained or anticipated.

It is observed by the editor of the *Quarterly Journal of Agriculture*, that the practical sagacity of the late Duke of Athol confirms in a most remarkable manner the theory of M. De Candolle, on the proper soil, situation, and culture of the larch. The duke began without much experience; but, in the course of practice, he found that "elevated situations were better for the larch than low ones; that declivities were better than flats; that 15 ft. or 16 ft. was the best distance at which larch plants could be planted asunder; and that they should be planted in autumn, in preference to spring." This, in short, may be considered the essence of the duke's experience. As introductory to the observations which are to follow, we cannot help noticing the great pleasure which the duke seems to have taken in his different plantations; some extracts from his memorandum-book reminding us of Evelyn's *Diary*, and of passages in the letters of the Earl of Fife, the greatest planter in Scotland in his time, published in the early volumes of the *Transactions of the Society of Arts*. For example: "Drove up to Loch Ordie, and home by the back of Craig-y-barns every way much gratified with the growth of the larch and the spruce; a very fine, grand, picturesque drive, not to be equalled in Britain! The extent of the drive through the woods of my own planting, from 1 to 40 years old, is

15 miles." And many other passages of a similar nature. The following is abridged from the *Highland Society's Transactions* :—

"The experience acquired during a period of more than half a century, in forming all kinds of plantations, suggested to the duke many improvements in the mode of planting trees in general, and particularly that of the larch, and the treatment of that wood during the progress of its growth. The result of that experience has introduced a simple, cheap, and efficacious mode of inserting larch plants into the ground. It has also determined the proper age of the plant at which it should be planted, so as it may acquire the greatest state of perfection at the earliest possible period. It has indicated the proper number of plants to be employed in planting an acre, both in low and high situations. It has proved, beyond dispute, the capability of the larch not only to vegetate, but to thrive luxuriantly, in elevations far beyond what were previously prescribed for its locality; and it has shown that larch timber may be judiciously employed in the construction of the largest class of vessels. The late duke carried on all his plans in planting systematically, which enabled him to detect any improvement on every new trial. Every new trial did, in fact, discover some improvement on the former, till the very last plantation which he executed gave him greater satisfaction in the work than all the preceding. Seeing the advantages of enclosing the ground before planting it, as practised by his father, in preserving the woods from the depredations of men and animals, he enclosed every piece of ground substantially with a high stone wall, dry built, for which there was abundance of excellent materials on the spot, before it was planted. Seeing, also, the disadvantages of allowing the wild shrubs to interfere with the growth of trees, he had them all previously removed by burning, pulling, and eradicating. These shrubs never grow to a troublesome height at an elevation exceeding 700 ft. above the level of the sea. At lower levels, most of them grow from 10 ft. to 12 ft. in height: the juniper pushes out strongly; and even the heath attains to the height of upwards of 2 ft. Feeling, too, the inconvenience of being shut out from viewing the interior of a plantation, he caused roads to be formed in every convenient direction through the grounds which were to be planted. These roads were not metaled, but they were made quite accessible to wheel-carriages, by the filling up of hollows, and the levelling of elevations; by making a ditch on each side of them, and sufficient openings across the hollows, to let off the superfluous water; and by running them across the face of acclivities, not only to avoid currents of water from the high grounds, but swampy places in the low grounds. Paths only of four or five feet in width were left in the highest parts of the ground, where wheel-carriages could not venture, but which were necessary as foot-paths for the inspection of the woods. These roads and paths were always formed before the ground was planted, as the lines of them could then be more easily traced on the ground. It was not found necessary to drain the acclivities of the mountains. Open cuts were formed in low swampy grounds, which were always planted with spruce instead of larch, as being a tree more suited to that particular state of the ground.

"*The Season of planting the Larch* commences as soon as the last year's shoots are entirely stripped of their leaves. In seedlings, this does not take place till the end of November or the beginning of December. About the 12th of April, the buds of the larch break forth rapidly into leaf. So that 65 days will embrace the longest period which can be allotted to the planting of the larch. With a planting instrument one man will plant from 800 to 1000 larches in a day; and, if 2000 plants are allowed to a Scotch acre, the cost per acre will be two days' wages of a man.

Age of the Plants, and Mode of Planting. "Finding great difficulty in collecting a sufficient number of 3 or 4 years transplanted larches, the age at which he had begun to plant, the duke resolved, previously to the planting of the large forest of 2409 acres, begun in 1800, on trying one or two years seedlings, or at the oldest one-year transplanted plants. After the large

shrubs were entirely removed, young and small plants seemed more desirable than large ones, especially as young ones could be inserted with greater facility into the ground, and at much less cost than old ones. The plant of making pits with the spade is always an expensive one; and the planting in pits can never be accomplished without the assistance of two people, one to hold the plant upright, and the other to shovel in the turf and the earth with the spade. The turf being thrown on its back into the bottom of the pit, to facilitate its rotting, it forms a serious obstacle to the expansion of the tender roots of the young plant. These pits, when made in the beginning of winter, get filled with rain water or melted snow; and, even should the plants be inserted into them when they are in a dry state, the water will afterwards run into the hollow around the plant. This hollow in the top of the pit is formed from the circumstance of the earth, which had been taken out of it at first being unable to fill it again. This is a property of mould well known to planters and labourers. The roots of the plants become chilled. Three or four years old transplanted plants may be so chilled in this manner, as to prevent their pushing out a shoot above 2 in. in length in one season for several years. The slit, on the other hand, formed by the planting instrument, resists all ingress of wetness or cold, the surface closing together as if it had never been cut; and the natural grassy covering protects the young plant from the severer effects of the frost. A one-year-old transplanted plant or a seedling, when inserted into a slit in the ground, takes immediate hold of the mould below, and grows onwards without molestation from the weather. This plant instrument consists of a flat piece of iron, shaped like the head of a flat spear or a mason's trowel, 10 in. in length, and 5 in. in breadth at the widest part. Its neck, which is of one piece with the blade, is 7 in. long, and passes through and is riveted to a cross handle of wood, that remains firm in the plane of the blade. The whole instrument is made stout, and of the best materials. It costs only 1s. 6d. In using this instrument, the planter holds it in one hand, and the plants in the other; and he makes a slit in the ground of the requisite depth for the plant to be inserted; then pushing the roots of the plant carefully into the slit, so that they shall not point upwards, he finishes the operation by treading with his heel the ground firm around the plant.

"*The Expense of Labour in planting* was greatly reduced by the use of this instrument. Pit-planting required 20 men to pit and plant an acre in a day; whereas two men will do the same work, in the same time, with the spear-planter. The three and four years old transplanted larch cost 10s. per 1000: the seedlings only cost 2s. 6d. per 1200. But, besides this direct saving of expense in employing the slit to the pit planting, there is the advantage of scarcely one plant going back by the former mode; whereas, by the latter, many go back, which are obliged to be filled up afterwards with fresh plants, creating an additional expense; and many that continued to grow assumed a sickly hue for some years after they were planted."

Here three tabular views are given, by which it appears that two-years-old transplanted plants, that had been chilled in winter-made pits with cold and wetness, and which were 1 ft. 2 in. high when planted, were, after being 6 years in the pits, only 3 ft. 7 in. high. The same-sized plants, planted in spring-made pits, were, at the end of 6 years, 6 ft. 10 in. high; and the same description of plants, planted by slit, were 11 ft. 2 in. high in the same period; being no less than 7 ft. 5 in. higher than those planted in the autumn-made pits, at more than treble the expense.

Soil and Situation. "It is an error to suppose that the larch will thrive in all soils and in all situations. There are many kinds of soils in which it will not thrive, and ought not to be planted. It has been found that, in soils which have been turned up by the plough, and which have borne corn crops, the larch cankers: it cankers in wet situations also." On this passage, Mr. Gorrie observes, that he has not found the larch, generally, to canker when planted on land that has borne crops. "In soils resting on a clayey subsoil,

it decays at the heart, after arriving at 40 years of age. In situations where water stands for a length of time about the roots, it becomes covered with lichens; but in all rocky situations, and particularly those which are composed of mica-slate containing crystals of garnets, among the fissures and fragments of which they can push down their roots, larches thrive to admiration. The geognostic character of the country from Dunkeld to Blair is primitive. At Blair is gneiss, at Dunkeld clay-slate, and the intermediate space is occupied by mica-slate. They lie conformably to one another.

"*The Advantages resulting from planting Mountain Ground* appear, at first sight, in the greater number of trees that may be supported on the acclivity of a mountain, than on a surface equal to its base. Trees derive nourishment from the soil immediately around the place in which they are fixed; and, as the superficies of that soil must, of course, be greater on an acclivity than on the base, a greater number of trees will be there supported. Practically speaking, 100 trees at 6 ft. apart can be planted on the hypotenuse of a right-angled triangle, whereas the base would only permit 80 at the same distance. Another and a great advantage derived from planting mountain ground is, that, on an acclivity, the trees expose a greater surface to the influence of the sun, air, and rain, than they can do on a level surface. The outside trees in a forest are always the strongest. On an acclivity they all possess the advantages of outside trees, and at the same time most of the shelter enjoyed by those in the interior."

Number of Plants annually planted. "From the great scarcity of arch plants at the commencement of the larch plantations at Athol, it was not possible to extend their cultivation beyond a very limited number or space in any one year. They were at first planted very little thicker on the ground, among other trees, than they would have been, had they been thinned out to stand for naval purposes. Generally, in mixed plantations, they were put in from 700 to 1000 plants per acre. In the first attempts at planting them entirely by themselves, they were increased only to 1500 plants per acre, from the want of plants. The keeping of the plants in the nursery grounds till they were 3 and 4 years transplanted from the seed-bed, tended greatly to decrease the disposable quantity of plants from such sources. Finding 1500 plants rather too few among broom and furze, they were increased to 1800 per acre. Even after one-year-old seedlings were planted, which practice immediately threw an immense number of plants into the market, they were only extended to 2000 per acre, on the higher and barer parts of the mountain range: 2000 per acre, the duke thinks may be considered by many thin planting, and up to the region of broom and furze, that number may have enough to do to contend with them; for, however these shrubs might have been subdued for a time, and, in many places, completely eradicated, yet, in more favourable situations, they would spring up again, were there not a sufficient number of trees to overtop and keep them down, by the exclusion of the pure atmospheric air. It must be observed, however, that were 3000 plants planted per acre, that would only bring the trees about half a foot closer to each other; whereas the lower branches of the 2000, having plenty of air, will meet one another when the plants are only eight years old from the seed, and they will then entirely prevent the growth of the shrubs. But, in the higher region, beyond the growth of the larger shrubs, 2000 plants per acre, the duke maintains, are not too few, when it is considered, in the first place, that this open planting delays greatly the period of thinning, and, of course, curtails expense, which is an object of consideration in large undertakings. In the next place, it is well known, that the lower branches of the larch assist more than any of the others to strengthen the roots, and increase the thickness of the base of the trunk of the tree. Strength of roots and a good girth give great stability to trees exposed to the fury of the elements in a mountainous country. The tops of the larch vibrate in the blast like the points of fishing-rods. By the time they are thinned, they will individually be able to withstand great blasts of wind with impunity. Besides, the lower

and larger branches being permitted to remain for a considerable time, they will, during that period, have deposited a large quantity of leaves for the nourishment of the ground below. The first thinning will be of such value as to compensate for the great labour of performing it, when it is thus long delayed; and it could not have been so long delayed, had the trees been planted thicker. The duke seems to be aware that the opinions of many planters, and many practical ones too, run counter to the practice of thin planting, as recommended by him; but it is questionable whether any of them has had the experience of rearing larch to the height of from 700 ft. to 1600 ft. above the sea. At that elevated region, it appears to the duke proper to follow the dictates of experience, rather than those of custom; and, though he may himself have, perhaps, at first adopted it from necessity, arising from a difficulty of obtaining plants, he continued it when that necessity no longer existed, because he had seen the good effects arising from it. Thin as 2000 plants may appear on an acre, they will only stand 5 ft. 3 in. apart."

The Process of the Thickening of the Soil by the Larch is one very important in its results; and we have already given it in p. 2373.

Comparative Effect of the Larch with other Trees in improving the Soil. "In oak copses, the value of the pasture is only 5s. or 6s. per acre for 8 years only in every 24 years, when the copse is cut down again. Under a Scotch pine plantation, the grass is not worth 6d. more per acre than it was before it was planted. Under beech and spruce it is worth less than it was before; but the spruce affords excellent shelter to cattle, either from the heat of summer or the cold of winter. Under ash, the value may be 2s. or 3s. per acre more than it was in its natural state; but under larch, where the ground was not worth 1s. per acre, the pasture is worth from 8s. to 10s. per acre, after the first 30 years, when all the thinnings have been completed, and the trees left for naval purposes, at the rate of about 400 to the acre, and 12 ft. apart."

Thinning. "The great object of the late duke seems to have been to raise larch timber on his property fit for naval purposes. With that view, he planted his trees, and thinned his plantations. No demand for wood for mere country purposes would have warranted him to plant so extensively as he did. He found that larches could grow to a great size at only 12 ft. apart; and this distance gives 380 trees to the Scotch acre, which is little more than one fifth part of the 2000 per acre originally planted. The first thinning should be a slight one, of about one fifth of the whole, by removing only those trees that are of least value, or worthless. After 24 years from the time of planting, the leaves fall off the lower branches, which are, of course, no longer useful to the soil below. From 20 to 30 years old, the thinning is carried on so extensively as to remove two thirds of those trees which were left standing by the first thinning. In thinning, it is necessary to observe that all the strongest and healthiest trees should be left, even if two or three of them should be closer together than 12 ft. These small clumps happening to light on a favourable situation, they will thrive well, as the air has access to each tree, around two thirds of its circumference. This thinning being delayed so long, the trees thinned out will be valuable for a variety of purposes. One of these purposes is the profitable use which may be made of the bark. The last thinning should be given when the trees are from 30 to 35 years old, which will leave from 380 to 400 trees per acre. The 380 will require a little pruning and trimming of the lower branches, in order to give head room to the cattle which are to browse on the grass below. The whole prunings and thinnings will cost about 5l., and their produce will fetch about 12l., leaving a profit on them of about 7l. an acre."

Planting the Scotch Pine along with the Larch. "The rapid growth of the young larch trees, even in exposed situations, is certainly matter of surprise. This property convinced the late duke of the inutility of providing nurses for them. His gardener, Alexander Macrostie, whose name as a planter the duke mentions with approbation, and who was at the head of all His Grace's plantations, thought proper, during the duke's absence, to fill up with Scotch

pine, as nurses to the larch, some part of the plantations which had been made about the year 1800, before the period of seedling plants being used. This, as the duke observes, was 'the dwarf nursing the giant.' In 1817, most of these Scotch pines had not attained a height exceeding 3 ft., while the larches, which they were intended to nurse, were from 15 ft. to 20 ft. high. In the lower part of the same plantation, where the Scotch pine had grown to 20 ft. in height, the larch exhibited a stature of from 30 ft. to 40 ft.; and, in the instance before referred to, in an elevated situation, at 900 ft. above the sea, where the Scotch pines were more than 42 years old, they were only 5 ft. and 6 ft. high; whilst the larch, in the same situation, and planted 10 years after them, had reached up from 40 ft. to 50 ft. in height. In 1816, the duke measured a larch, on a pinnacle of the highest ridge of the ground alluded to above, at only 9 years after planting, which was quite straight and vigorous, and stood 16 ft. high, and the nearest Scotch pine to it was only 2 ft. 6 in." On this passage, Mr. Gorrie remarks, that the Scotch pine should never be mixed with the larch in plantations, as it will produce rot.

Rate of Growth of the Larch. "Taking the average height, then, of an average larch of 8 years from the seed at 11 ft., it will be nearly accurate to allow 16 in. as the annual growth, till the tree is 50 years old; and after that, only 10 in. per annum, for 22 years longer, as the length of the tree lessens in growth as the bulk of the wood increases. These data give a larch tree of 72 years of age a height of 93 ft. 4 in.; a fair average, agreeing with actual experiment. The shoots of larches beyond 35 years of age are heavier, though they are not so long as those of younger trees. The larch, like the oak, puts forth two shoots every year, the one in spring, the other in autumn. The spring shoot has no lateral branches: the autumnal shoot pushes out like the spring one; but, at the time this process is going on, the spring one is throwing out lateral branches. These lateral branches are firm and woody. In regard to the growth of the girth, a larch tree, on an average, will acquire 1 in. in girth per annum, till it be 24 years old; and from that time, till it has acquired the age of 72 years, it will grow $1\frac{1}{4}$ in. in girth every year; thus,

In 24 years, it will be 2 ft. in girth, at 1 in. per annum.
48 — more 5 — $1\frac{1}{4}$ —
In 72 — it will be 7 ft.

The larch begins to make wood at 24 years of age.

At 50 years old, it will contain 26 cubic feet of wood.
60 — — 14 — more.
72 — — 20 — —

In all, 60 cubic feet of wood; or one load of 50 cubic feet, and 10 ft. more.

"These results correspond exactly with the quantities which the duke obtained at these respective ages. Larch appears to be on its greatest increase for timber from 57 to 72 years old. A larch containing 50 cubic ft., or one load of timber, is quite fit for naval purposes. At half that size it is suitable for every country purpose.

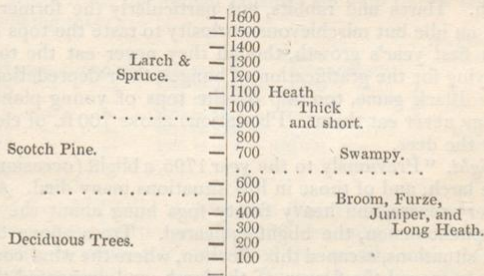
"A few Examples of the sizes of the timber which the duke felled may not prove uninteresting. In 1806, twenty larches, at the age of 64 years, were cut for centres to the bridge building at Dunkeld. These trees having been drawn up by close planting, they were from 105 ft. to 109 ft. in length; their girths were from 5 ft. to 5 ft. 4 in.; and they averaged from 80 to 90 cubic feet of timber. In 1810 and 1811, 600 trees were felled at Dunkeld and Blair, to send to Woolwich dockyard, the aggregate amount of which was 606 loads. The timber was much admired by the best judges. One of the logs contained 83 ft. of wood.

"The Larch will thrive better in a northern than in a southern Exposure, till it is about 30 years of age; but, after that period, there is no perceptible difference. This circumstance may be explained by the favourable effect of an equable temperature on the health of trees. The vicissitudes of frost and thaws must

produce a greater effect on the sunny side of mountains than on the opposite. The tallest larches do not always contain the greatest quantity of timber, as is instanced in the case of two trees which were felled on the 1st of June, 1829, aged 82 years. The one, which was only 97 ft. in length, yielded 138 cubic feet; while the other, which was 104 ft. in length, only gave 81 cubic feet.

“One of the greatest Advantages of planting Larch is derived from its peculiar property of thriving in very elevated situations. Immense extents of mountain ranges may thus be applied to useful purposes, which otherwise would have been quite unavailable. The Scotch pine thrives at an elevation below 900 ft.; but the larch ascends to 1600 ft. above the sea, and it may ascend higher. This is an important fact, in a national point of view. Much of the mountain land of Great Britain, which is at present worthless, may grow timber to supply her navy and merchant shipping, without at all interfering with the land which produces her cereal crops, or even her fine pasture land in a lower situation. But here the duke anticipates an objection which might be started by some, and that is, whether the larch will certainly become useful timber at these elevations. ‘An argument,’ says he, ‘may, indeed, arise, whether, all the upper part of the mountain being rugged, trees can grow in many parts to stand for timber, at 400 per acre. Reasoning from the experience of 43 years, which proves trees fully to that extent per acre to contain 10 or 15 cubic feet or more of wood already to exist, I am clearly of opinion that 400 trees may grow, within 70 years, to average one load of wood or more, at a height of from 1200 to 1600 ft. above the sea; and the researches which the larch makes with its roots among the crevices of the rocks and the shivered fragments are such, and the ground so found being virgin soil, that, along with the rains and mists imbibed by the tops, and invigorating the trunk, I am quite convinced they will have the effect to produce a load of timber, or more, within the period mentioned. Some of the trees, of the age of 57 years, cut in 1816, among rocks fully as rugged as those described, exceeded 60, and some 70, cubic feet of wood; and the 223 cut from similar situations averaged, at 57 years of age, 40 cubic feet of timber, laid down at Woolwich dockyard in 1817.’

“Mountain Planting may be very well illustrated by the following diagram; in which the space occupied by the larch is seen to exceed greatly in height the site of every other species of useful tree. It also occupies, in common with the other trees, the ground at the lowest level; so that its range of growth is extensive.



“These elevated regions are far above the range of the vegetation of the Scotch pine. This is a dull heavy-looking tree in large plantations: it cannot withstand a strong wind; and it decays, in Britain, after it has attained an age of from 70 to 80 years. The larch is quite the opposite in all these respects; and it will supply ship-timber at a great height above the region of oak. Besides the almost immeasurable extent of ground thus obtained, by means of the larch, for the growth of ship-timber, it is a more profitable tree in that respect than the oak. An English acre of larch, at 12 ft. apart, will give 302 trees per acre.

					Loads. ft.
100 larch trees, at 64 years old, would give 1 load per tree,					= 100 0
100	—	68	—	—	= 100 0
102	—	72	—	1	= 122 10
302 trees, at an average of 68 years old, would give					322 10

It is said that 3000 loads of timber are required to build a 74-gun ship. Ten acres, therefore, of larch would easily supply that quantity. Now, an English acre will only grow 40 oaks at 34 ft. apart, the distance required for their growth; and, allowing oak to yield a load of timber at 68 years of age, that would only yield 40 loads of timber per acre; or, in other words, it would require 75 English acres to supply the requisite quantity of oak to build a 74-gun ship.

Accidents and Diseases. "The larch, like other trees, is liable to accidents and diseases. Wind may drive them down by the roots, but it can very seldom break them, which shows the toughness of the wood. In November, 1826, a hurricane was very fatal to the Scotch fir, and it tore up many larches by the roots. The depredations committed by wild animals are sometimes considerable, such as those done by red deer, the roe, hares, rabbits, and even the black game. Fences of good stone walls will certainly form a powerful barrier against the inroads of all these creatures; but still they find an entrance into the woods by gateways, and such like openings, for the sake of shelter. The red deer but seldom leave their more herbaceous pasture about Blair; but the roe deer commit considerable depredations about Dunkeld, insomuch that war was obliged to be declared against them in 1816; and in that season, 170 were brought in dead; and others, dying from wounds, would swell the number of slain, that season, to upwards of 200. Before 1774, the roe deer were not known to exist nearer than 30 miles to Dunkeld; and then they were scarce any where; but, since they have received shelter and protection from the numerous young plantations, they have increased very fast in numbers. Their habits are peculiar: they always go in herds of odd numbers, from 3 to 9. The doe generally produces two at a birth, and can rear them easily: but one or both of the fawns are often destroyed by the foxes. The weight of a good buck with the skin, but without entrails, is 40 lb.; that of a doe from 32 lb. to 38 lb. The principal mischief committed by them is by the buck rubbing his horns between two trees, to get rid of the velvet which covers them. A dozen of trees may be seen at one view, of from 7 to 8 years of age, completely stripped round of their bark. Both the buck and the doe eat the tops of the young larch. Hares and rabbits, but particularly the former, appear to be seized with an idle but mischievous curiosity to taste the tops of a new plantation in its first year's growth, though they never eat the tops they nip off. Not destroying for the gratification of hunger, their depredations are the more extensive. Black game, too, nip off the tops of young plants for a year or two, but they never eat them. Plantations above 700 ft. of elevation are only annoyed by the deer.

Larch Blight. "Previously to the year 1795, a blight (occasioned by an insect) affected the larch, and of those in low situations many died. At that time the frost was very severe, and heavy frosty fogs hung about the trees in spring. After this phenomenon, the blight appeared. Trees above 30 ft. in height, and in high situations, escaped this affection, where the wind could shake them. This blight destroyed the flower of the larch, and prevented the formation of the seed, and consequently the propagation of the plant. The first appearance of the blight was indicated by a substance on the larch, resembling small balls, of a fine white matter like cotton. These balls, or nidi, enclosed small insects, a species of aphid, the two sexes of very different appearance. They appeared to live upon the juices exuding from the bark of the tree, and not upon the leaves; and they probably prevented the sap from ascending, at least no fresh shoots were thrown out by the tree that season. Many trees were much injured by this disease; and, for a long time afterwards, they presented a remarkable appearance, that of being completely covered over with lichens.

The trees, however, shot up clean stems 20 ft. to 25 ft. above the part covered with moss; and these stems were as healthy as those of the healthiest trees, that had never been affected. On cutting the wood, the covered part was no more injured in quality than the wood of the healthiest trees, though the lichen had adhered to them for 15 years. The effect of this blight, then, was only superficial. The existence of this disease for 8 or 10 years certainly retarded the growth of the trees; but it did not cause the duke to relax in the least in his efforts to form large larch forests: on the contrary, it impressed upon him the necessity of planting the high ridges of the mountains, in order that the trees might be placed beyond the influence of the disease, which did not appear higher than 600 ft. above the level of the sea.

"In *Felling large Trees of Larch*, care must be taken to use plenty of rope, and to take advantage of the direction of the wind. A windy day should be avoided. It was found that, in digging the Scotch pine out by the roots from among the larch, the ground was much shaken about the roots of the larch, so as to endanger their stability. Ever after, the pine was cut over by the ground.

"*The Seasoning of Larch Timber* is accelerated by stripping off the bark before felling. In May, 1815, the duke experimented on 50 trees of larch at Dunkeld, that were growing in a situation, among other wood, that was nearly inaccessible for want of a road or path to it. In 1816, they were cut down and used for several purposes, and they appeared to be completely seasoned. They contained 25 cubic feet of wood each. Larch trees that had been only 10 months cut down were built into a steam-boat on the river Thames; but they had not been seasoned enough, as the planks above water, near the deck, shrunk a little. In this case, however, the scantlings were made the same as of oak, which were of too slight dimensions for larch.

"*The probable future Supply of Larch Timber from the Woods of Athol* is thus calculated by the duke. The experiments performed on the value and durability of larch, as ship timber, were performed chiefly on the 1900 trees planted by Duke James, and which had attained a serviceable size during the time of the late duke. Of them only 800 or 900 were left as ornaments about the lawns and parks of Dunkeld and Blair. Unfortunately, a blank of 15 years took place in the planting of larch by Duke John. To compensate, as far as was in the power of the late duke, for this great deficiency in the regular supply of timber, he resolved, in 1817, not to cut any trees for ship-building till the year 1832; thus sacrificing his own personal emolument for the sake of the estate. The most of the trees planted by Duke John were too young for ship-building. After 1832, the annual cuttings for ship timber may be calculated at the following rates:—

	Loads.	The produce of Acres.
12 years cutting after 1832 to 1844 =	1,250 annually.	} 2000
10 — — — 1844 to 1854 =	8,000 — —	
8 — — — 1854 to 1862 =	18,000 — —	
8 — — — 1862 to 1870 =	30,000 — —	
16 — — — 1870 to 1886 =	52,000 — —	
18 — — — 1886 to 1904 =	120,000 — —	
72		3000

"*The Value of Larch Timber* may be seen from the prices which the duke received for it for various purposes. In 1806, the duke cut 20 larch trees of the age of 64 years, to make the centres of the middle arch, of 90 ft. span, of the bridge that was building across the Tay at Dunkeld. They were from 105 ft. to 109 ft. in length, and they contained from 80 to 90 cubic feet of timber each. After standing .or 3 years as centres, they were sold by public sale, at 2s. 8d. per cubic foot. In 1810, Messrs. Symes and Co., ship-builders in Leith, bought 11 trees, producing 1066 cubic feet, at 3s. per foot. In February, 1819, the duke sold to Messrs. Bolton and Watt, and laid down for them at Evan's Yard, London, 4176 cubic feet of larch, at 3s. 6d. per foot, for the building of steam-boats. Mr. Ainslie, ship-builder, Perth, bought 500 trees, yielding not less than 12 ft. each, at 1s. 6d. per foot; the buyer paying all expenses of cutting down and carrying away. The duke also supplied

larch for the building of 2 brigs at Perth; the one, the brig Larch, built by Mr. Brown, of 171 tons register; and another, of 240 tons, built by Mr. Ainslie.

"*The Value of Larch Wood, exclusive of the Value of the Pasture under it*, may be estimated in this manner:— Suppose the plantations are thinned out by 30 years to what they are to stand for ship timber, that is, to 400 trees per Scotch acre; suppose, after that period, the whole were cut down at the following respective ages, the value of the whole per acre, at the different periods, would be as follows:—

	£	s.	d.
400 Trees at 30 years old, at 2½ cubic feet each tree, = 1000 cubic feet, or 50 loads, at 1s. 6d. per foot profit, = per acre	75	0	0
400 Trees at 45½ years old, at 15 cubic feet each tree, = 6000 cubic feet, or 120 loads, at 1s. 6d. per foot profit, = per acre	450	0	0
400 Trees at 59 years old, at 40 cubic feet each tree, = 16,000 cubic feet, or 320 loads, at 2s. 6d. per foot profit, = per acre	2000	0	0
400 Trees at 72 years old, at 60 cubic feet each tree, = 24,000 cubic feet, or 480 loads, at 2s. 6d. per foot profit, = per acre	3000	0	0

"The average of these prices would be 1381l. 5s. per acre; so that 1000l. per acre is not too high a calculation of the value of the duke's larch plantations.

"*The comparatively superior Value of Larch to Oak per Acre* has already been alluded to, when the comparative quantities of timber per acre were made out, by a statement in favour of the larch. In comparison to Scotch pine, as a comparison of one kind of fir with another, the difference is still more striking. Fifty larch and 50 Scotch pine trees were cut out of the same plantation. The average contents of the fir were 8 cubic feet, at 1s. 3d. per foot, or 10s. per tree. The larch averaged 30 cubic feet each, and fetched 2s. 6d. per foot, or 3l. 15s. per tree. So that the larch was superior in contents 3½ times, and in value more than 7 times, to the Scotch pine.

"*The superior Value of the common Larch, when compared with the Russian Larch.* The duke, having heard of the valuable properties of the Russian larch, with some difficulty procured the seed of it from Archangel, reared the plants, and planted them out, in number about 200. They shot out about 8 days earlier than the common larch, but they did not attain to one third of its size in the same time; and, both in their appearance as trees, and their value as timber, they were found much inferior to the common larch.

"*The Uses to which the Larch Tree may be applied* are various and important. In one instance, the duke applied larches successfully as nurses to spruce firs, which were going back. The requisite shelter recovered the health of these valuable trees. The great thinnings of larch plantations, which take place from 20 to 30 years of their age, supply useful materials for various purposes. Posts and rails for fencing may be made either out of the tops or the trunks of young trees. While fir posts and rails last only about 5 years, and are wormeaten after that period, the larch posts stand for 20 years, and never get wormeaten. But the trunks of young trees are preferable for this purpose to the tops, as they have less sap wood. In 1807, the duke fenced a nursery ground with young larch trees cut up the middle, made into a railing 7 ft. high. In 3 years after, the sawn side assumed a leaden-grey colour, and in 1817 the whole railing was quite sound. The railing round the lawn at Dunkeld, made out of the tops of trees, was taken down in 1818, after it had stood for 10 years. Six inches only of the posts were decayed under ground, which being cut off, the rail was nailed up again. A rustic bridge was thrown over a high road and a ravine, as an easy access to the nursery ground, which remained, in 1817, quite sound.

"*Tanning.*" About the year 1800, the tanning properties of larch bark were tried by a tanner at Perth, by the duke's desire. It succeeded tolerably well; but the tanner complained that the bark had not half the strength of oak bark. The bark of old trees cut at Blair, the duke found quite unsaleable. The duke was not at all sanguine about the bark of the larch affording a valuable tan; but, in fact, though more encouraging markets had been found for it, it is questionable whether the loss arising from the deterioration in the quality

of the wood, by being cut full in the sap, did not counterbalance all the advantages derived in the shape of increased value of bark. Even in the case of young trees which were appropriated to posts and rails after having been peeled for their bark, great expense was incurred in paint, in order to preserve the rails after they were deprived of their bark, which is a great preservation to posts and rails. If any profit is to be derived from larch bark to the grower, it must be from the produce of that great thinning which takes place when the trees are from 20 to 30 years old. The making of a road, in June 1819, to carry off the wood from the top of Craig-y-Barns, gave the duke a favourable opportunity of trying the peeling of the bark from trees that were cut down at that season of the year when the sap was quite full in them. Some of the trees, that were 50 years old, peeled from end to end without difficulty, and each of them produced from 5 to 6 stones Dutch of bark. Thickly planted trees of 33 years of age, and 37 ft. in length, and 25 in. in girth, 3 ft. from the but end, were also peeled, and they each yielded about a Dutch stone of bark. At an age of 20 or 21, and height of 28 ft., they yielded only half a stone; but even this small quantity, calculated at the current price of larch bark, at 10*d.* per stone, gave 5*d.* a tree, a price greater than any Scotch pine near them was worth altogether, of the same age." At present, Mr. Gorrie informs us, larch bark does little more than cover the expense of peeling, drying, and carrying to market; and that it now sells at from 6*d.* to 8*d.* per stone.

"*Larch Tops* which had lain cut for 4 years, and were, of course, well worn, were found useful in filling drains where stones were at a distance; and they continued sound in them for many years.

"*Larch Timber* was used for axles to different kinds of mills, from 1793 to 1802; and up to 1817 they continued quite sound, though constantly in water.

"*For Buildings*, the larch is found equally desirable. In 1779, the duke built the shooting-box in Glentilt, called Forest Lodge, the floors and joists of which were made of larch. The wood was under 40 years old; and, as an experiment, some of the deals were cut up narrow, and others as broad as they could be wrought. In 1817, the narrow boards continued quite close together. After the bridge was thrown over the Tay at Dunkeld, the duke altered the course of the great northern road to Inverness, which caused him to build new porter's lodge, stables, and offices to Dunkeld-House, near the new line of road. The whole woodwork of these buildings was executed with larch. They were finished in 1812. In 1813, part of Athol House was burnt down, and the repairs of wood, consisting of joists, floors, doors, and windows, were all made of larch. This wood was so red in colour, that it looked like cedar. Several houses were also repaired in the town of Dunkeld with larch. At Dunkeld 271, and at Blair 170, larch trees had been used, by 1817, for building purposes.

"*The first Attempt to use the Larch for the Purposes of Navigation* was in the construction of fishing-cobles on the Tay, in 1777. Previously to that, they were made of Scotch pine; and they lasted only three years, when they had to undergo a thorough repair. In fifteen years more, ferry-boats were constructed of larch, instead of oak, for the conveyance of passengers across the different ferries on the numerous rivers on the property. The oars, too, in the course of time, were made of larch, and they were found to be excellent in lightness, toughness, and elasticity. In 1809, 8491 cubic feet of larch timber were sent to Woolwich dockyard, the greatest part of which was employed in the repair of the Serapis store-ship in 1810; and the state of its soundness was favourably reported on in 1817. One beam of it was put into the large frigate *Sybelle*, in 1816, after it had lain six years in the dockyard.

"The next trial of larch in ship-building was in the *Sir Simon Clerk* merchant vessel, of 375 tons register, built by Messrs. Symes and Co. of Leith, in 1810; but, as that vessel was soon afterwards taken by the Americans, no account could be got regarding the durability of the timber.

Knee Timber for Larch Roots. "In order to dress the ground, and lay it

down properly to grass, upon which the sixty large trees sent to Woolwich had grown, the duke caused the large roots to be extracted out of it. After they were out of the earth, the duke was struck with their apparent capability of being cut up into knees for ships; and he immediately entreated the Navy Board to try them for that purpose, but the proposal was declined. Thus rejected, the fate of some of these roots, in the shape of knees, was curious, and is thus described by the duke:—‘ In 1811, an American vessel, the *Frances* of Baltimore, of 160 tons register, a brig, sustained very considerable damage on her voyage to Leith, and came in nearly a wreck. Messrs. Symes and Co., who repaired her, put into her some of these larch knees offered to the Navy Board. The captain of the vessel said he never saw any wood of so fine a quality, and so applicable for knees; and he was extremely urgent to know what kind of wood it was, and if he could get any more of it: but they had no more to give him.

“ *The Larch has been tried in a small Way as Masts.* Three sloops at Perth were fitted up with them; but, as they all soon left the Tay, its value as such could not be ascertained.

“ *The great and important Trial of the Larch, as a valuable Tree for naval Timber,* was made from 1816 to 1820, in the building of His Majesty’s frigate the *Athol*. Her keel, masts, and yards were made wholly of larch. She was launched on the 21st of November, 1820. Her dimensions are as follows:—Length of deck, 113 ft. 8 in.; keel for tonnage, 94 ft. 3 $\frac{3}{4}$ in.; extreme breadth, 31 ft. 6 in.; moulded, 31 ft.; depth of hold, 8 ft. 6 in.; admeasurement, 499 $\frac{1}{4}$ tons. She carries 20 guns of 32 lb., 6 guns of 18 lb., and 2 guns of 6 lb.; in all, 28 guns. Her main, fore, and mizen masts, with their topmasts and topgallant-masts, and their respective yards, bowsprit, sprits, and tops, tit-booms, and speding-booms, were all of larch. She drew of water, afore, 8 ft. 11 in.; and abaft, 11 ft. 3 in. When launched, her weight was 267 tons. Many minute inspections took place at different times, by competent judges, of the state of the larch in the *Athol*, and all are very laudatory of its qualities as ship timber. The following important particulars regarding the larch in general were related by Mr. Symes of Leith, after he had inspected the *Athol* in Leith Roads, in July, 1824. The larch becomes harder and more durable by age in a ship. It holds iron as firmly as oak; but, unlike oak, it does not corrode iron. Iron bolts may be driven out afterwards perfectly clean. It does not shrink: the *Athol* had been caulked but once in four years. It possesses the valuable property of resisting damp, inasmuch as the pump-well was as dry as the cabin. This is a very important fact, as regards the durability of the ship, and the health and comfort of the crew. The beams and knees in the gun-deck were as well finished as the best joiner’s work, and they had no appearance of shrinking or straining. The *Larch*, a brig, the *Diana*, a steam-vessel, and other ships, were afterwards built of the larch, and all with favourable results.

Incombustibility of Larch Wood, and its Property of not splintering. “ Among the properties of larch which may be considered as valuable in respect of ship-building, is the one of its being slow of kindling by fire. Though hot embers be thrown on a floor of larch, it will not get suddenly up into a blaze, like other kinds of fir. It is admirably adapted to be formed into wooden steps for guard-ships or quays, the edges of them not breaking or splintering like other fir wood. The property of its not splintering makes it a valuable wood for the upper works of men-of-war. The splinters made by cannon-shot are often more hurtful to the seamen in action than the shot themselves. A shot-hole through larch closes and does not splinter. Larch treenails were allowed by Sir Robert Seppings to drive remarkably well.

“ *The Products arising from the chemical Treatment of Larch Wood* may be useful to the arts. The following results were obtained by chemical experiments made by Mr. Brown of Old Brompton, on the 19th of March, 1828. A piece of larch wood of 6 lb. weight was placed in a retort, which was heated

to a red heat, and $31\frac{1}{2}$ cubic feet of olefiant gas came over. This gas was not fit for the purposes of illumination. Of crude pyrolignous acid, there was $1\frac{1}{2}$ pint. Half a gill of tar, of superior quality to that made from coal, and 1 lb. 9 oz. of charcoal were the rest of the ingredients obtained. The pyrolignous acid, in the crude state, is sold in large quantities at 7d. per gallon. It may be obtained from the loppings of the larch trees. Charcoal, in large quantities, varies in price from 1s. 7d. to 1s. 8d. per bushel. Pieces of wood 29 in. in length, and 4 in. in diameter, could easily be converted into charcoal, for which there is a demand in this country to the value of 10,000l. yearly."

Some examples are next given of the *elasticity, durability, strength, and resilience* of larch timber; but, as they are at great length, and illustrated by minute tabular details, and as the general results have been given in a preceding part of this article, we omit them, and refer the reader to the original paper in the *Highland Society's Transactions*, vol. xi. p. 165. to 219.

Statistics. Near London. At Syon, it is 79 ft. high, the diameter of the trunk 2 ft. 8 in., and of the head 42 ft.; at Gunnersbury Park, 33 years planted, it is 60 ft. high.—South of London. In Devonshire, at Grilston, 21 years planted, it is 51 ft. high; at Killerton, it is 73 ft. high, the diameter of the trunk 3 ft., and of the head 34 ft.; at Bystock Park, 21 years planted, it is 50 ft. high; at Endsleigh Cottage, 22 years planted, it is 80 ft. high. In Dorsetshire, at Melbury Park, 55 years planted, it is 60 ft. high. In Hampshire, at Strathfieldsaye, it is 130 ft. high, the diameter of the trunk 3 ft. 6 in.; at Alresford, 41 years planted, it is 72 ft. high; at Testwood, 70 years planted, it is 80 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 30 ft. In Somersetshire, at Leigh, it is 90 ft. high, the diameter of the trunk 2 ft. In Surrey, at Bagshot Park, 22 years planted, it is 40 ft. high. In Sussex, at Cowdrey, it is 55 ft. high, with a trunk 4 ft. in diameter; at Slaughtam Park, 9 years planted, it is 24 ft. high. In Wiltshire, at Longford Castle, 5 years planted, it is 20 ft. high.—North of London. In Bedfordshire, at Flitwick House, it is 75 ft. high, with a trunk 2 ft. 6 in. in diameter. In Berkshire, at Bear Wood, 14 years planted, it is 30 ft. high. In Denbighshire, at Llanbede Hall, 45 years planted, it is 53 ft. high. In Durham, at Southend, 18 years planted, it is 45 ft. high. In Essex, at Audley End, 36 years planted, it is 60 ft. high. In Herefordshire, at Hafield, 15 years planted, it is 45 ft. high. In Hertfordshire, at Aldenham Abbey, 34 years planted, it is 75 ft. high, the diameter of the trunk 2 ft., and of the head 30 ft.; at Cheshunt, 13 years planted, it is 50 ft. high. In Leicestershire, at Donnington Park, 60 years planted, it is 86 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 43 ft.; at Belvoir Castle, 14 years planted, it is 40 ft. high. In Monmouthshire, at Tredegar, 55 years planted, it is 60 ft. high, the diameter of the trunk 4 ft., and of the head 66 ft.; at Dowlais House, 10 years planted, it is 16 ft. high. In Nottinghamshire, at Clumber Park, it is 78 ft. high, with a trunk 3 ft. 3 in. in diameter; at Worksop Manor, 120 years old, it is 95 ft. high, the diameter of the trunk 3 ft., and of the head 101 ft. In Northamptonshire, at Wakefield Lodge, 14 years planted, it is 32 ft. high. In Northumberland, at Hartburn, 83 years planted, it is 89 ft. high, the diameter of the trunk 4 ft., and of the head 47 ft. In Pembrokeshire, at Stackpole Court, 30 years planted, it is 40 ft. high. In Shropshire, at Hardwick Grange, 10 years planted, it is 39 ft. high; at Willey Park, 18 years planted, it is 49 ft. high; and 9 years planted, it is 45 ft. high. In Staffordshire, at Trentham, it is 100 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 32 ft. In Suffolk, in the Bury Botanic Garden, 10 years planted, it is 26 ft. high; at Finborough Hall, 14 years planted, it is 50 ft. high. In Worcestershire, at Hagley, are several with trunks 4 ft. in diameter; at Hadzor House, 10 years planted, it is 26 ft. high; at Croome, 50 years planted, it is 95 ft. high. In Yorkshire, at Hackness, 20 years planted, it is 42 ft. high; at Grimstone, 13 years planted, it is 56 ft. high; at Studley, 112 ft. high, diameter of the trunk 4 ft., and of the head 60 ft.—In Scotland, in the Experimental Garden, Edinburgh, 10 years planted, it is 19 ft. high; at Craigmound House, it is 70 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 50 ft.; at Hope-toun House, it is 75 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 48 ft. In Ayrshire, at Doonholm, 70 years old, it is 85 ft. high; at Doonside, 60 years old, it is 80 ft. high, with a trunk 3 ft. 6 in. in diameter. In Roxburghshire, at Minto, 100 years old, it is 90 ft. high, with a trunk 4 ft. in diameter. In Banffshire, at Cullen House, 90 years old, it is 85 ft. high. In Perthshire, at Geneagles, many pine trees from 80 ft. to upwards of 90 ft. high; at Taymouth, 70 years old, it is 96 ft. high, the diameter of the trunk 4 ft. 8 in.; and another is 120 ft. high. In Ross-shire, at Brahan Castle, it is 80 ft. high. In Sutherlandshire, at Dunrobin Castle, it is 86 ft. high. In Stirlingshire, at Blair Drummond, 100 years old, it is 105 ft. high; at Airthrey Castle, it is 100 ft. high; and at Tullibody, 85 ft. high.—In Ireland, in Tyrone, at Baron's Court, it is 94 ft. high.—In France, at Nantes, in the nursery of M. Nerrières, 40 years planted, it is 50 ft. high.—In Saxony, at Wörlitz, 60 years old, it is 80 ft. high.—In Austria, at Brück on the Leytha, 50 years old, it is 70 ft. high.

Commercial Statistics. Price of seeds, in London, 3s. per lb.: of one year's seedling plants, 1s. 6d. per thousand; of two years' seedlings, 2s. 6d. per thousand: transplanted plants, from 1 ft. to 2 ft. high, 10s. per thousand; from 2 ft. to 3 ft. high, 25s. per thousand: plants raised from Tyrolese or Vallais seeds, one year transplanted, 5s. per hundred. At Bollwyller, two years' seedlings, 2 ft. high, are 10 francs per hundred. At New York, plants are 50 cents each.

‡ 2. L. AMERICANA Michx. The American Larch.

Identification. Michx. N. Amer. Syl., 3. p. 213.

Synonymes. Pinus laricina Du Roi Harbk., ed. Pott., 2. p. 117.; *P. microcarpa* Willd. Baum., p. 275., Lamb. Pin., ed. 2., t. 50.; *A'bies microcarpa* Poir.; Hackmatack, Amer.; Tamarack by the Dutch in New Jersey; E'pinette rouge in Canada.

Engravings. Michx. N. Amer. Syl., 3. t. 153.; Lamb. Pin., ed. 2., t. 50.; and the plate of this tree in our last Volume.

Spec. Char., &c. Leaves short. Cones small, ovate-roundish, with few scales. (*Michaux.*) Leaves from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long. Cones from $\frac{1}{2}$ in. to $\frac{3}{4}$ in. long, and from $\frac{3}{8}$ in. to $\frac{1}{2}$ in. broad. A tree, with a slender trunk, and attaining, in America, as great a height as the European larch does in Europe. Introduced in 1739, and flowering in May. None of the varieties of this species can be at all compared with the European larch, in point of utility, or even ornament.

Varieties.

† *L. a. l. rubra*; *L. microcarpa* Laws. *Man.*, p. 388.; *Pinus microcarpa* Pursh *Fl. Amer.*, Sept., p. 645., *Lodd. Cat.*; *E'pinette rouge*, Canada. The small red-coned American Larch. — The following characters of this variety are given in Lawson's *Manual*: — "Tree, medium-sized, upright, of a slender, conical, or pyramidal habit of growth, but not so much so as in *L. a. pëndula*. Branches horizontal, or slightly pendulous, except the upper, which are rather aspiring; branchlets also pendulous, and, together with the branches, more numerous and dense than those of *L. a. pëndula*. Bark smoothish, of a brownish grey, and light brown on the young twigs. Leaves of a vivid grassy green, and shorter and narrower than those of *L. europæ'a*. Catkins very similar to those of the *L. a. pëndula*; but the bractæ of the female or young cones are of a more regular oval shape. Ripe cones about $\frac{1}{2}$ in. in length, easily detached from the branches, of an oblong shape; scales also somewhat oblong or oval, light brown, slightly incurved, and rougher, or more distinctly striated, than those of the black larch. Seeds also shorter, or more rounded, and, together with the alæ, of a lighter brown." A native of North America. Introduced in 1760, and flowering in April. (*Laws. Man.*, p. 388.) There are trees of this variety in the Duke of Athol's plantations, which, in 1820, were 50 years old, and did not contain a third part of the timber of the common larch of the same age. The wood, however, is so ponderous, that it will scarcely swim in water.

† *L. a. 2 pëndula*; *L. pëndula* Laws. *Man.*, p. 387.; *Pinus pëndula* Ait. *Hort. Kew.*, ed. 1., iii. p. 369., Pursh *Fl. Amer.* Sept., ii. p. 645., Willd. *Baumz.*, p. 215., Lamb. Pin., ed. 2., t. 49.; *P. intermedia* Du Roi *Harb.*, ii. p. 115., Wang. *Beit.*, p. 42., *Lodd. Cat.*, ed. 1836; *P. Lærix nigra* Marsh. *Arb. Amer.*, p. 203.; *A'bies pëndula* Poir. *Dict.*, p. 514., N. Du Ham., v. p. 288.; Tamarack, Amer. The black pendulous-branched American Larch. — According to Lawson, this is a "tree of medium size, slender, and generally bending towards the top. Branches verticillate, few, remote, and pendulous; branchlets also thin, and more pendulous than the branches. Bark smooth, and very dark-coloured; that on the youngest twigs of a dark purplish colour, inclining to grey. Leaves like those of the common larch in shape, but rather longer, darker in colour, and arising from shorter and much darker-coloured buds or sheaths. Male and female catkins small and short; the latter generally tinged with reddish purple. Cones, when ripe, easily detached from the branches, generally under $\frac{3}{4}$ in. in length; scales round, or slightly approaching to an oval shape, smoothish, of a dark brown colour, few, loose, and slightly incurved on the margins; bractæ much shorter than the scales, of a somewhat lyrate shape; waved on the margins, and tipped with a short, soft, acute point. Seed considerably smaller than that of *L. europæ'a*, and of an oblong shape; alæ, or wings, of a brownish-purple colour. Native of North America. Introduced into Britain in 1739. The *L. a. pëndula* grows only in the colder parts of North America, being entirely confined to the northward of 40° of latitude; and is found in greatest abundance in mountainous parts, on rather moist and inferior soils. The timber of *L. a. pëndula* is of a darkish brown colour, waved, very tough, durable, and, where it is plentiful, preferred, for general pur-

poses, to any of the American pines or firs which grow in the same parts." (*Laws. Manual*, p. 388.) Mr. Blair, when in Canada, was informed that the wood of this tree is preferred to maple, hickory, or beech, as fuel for the steam-boats on the St. Lawrence. (*Blair in Gard. Mag.*, vol. viii. p. 488.) In Mr. M'Nab's article on the local distribution of different species of trees in the native forests of America, published in the *Quarterly Journal of Agriculture*, he states that on a flattened, low, moist meadow, on this line of road, was an extensive forest of the tamarack, or black American larch, which he calls *Larix pëndula*, tall straggling trees, with stems not exceeding 1 ft. 8 in. in circumference. "Through the tract of country which we have passed," he adds, "this tree was by no means plentiful, having only seen four masses of them, and these very distant from each other: all were in similar situations." (*Quart. Journ. of Agr.*, vol. v. p. 601.)

† *L. a. 3 prolifera*; *L. prolifera Malcolm*. *The proliferous-branched Larch*.—In this variety, the axis of the cones is prolonged in the form of a shoot; a kind of monstrosity which is found in all the varieties of *L. americana*, and also occasionally, as Richard has shown, in some species of *Abies* and *Picea*. The plant in the Horticultural Society's Garden, after being 12 years planted, is 15 ft. high.

Description, &c. Michaux describes the American larch as a tall slender tree, with a trunk 80 ft. or 100 ft. high, and only 2 ft. or 3 ft. in diameter. Its numerous branches, except near the summit, are horizontal or declining. The bark is smooth and shining on the trunk and larger branches, but rugged on the smaller branches. The leaves are flexible, and shorter than those of the European species. The cones are small and erect; green in spring, and generally brown when ripe, but sometimes they are found of a violet colour. The wood, Michaux says, is equal to that of the European larch, being exceedingly strong, and singularly durable. The American larch is most abundant in Vermont, New Hampshire, and the district of Maine; but, though the soil is well adapted to its growth, it does not form the hundredth part of the *Abiëtinae* in these latitudes. According to the elder Michaux's observations, in his journey to Hudson's Bay, it is only beyond the St. Lawrence, particularly near Lake St. John, and the Great and the Little Lake Mistassin, that it begins to abound, and to form masses of wood, some of which are several miles in extent. It is abundant in Newfoundland, in nearly the same latitude. New Jersey, Pennsylvania, and the coldest and gloomiest exposures in the mountainous tracts of Virginia, are the limits of its appearance towards the south; but it is rare in these states: and, in Lower Jersey and the vicinity of New York, it is seen only in the swamps of white cedar (*Cuprëssus thuyoides*), with which it is scantily mingled. According to Pursh, the two forms of this species, though united in one by Michaux, are specifically and constantly different. He never saw them both growing in the same place, or even near one another. *L. a. pëndula* was introduced by Peter Collinson, in 1739; and the original tree planted by him at Peckham was afterwards removed to Mill Hill; where it was cut down, says Sir James Edward Smith, "about the year 1800, to make a rail, by its sapient possessor. The abundance of seeds," he adds, "which it annually produced might have been a far more lasting source of profit, as few exotic trees are more worthy of cultivation. It was from this tree that Solander first described *L. a. pëndula* as a distinct species, *L. a. rùbra* not having been introduced till 1760. The original tree of this latter variety was planted by John Duke of Argyll at Whitton, where Sir James Edward Smith and Mr. Lambert saw it early in the present century, and where we examined it on the 21st of July, 1837, and found it between 40 ft. and 50 ft. high. The wood, in America, and especially in Canada, according to Michaux, is considered among the most valuable timber, and has no fault except its weight. In the district of Maine, it is more esteemed than any other resinous wood,

for the knees of vessels; and Michaux thinks that it would be much more employed in America than it is, if it were not comparatively rare there. In Britain, it can only be considered as a curious or ornamental tree. Seeds are sometimes ripened in this country, and are also sometimes imported; in consequence of which, both varieties are not uncommon in the nurseries.

Statistics. *Larix americana rubra.* In the environs of London. At Syon, it is 67 ft. high, the diameter of the trunk 1 ft. 3 in., and of the head 35 ft. This tree is figured in our last Volume. — South of London. In Surrey, at Farnham Castle, 35 years planted, it is 20 ft. high, the diameter of the trunk 1 ft. 8 in.; at Bagshot Park, 16 years planted, it is 25 ft. high; at Claremont, it is 70 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 40 ft. In the Isle of Jersey, in Saunders's Nursery, 10 years planted, it is 24 ft. high. — North of London. In Bedfordshire, at Southill, it is 65 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 65 ft. In Warwickshire, at Combe Abbey, 60 years planted, it is 84 ft. high, diameter of the trunk 3 ft., and of the head 42 ft. In Worcestershire, at Croome, 40 years planted, it is 90 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 20 ft. — In Scotland, in the environs of Edinburgh, at Dalhousie Castle, 15 years planted, it is 19 ft. high. — In Ireland, in the Glasnevin Botanic Garden, 20 years old, it is 16 ft. high. At Cypress Grove, near Dublin, it is 40 ft. high. In King's County, at Charleville Forest, 45 years planted, it is 94 ft. high.

Larix americana pendula. In England. In Berkshire, at White Knights, 34 years planted, it is 48 ft. high. In Staffordshire, at Trentham, 26 years planted, it is 40 ft. high, the diameter of the trunk 1 ft. 4 in., and of the head 25 ft. In Worcester, at Croome, 35 years planted, it is 40 ft. high. — In Scotland, in the Experimental Garden, Edinburgh, 6 years planted, it is 12 ft. high. — In Ireland. At Terenure, near Dublin, 15 years planted, it is 10 ft. high. In Louth, at Oriel Temple, 55 years planted, it is 52 ft. high.

Commercial Statistics. Price of seeds, in London, 2s. 6d. per oz.; of plants, 10s. per 100. At Bollwyller, plants are 2 francs each; and at New York, 75 cents.

GENUS V.



CE'DRUS Barrel. THE CEDAR. *Lin. Syst.* Monœ'cia Monadélphia.

Identification. Barrelier Plantæ per Galliam, &c., observatæ, &c., 1c., 499.
Synonymes. Pinus *Lin.*, in part; *A'bies Poir.*, in part; *Larix Tourn.*, in part; Cèdre, *Fr.*; Ceder, *Ger.*

Derivation. Some suppose the word Cedrus to be derived from *Cedron*, a brook in Judea, on the banks of which the cedar of Lebanon was once plentiful: others (see *M. Théis Gloss. Bot.*, p. 366.), from *kaig*, 1 burn; or from the wood of some of the kinds of cedar being burned as incense: and others, from the Arabic *kedroum*, or *kedre*, power. (See *Gottius Lexicon Arab.*, col. 1861.)

Description. Majestic evergreen trees; natives of Asia and Africa, with large spreading branches. Extremely ornamental, and one species producing excellent timber.

† 1. C. LIBA'NI Barr. The Cedar of Lebanon.

Identification. Barrel. *lc.*, 499; *Edw. Ornith.*, t. 188; *Lawson's Manual*, p. 380; *Bon Jardinier*, ed. 1837, p. 981.

Synonymes. Pinus Cedrus *Lin. Sp. Pl.*, 1420, *Syst.*, ed. Reich., 4. p. 174., *Smith in Rees's Cyclo. Hunt. Evel. Syl.*, p. 311., *Ait. Hort. Kew.*, 3. p. 369., *Vilm. Sp. Pl.*, 5. p. 345., *Willd. Berl. Baumz.*, p. 214.; *P. foliis fasciculatis*, &c., *Du Roi Harbk.*, ed. Pott., 2. p. 120.; *Larix Cedrus Mill. Dict.*, No. 3.; *Larix orientalis Tourn. Ins.*, p. 586., *Du Ham. Arb.*, 1. p. 332.; *Cedrus magna Dod. Pempt.*, 867.; *C. conferta Bauh. Pin.*, p. 490., *Rait Hist.*, p. 1404.; *C. phoenicea Rencalm. Sp.*, p. 47.; *Cedrus Bell. It.*, p. 162., *Cam. Eptl.*, p. 57.; *A'bies Cedrus Poir. Dict. Encyc.*, 6. p. 510., *N. Du Ham.*, 5. p. 287., *Lindl. in Penn. Cyc. Engravings.* *Du Ham. Arb.*, 1. t. 132.; *Trew Ehret.*, t. 1. 4. 28. 60, and 61.; *Nov. Act. A. N. C.*, 3. App., t. 13. f. 1. 7. 11, 12., and 14.; *Barrel. lc.*, t. 499.; *Edw. Ornith.*, t. 188.; *Lamb. Pin.*, ed. 2., t. 51.; *our fig.* 2267.; and the plates of this tree in our last Volume.

Spec. Char., &c. Leaves tufted, perennial. Cones ovate, abrupt; their scales close-pressed. Crest of the anthers ovate, flat, erect. (*Smith.*) Cones ovate, from 3 in. to 5 in. long, and from 2 in. to 2½ in. broad. Seeds of an irregular triangular form; nearly ½ in. long, with a very broad membranaceous wing. Cotyledons 6. A tree, a native of Syria, on Mount Lebanon; and of the north of Africa, on Mount Atlas. Introduced before 1683.

Varieties.

† *C. L. 2 foliis argenteis* has the leaves of a silvery hue both above and below. There are very large trees of this variety at Whitton and Pain's Hill, and a dwarf bushy one, remarkable for its silvery aspect, at the Countess of Shaftesbury's villa (formerly the residence of

Thomson the poet), on the banks of the Thames at Richmond, of which there is a portrait in our last Volume. It is singular that the nurserymen have never taken the trouble to raise plants from the seeds, or from scions, of this very beautiful variety.

- ‡ *C. L. 3 nana* is a very dwarf variety, of which we have only seen one plant at Hendon Rectory, Middlesex, which, 10 or 12 years old, is only from 2 ft. to 3 ft. high, making shoots from 2 in. to 3 in. in a year.

Other Varieties. At Pepper Harrow, in Surrey, the seat of Lord Viscount Middleton, there are a great many cedar trees, some of which are quite fastigate in their habit of growth, resembling immense cypresses; while others have the branches depressed at their insertion in the trunk, and their extremities pendulous like those of the hemlock spruce. Some are dwarf and bushy, and others very tall, with comparatively few branches; the leaves of some are dark green, while those of others are quite glaucous. The cones are of very different sizes. These variations arise, no doubt, simply from the tendency of the cedar to sport when raised from seed; as similar variations are always found, more or less, wherever the cedar has been planted in considerable quantities. In the Garden Lemonnier, at Versailles, is a cedar about 20 ft. high, with a trunk 2 ft. in circumference at the base. It is apparently very old, and has a knotty stunted appearance, like the gnarled branches of an aged oak. It has never produced seeds (*Ann. d'Hort.*, xvi. p. 337), and is most probably only a variation.

Description. A widely spreading tree, generally from 50 ft. to 80 ft. high; and, when standing singly, covering a space with its branches, the diameter of which is often much greater than its height. The leading shoot, in young trees, generally inclines to one side, but it becomes erect, as the tree increases in height. It is covered with a brownish bark, which becomes cracked as the tree advances in age. The horizontal branches, or limbs, when the tree is exposed on every side, are very large in proportion to the trunk: they are disposed in distinct layers, or stages, and the distance to which they extend diminishes as they approach the top; thus forming a pyramidal head, broad in proportion to its height. The extremities of the lower branches, in such trees, generally rest on the ground, bent down by their own weight; but they do not root into it.

The summit, in young trees, is spiry; but in old trees it becomes broad and flattened. When the cedar of Lebanon is drawn up among other trees, it produces a clean straight trunk, differing only in appearance from that of the larch in the colour of its bark; but having been long considered more as an ornamental than a useful tree, it is seldom found planted in masses, or intermixed with other trees in plantations. If a branch of the cedar is cut off, it is stated in Lambert's *Pinus*, that "the part remaining in the trunk gradually loosens itself, and assumes a round form resembling a potato; and, if the bark covering it be struck smartly with a hammer, the knot leaps out." This fact, Mr. Lambert states, was communicated to him by Sir Joseph Banks; but he adds that he had tried the experiment himself. The branchlets are disposed in a flat fan-like manner on the branches; and, as they are numerous and thickly set with leaves, single detached trees appear, at a little distance, a dense mass of foliage. The leaves are straight, about 1 in. long, slender, nearly cylindrical, tapering to a point, and are on short footstalks: they are generally of a dark grass green; but, in the variety called the silver cedar, they have a beautiful glaucous hue. The leaves, which remain two years on the branches, are at



first produced in tufts; the buds from which they spring having the appearance of abortive shoots, which, instead of becoming branches, only produce a tuft of leaves pressed closely together in a kind of whorl. These buds continue, for several years in succession, to produce every spring a new tuft of leaves, placed above those of the preceding year; and thus each bud may be said to make a slight growth annually, but so slowly, that it can scarcely be perceived to have advanced a line in length; hence, many of these buds may be found on old trees, which have eight or ten rings, each ring being the growth



The Syon Cedar.

of one year; and sometimes they ramify a little. At length, sooner or later they produce the male and female flowers. The male catkins are simple, solitary, of a reddish hue, about 2 in. long, terminal, and turning upwards. They are composed of a great number of sessile, imbricated stamens, on a common axis. Each stamen is furnished with an anther with 2 cells, which open lengthwise by their lower part; and each terminates in a sort of crest pointing upwards. The pollen is yellowish, and is produced in great abundance. The female catkins are short, erect, roundish, and rather oval: they change, after fecundation, into ovate-oblong cones, which, when they approach maturity, become from 2½ in. to 5 in. long. The cones are of a greyish brown, with a plum-coloured or pinkish bloom when young, which they lose as they approach maturity: they are composed of a series of coriaceous imbricated scales, laid flat, and firmly pressed against each other in an oblique spiral direction. The scales are very broad, obtuse, and truncated at the summit; very thin, and slightly denticulated at the edge; and reddish and shining on the flat part. Each scale contains 2 seeds, each surmounted by a very thin membranaceous wing, of which the upper part is very broad, and the lower narrow, enveloping the greater part of the seed. The cones are very firmly attached to the branches: they neither open nor fall off as in the other *Abiétinæ*; but, when ripe, the scales become loose, and drop gradually, leaving the axis of the cone still fixed on the branch. The seeds are of an irregular, but somewhat triangular, form, nearly 1½ in. long, of a lightish brown colour. Every part of the cone abounds with resin, which sometimes exudes from between the scales. The female catkins are produced in October, but the cones do not appear till the end of the second year; and, if not gathered, they will remain attached to the tree for several years.

The tree does not begin to produce cones till it is 25 or 30 years old; and, even then, the seeds in such cones are generally imperfect, and it is not till after several years of bearing, that seeds from the cones of young trees can be depended on. Some cedars produce only male catkins, and these in immense abundance; others only female catkins; and some both. There are trees at Whitton, Pepper Harrow, and other places, which, though upwards of 100 years old, and of vigorous growth, have scarcely ever produced either male or female catkins. The duration of the cedar is supposed to extend to several centuries.



The Enfield Cedar.

The rate of growth of the cedar is generally considered slow; but, under favourable circumstances, it is at least as rapid as that of other resinous trees. Loiseleur Deslongchamps, in his very able article on the cedar in the *Nouveau Du Hamel*, compares the rate of growth of the tree in England and France, by showing the increase in a given number of years of the trees at Chelsea, and of that in the Jardin des Plantes. The trees in the Chelsea Garden were planted in 1683, being then 3 ft. high; and, in 1766, two of them were upwards of 12 ft. 6 in. in girth at 2 ft. from the ground, and their branches extended more than 20 ft. on every side; which branches, Miller adds, "though they were produced 12 ft. or 14 ft. above the surface, did, at every termination, hang very near the ground, and thereby afford a goodly shade in the hottest season of the year." The cedar in the Jardin des Plantes measured, in 1786, at the ground, 4 ft. 6 in. French (about 5 ft. English) in circumference; in 1802, according to M. Dutour (*Nouv. Dict. d'Hist. Nat.*, iv. p. 449.), it was 7 ft. 10 in. (nearly 8 ft. 6 in.); and in 1812, when it was 78 years old, it was 8 ft. 8 in. (9 ft. 4½ in.) In 1834, according to the Return Paper we received from M. Mirbel, the same tree, then exactly 100 years old, was 10 ft. 6 in. (11 ft. 4 in.) in circumference; and the largest of the Chelsea cedars, in the same year, was nearly 15 ft. in circumference, they being upwards of 150 years old. The rapid growth of the Chelsea cedars during the first 83 years is accounted for by the circumstance of their standing near a pond, into which their roots extended; and, when this pond was filled up (which it was a few years after 1766, when Miller measured them), their growth was instantly checked; and so much so, that, in 1793, when measured by Sir Joseph Banks, the largest was only 12 ft. 11½ in. in circumference, having increased only 5½ in. in 30 years. The cedar in the Jardin des Plantes, though the most celebrated, is not the largest in France: another plant, brought from England by Jussieu at the same time, and planted in the garden of the Château de Montigny, had a trunk, in 1832, when measured by M. Murat, nearly 17 ft. French (18 ft. 5 in. English) in circumference at 4 ft. from the ground. It had lost its leading shoot, and was only a little higher than the tree in the Jardin des Plantes.

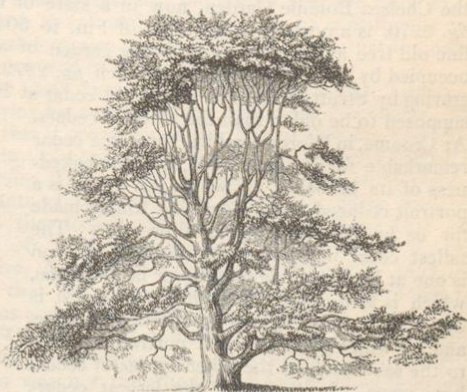
The two largest cedars at Whitton, which, in 1837, were 105 years old from the seed (see p. 57.), were upwards of 70 ft. high, with trunks 14 ft. 6 in. in circumference at 2 ft. from the ground. The pinaster, Scotch pine, silver fir, and larch, at Whitton, in the same soil and situation, had not made nearly so much timber; though it is proper to state that these last kinds had rather less room than the cedars. One of the largest of these cedars was blown down in the violent storm of wind in November, 1836. The lower part of the trunk, after being squared, measured nearly 4 ft. on the side; and the annual growths were so large, that 20 of them measured across 6½ in. The largest of these annual layers was no less than ½ in., and the smallest exceeded ⅓ in. A plank of this



The Chelsea Cedars.

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The Croome Cedar

most remarkable tree was kindly presented to us by the proprietor, J. Gostling, Esq.; on a portion of which we made several experiments, which proved it to be very inferior in point of strength to the common English-grown Scotch pine, and the remainder we have had made into a table. The colour and the grain of the wood are precisely the same as those of a specimen accompanied by cones and leaves received by Mr. Lambert from Morocco. At St. Ann's Hill is a cedar planted by the Honourable Mrs. Fox, in 1794, which, in 1834, was 50 ft. high, diameter of the trunk 3 ft. 6 in., and of the head 72 ft. At Redleaf, near Penshurst, there are cedars which, in 1837, were 36 ft. high, and girted 4 ft. 6 in. at 3 ft. from the ground. These were raised from seeds exactly 20 years before, by the proprietor, W. Wells, Esq., who purchased the cone from which the seeds were taken in a London seed-shop in 1816. Another cedar at Redleaf, after being planted 27 years, when under 3 ft. high, is 52 ft. high, and 5 ft. 6 in. in circumference at 3 ft. from the ground. In Scotland and Ireland, in sheltered situations, and on good soil, the growth of the cedar is found to be nearly as rapid as that of the larch. When the leading shoot of the cedar is broken, it does not form another, and ceases to grow in height. The cedar in the Jardin des Plantes, which lost its leader at the commencement of the French revolution, has not increased in height since; but its branches have extended 45 ft. French (nearly 50 ft. English) on each side, giving a diameter to the head of nearly 100 ft.

The most remarkable cedars in point of age, near London, are those in the Chelsea Botanic Garden, now in a state of rapid decay; and of which *fig. 2270.* is a portrait to the scale of 1 in. to 50 ft. There was till lately a fine old tree at Hammersmith, in the garden of a house which was formerly occupied by Bishop Atterbury, of which *fig. 2272.* is a portrait from an engraving by Strutt. There is a very old cedar at Enfield (*fig. 2269.*), by some supposed to be older than the Chelsea cedars. At Croome, in Worcestershire, there is a cedar remarkable for its magnitude, and the nakedness of its branches, of which *fig. 2271.* is a portrait reduced from a drawing kindly made for us by Miss Radcliffe of Worcester. The tallest cedar in the neighbourhood of London is one at Kenwood, figured in our last Volume, which is 95 ft. high; and the handsomest is one at Syon, also figured in our last Volume, and of which *fig. 2268.* is a portrait reduced to the same scale as the other figures of cedars here given. In Scotland, the largest cedars are at Hopetoun House, and in Dalkeith Park; and there is a very handsome one, comparatively young, on the estate of Gray, in Forfarshire, of which *fig. 2273.* is a portrait, reduced from a drawing sent to us by Mr. Robertson, gardener to Earl Gray, at Kinfauns Castle. The largest cedars in Ireland are believed to be those at Castletown, the seat of Colonel Conolly; or at Mount Anville, the seat of Counsellor West.

Geography. The cedar of Lebanon is generally supposed to grow nowhere but on that mountain; but it was discovered, in 1832, on several mountains of the same group, by N. Bové, ex-director of agriculture of Ibrahim Paçha, at Cairo. In passing from Sakhléhé to Der-el-Khamer, on the afternoon of October 11., M. Bové passed through a valley, the right side of which was bounded by a mountain, and on its summit some thousands of cedars of Lebanon were growing, covered with catkins. "These

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The Hammersmith Cedar.

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The Gray Cedar.

trees," he says, "are from 3 ft. to 16 ft. French, in circumference, and their height exceeds 50 ft. French. I suppose," he adds, "that they owe their preservation to their being situated on a mountain difficult of access, and at a distance from towns where their wood could be used, and to which from their present habitat, it could now be only transported on the backs of animals." (*Ann. Scien. Nat.*, 2. s., vol. i. p. 235.) The cedar has also been lately discovered on Mount Atlas, whence cones, and specimens of the branches, leaves, and wood, have been sent by Mr. Drummond Hay, the British consul at Tangier, to Mr. Lambert; and specimens have also been received from Morocco by P. B. Webb, Esq. The probability is, that the range of the tree not only extends over the whole of that group of mountains which is situated between Damascus and Tripoli in Syria, and which includes the Libanus and Mounts Amanus and Taurus of antiquity, and various other mountains, but that its distribution on the mountainous regions of the north of Africa is extensive; though of the botany of these latter regions scarcely anything is at present known. The ancient writers who mention the cedar state that it had many different habitats; and Theophrastus and Pliny make it a native of Egypt, Crete, Cyprus, &c.; but, as they included the junipers, and probably several other trees, under the general name of Cedrus, no reliance can be placed on their testimony. The cedar has been said by some authors, both Continental and British, to be a native of Mounts Amanus and Taurus, and of Siberia; but, though the first statement is probably true, the second, as will hereafter be shown, is decidedly erroneous. Loiseleur Deslongchamps in the *Nouveau Du Hamel*, and Baudrillart in the *Dictionnaire des Eaux et Forêts*, inform us that Belon found the cedar growing on Mount Amanus and Mount Taurus; and that Pallas states, in his *Observations faites dans un Voyage*, &c., that he found it in the countries between the Wolga and the Tobol, in Siberia, and on the Altaic Mountains, Baudrillart adding that he had been informed by a Russian officer in the administration of the forests, that the wood of the cedars found in Siberia was so soft and so brittle, as to be unfit for the construction of ships. Mr. Lambert also quotes Pallas, to prove that the cedar, in Siberia, does not thrive so well in dry as in moist ground.

Belon, who wrote about 1550, mentions the cedar among the "singularities" observed by him during his travels in the East (see *Les Observ.*, &c., p. 162. 166.); and states that it grows not only on Mount Libanus, "on which some remain even to this day, planted, as it is thought, by Solomon himself;" but also "on the mountains Taurus and Amanus, in cold stony places." He adds that the merchants of the factory of Tripoli, in Syria, told him that "the cedar grew on the declivity of Mount Lebanon next that city, and that the inhabitants of Syria made boats of it, for want of the pine tree." In Belon's treatise, *De Arboribus Coniferis*, published in 1553, the author says he was told that the cedar of Solomon is found on Mount Lebanon, and also on Amanus and Taurus, and on the mountains above Nicea; but nowhere in the Isle of Crete. He then mentions several kinds of juniper, all of which he calls cedars; and states it to be his opinion, that the great cedar of Mount Lebanon was not the wood used for building Solomon's temple. (p. iv.) In another page, after relating his visit to Mount Lebanon, he says, "Right true and excellent are the trees of Mount Lebanon." He afterwards describes their appearance and mode of growth, adding: "The cedars that we saw on Amanus and Taurus were very similar to these. They grow in moist places, like those in which the spruce fir (*picea*, *Abies L.*) delights; and they are also found in moist valleys:—*Cedros* quas in Amano et Tauro vidimus, eandem cum prædictis habere similitudinem comperimus. In humidis nati quemadmodum *picea*, oblectatur, atque etiam convalles humorem habentes sequi." He adds that these trees grow somewhat like the silver fir (*abies*, *Picea L.*), but have a portion of the trunk smooth (*glabro*), and unclothed. It is very probable, the trees found by Belon on Mounts Amanus and Taurus were not cedars of Lebanon, but the *Pinus Cembra*. With regard to the assertion, that Pallas found the cedar in Siberia, M. Delamarre, in his

Traité pratique de la Culture des Pins, p. 315., observes:—"There appears to be an error in the statement that Pallas found the cedar in Siberia, and on the Altaic Mountains. M. Ferry, a literary man, who resided three years in Siberia, has published a paper in the *Bibliothèque Physico-économique*, in which he proves that the tree called by the French translator of Pallas's *Travels* the cedar, was, in fact, *Pinus Cembra*; the Russian name for which is *kedr*. He adds, in confirmation of this, that Pallas, in his *Flora Rossica*, does not mention the cedar of Lebanon, though he speaks fully of *P. Cembra* (*Fl. Ross.*, p. 4.); stating that he found it both in forests by itself, and intermixed with other trees; and that it preferred cold moist places to dry ground. M. Ferry adds that Pallas, in his *Travels*, invariably calls the trees he mentions by their popular names in their native countries; and that the French translator, meeting with the word *kedr* in the German work, fancied that it must mean cedar, and translated it accordingly." M. Loiseleur Deslongchamps has also noticed this error in an article entitled *Histoire du Cèdre du Liban*, published in the *Annales de l'Agric. Franç.*, for 1837, a copy of which we have received since this sheet was in type.

History. The first account we have of the cedar of Lebanon is that contained in the *Bible*, where we are told that Moses commanded the lepers among the Israelites to make an offering of two sparrows, cedar wood, scarlet (that is a lock of wool twice dyed), and hyssop. (*Levit.*, xiv. 4. 6.) The houses in which lepers had dwelt were purified in the same manner. (*Ibid.*, 49, 51, and 52.) When Moses and Aaron were ordered to sacrifice a red heifer (*Numbers*, xix. 6.), they were also commanded to throw cedar wood, hyssop, and scarlet into the midst of the burning sacrifice; and the ashes of them were gathered up to serve as a purification from sin. When Solomon rebuilt the temple of Jerusalem, he obtained permission from Hiram, king of Tyre, to cut down the cedar and fir necessary from Mount Lebanon; and for this purpose he sent fourscore thousand hewers to cut down the trees. There was also a palace built by Solomon, which was called the House of the Forest of Lebanon, from the great quantity of cedar used in its construction. Solomon is stated to have paid to Hiram twenty thousand measures of wheat, and twenty measures of pure oil, annually, while the work was in progress; and, when it was completed, he ceded to him twenty villages in Galilee. In the *Psalms*, there are frequent allusions to the cedar:—"The righteous shall flourish like the palm tree: he shall grow like a cedar in Lebanon." "The hills were covered with its shadow, and the boughs thereof were like goodly cedars," &c. In the Book of Ezekiel is the following striking passage:—"Behold, the Assyrian was a cedar in Lebanon, with a shadowing shroud of a high stature; and his top was among thick boughs. The waters made him great; the deep set him up on high with her rivers running round about his plants, and sent out her little rivers unto all the trees of the field, therefore his height was exalted above all the trees of the field, and his boughs were multiplied; and his branches became long, because of the multitude of the waters where he shot forth. All the fowls of heaven made their nests in his boughs, and under his branches did all the beasts of the field bring forth their young, and under his shadow dwelt all great nations." (*Ezekiel*, xxxi. 3, 4, 5, and 6.) Many other passages might be quoted, but these will suffice to show the very frequent allusions to the tree in Holy Writ. Some persons, however, suppose that the cedar of the *Bible* is not that of Mount Lebanon; as the wood of the latter, though slightly fragrant, is not durable, and the tree cannot be called very lofty. It is possible that the wood of old trees, growing in their native habitat, may be much harder, of finer grain, and consequently less liable to corrupt, than the timber of young trees grown rapidly in this country; and, though there is no tree now existing on Mount Lebanon, or elsewhere, of very lofty stature, the terms employed probably alluded rather to the grandeur and magnificence of the tree, than to its actual height. Some writers have supposed that the cedar of the *Bible* was a kind of juniper; others that it was the *Cedrus Deodara*; and some, that it might be the *Thuja articulata*; but the expression of the Psalmist, when, in allusion to the flourishing state of a people, he says, "they shall spread their branches like the cedar," seems clearly to allude to the cedar of Lebanon.

In profane history, many writers mention the usefulness and durability of the cedar. Diodorus Siculus tells us that Sesostris the Great, king of Egypt, built a vessel of cedar, 280 cubits long, which was covered with gold both within and without. (*Lib. i.* § 2.) Theophrastus and Pliny say that the Egyptians used the cedar instead of the pine, which did not grow in their country (*Theophr.*, lib. v. cap. 8; *Plin.*, lib. xvi. cap. 40.); and they are said to have used the extract of cedar, mixed with other drugs, to preserve their mummies. The largest cedar recorded in ancient history is one which was employed to make a galley for King Demetrius, which had eleven ranks of oars; but this tree, as it grew in the Isle of Cyprus, was probably the evergreen cypress: its length was 130 ft., and its thickness 18 ft. The Emperor Caligula had constructed of the wood of the cedar what he called Liburnian ships, of which the poops were enriched with precious stones, and the sails were of different colours; and which contained baths, and dining-rooms decorated with painting and carving. (*Suet. in Caligula*, cap. xxxvii.; *Plin.*, lib. xiii. cap. 5.) The ancients considered the cedar as an incorruptible kind of wood, which would last for ever; and for this reason they made with it their temples, and the statues of their gods and kings. Virgil says,—

"Quin etiam veterum effigies ex ordine avorum
Antiqua e cedro."

Æneid. vii. 177.

"Before the gates, a venerable band,
In cedar carved, the Latian monarchs stand."

Pitt's trans.

According to Vitruvius (*lib. iii.* cap. 9.), the leaves of the papyrus, and other objects, were rubbed with the resin of the cedar, an oil, or juice, which he calls *cedria*, in order to preserve them from the worms; as, according to Pliny and others, it did the Egyptian mummies. (*Plin.*, lib. xvi. cap. 11.; *Diod. Sic.*, lib. i. § 2.) Vitruvius also mentions the *Juniperus Oxcedrus*, but clearly distinguishes it from the great cedar, which is supposed to be the cedar of Lebanon. The celebrated temple of Diana at Ephesus, which was accounted one of the seven wonders of the world, which took 250 years in building, and which was burned down to the ground the night Alexander the Great was born, was principally constructed of cedar. Pliny tells us of a temple of Apollo at Utica (the well-known city of that name in Africa), in which was found cedar timber that, though nearly 2000 years old, was perfectly sound. At Saguntum, in Spain, continues Pliny, was a temple consecrated to Diana, which was built 200 years before the destruction of Troy; and it contained a statue

of the goddess formed of cedar, which had been formerly taken from the Island of Zacynthus (now called Zante) by the inhabitants, when they formed the colony of Saguntum. When the inhabitants of the city, after having endured a siege of eight months, destroyed themselves and their city by fire, this temple, standing in a valley beyond the walls, escaped; and the cedar image of the goddess was found by Hannibal, who would not suffer it to be injured by his soldiers. The books of Numa, which were preserved so many centuries, are said to have been smeared over with the cedar, or juice of cedar. According to Virgil, the ancients used it in their dwelling-houses, as well as for their temples. What proportion of the above history belongs to the cedar of Lebanon, and what belongs to other Conifereæ, it is impossible at this distance of time to determine.

The modern history of the cedar of Lebanon is attended with much greater certainty. It may be said to commence with the revival of literature, as almost every modern traveller who has visited Syria has ascended Mount Lebanon, and recorded his visit. One of the first travellers who has given any particulars of Mount Lebanon is Belon, who travelled in Syria about 1550. About 16 miles from Tripoli, a city in Syria, he says, "at a considerable height up the mountain, the traveller arrives at the Monastery of the Virgin Mary, which is situated in a valley. Thence, proceeding four miles farther up the mountain, he will arrive at the cedars; the Maronites or the monks acting as guides. The cedars stand in a valley, and not on the top of the mountain; and they are supposed to amount to 28 in number, though it is difficult to count them, they being distant from each other a few paces. These the Archbishop of Damascus has endeavoured to prove to be the same that Solomon planted with his own hands in the quincunx manner, as they now stand. No other tree grows in the valley in which they are situated; and it is generally so covered with snow, as to be only accessible in summer." (*De Arb.*, &c., p. 4.) About this period, paying a visit to the cedars of Mount Lebanon seems to have been considered as a kind of pilgrimage; and, as every visiter took away some of the wood of the trees, to make crosses and tabernacles, the patriarch of the Maronites, fearing that the trees would be destroyed, threatened excommunication to all those who should injure the cedars; and, at the same time, exhorted all Christians to preserve trees so celebrated in Holy Writ. The Maronites were only allowed to cut even the branches of these trees once a year; and that was, on the eve of the Transfiguration of our Saviour; which festival occurs in August, and consequently at a suitable period for visiting the mountain. On this festival, the Maronites and pilgrims repaired to Mount Lebanon, and, passing the night in the wood, regaled themselves on wine made from grapes grown on the mountain, and lighted their fires with branches cut from the cedars. They passed the night in dancing a kind of Pyrrhic dance, and in singing and regaling; and the following day the festival of the Transfiguration was held on the mountain, and the patriarch celebrated high mass on an altar built under one of the largest and oldest cedars. (*Bel. in Arb. Con.*, &c.; and *Lois. in N. Du Ham.*, v. p. 300.) Dr. Hunter, in his notes to Evelyn's *Sylva*, says,—"we are informed, from the *Memoirs of the Missionaries in the Levant*, that, upon the day of the Transfiguration, the patriarch of the Maronites (Christians inhabiting Mount Libanus), attended by a number of bishops, priests, and monks, and followed by five or six thousand of the religious from all parts, repairs to these cedars, and there celebrates the festival which is called 'the Feast of Cedars.' We are also told that the patriarch officiates pontificaly on this solemn occasion; that his followers are particularly mindful of the Blessed Virgin on this day, because the Scripture compares her to the cedars of Lebanon; and that the same holy father threatens with ecclesiastical censure those who presume to hurt or diminish the cedars still remaining." (*Hunter's Evelyn*, ii. p. 5.) La Roque, in his *Voyage de Syrie et du Mont Liban*, in 1722, mentions this fête; and adds:—"The Maronites say that the snows no sooner begin to fall, than these cedars, whose boughs are now all so equal in extent that they appear to have been shorn, never fail to change their figure. The branches, which before spread themselves, rise insensibly, gathering together, it may be said, and turn their points upwards towards heaven, forming altogether a pyramid. It is nature, they say, that inspires this movement, and makes them assume a new shape, without which these trees could never sustain the immense weight of snow remaining for so long a time." (*Voy.*, &c., as quoted in an able article on the cedar, in the *Gen. Mag.*, 2d series, iv. p. 578.) Rauwolf, who visited the cedars in 1574,

says that his party ascended the highest point of the mountain, "and saw nothing higher, but only a small hill before us, all covered with snow, at the bottom whereof the high cedar trees were standing. And, though this hill hath, in former ages, been quite covered with cedar trees, yet they are since so decreased, that I could tell no more but twenty-four, that stood round about in a circle; and two others, the branches whereof are quite decayed for age. I also went about in this place to look for some young ones, but could find none at all. These trees are green all the year long; have strong stems, that are several fathoms about; and are as high as our fir trees." (*Itin.*, part ii. chap. xii.) Thévenot, a French traveller, who visited Mount Lebanon in 1655, makes the number of trees twenty-three; and alludes to a popular superstition, which appears to have been prevalent in his day, that "when the cedars of Mount Lebanon are counted several times, their number is found each time to vary." (*Voy. du Levant*, part i. p. 443., ed. 1664.) The Dutch traveller, Cornelius Bruyer, in his *Voyage to the Levant*, the English edition of which was published in 1702, appears firmly to believe in this superstition; and says it is impossible to count them. He, however, thought the number was about thirty-six. Maundrell, in his *Journey from Aleppo to Jerusalem*, in 1696, gives a more detailed account. After ascending the mountain for four hours and a half, he came to a small village called Eden; and in two hours and a half more, to the cedars. "These noble trees," he says, "grow amongst the snow, near the highest part of Libanus; and are remarkable, as well for their own age and largeness, as for the frequent allusions made to them in the Word of God. Here are some very old, and of a prodigious bulk; and others younger, of a smaller size. Of the former, I could reckon up only sixteen: the latter are very numerous. I measured one of the largest, and found it 12 yards 6 in. in girth, and yet sound; and 37 yards in the spread of its boughs. At about 5 or 6 yards from the ground, it was divided into five limbs, each of which was equal to a great tree." (*Journ.*, &c., p. 142.) Miller, in the first edition of his *Dictionary*, art. *Cedrus*, states that a friend of his, who visited the trees in 1720, confirms this account, except that he found the spread of the largest tree to be 22 yards in diameter, instead of 37 yards in circumference. La Roque, who visited the cedars in 1722, says that he counted 20 large cedars, the largest of which had a trunk 19 ft. in circumference, and a head 120 ft. in circumference. (*Voy.*, &c.) Dr. Pococke, who visited Syria in the years 1744 and 1745, has given us the following account of the state in which he found these celebrated trees:—"From the Convent of St. Sergius (Latin Carmelite friars), there is a gentle ascent, for about an hour, to a large plain between the highest parts of Mount Lebanon. Towards the north-east corner of it are the famous cedars of Lebanon: they form a grove about a mile in circumference, which consists of some large cedars that are near to one another, a great number of young cedars, and some pines. The great cedars, at some distance, look like very large spreading oaks: the bodies of the trees are short, dividing at bottom into three or four limbs, some of which, growing up together for about 10 ft., appear something like those Gothic columns which seem to be composed of several pillars: higher up they begin to spread horizontally. One that had the roundest body, though not the largest, measured 24 ft. in circumference; and another, with a sort of triple body, as described above, and of a triangular figure, measured 12 ft. on each side. The young cedars are not easily known from pines: I observed they bear a greater quantity of fruit than the large ones. The wood does not differ from white deal in appearance, nor does it seem to be harder. It has a fine smell, but is not so fragrant as the juniper of America, which is commonly called cedar; and it also falls short of it in beauty. I took a piece of the wood from a great tree that was blown down by the wind, and left there to rot: there are 15 large ones standing. The Christians of several denominations near this place come here to celebrate the festival of the Transfiguration, and have built altars against several of the large trees, where they administer the sacrament. These trees are about half a mile north of the road, to which we returned, and, from this plain on the mountains, ascended about three hours

up to the very summit of Mount Lebanon; passing over the snow, which was frozen hard. These mountains are not inhabited higher up than the Carmelite Convent; nor all the way down on the east side, which is steep, and a barren soil. I observed the cypresses are the only trees that grow towards the top, which, being nipped by the cold, do not grow spirally, but like small oaks; and it may be concluded that this tree bears the cold better than any other." (*Pococke's Description of the East*, vol. ii. part i.; *Obs. on Syria*, p. 105.) Kinneir, in 1813, found cedars no where but on Mount Lebanon, and their number, he says, amounts to 400 or 500. (*Travels in Asia Minor, &c.*, in 1813-14.) In Wolf's *Missionary Journal*, 1823; and 1824, he states that, on visiting Mount Lebanon, he counted 13 large and ancient cedars, and numerous smaller ones, making in the whole 387 trees. Buckingham, in 1825, says:—"Leaving Biskerry on our right, we ascended for an hour over light snow, until we came to the Arz-el Libenien, or the cedars of Lebanon. These trees form a little grove by themselves, as if planted by art, and are seated in a hollow, amid rocky eminences all round them, at the foot of the ridge which forms the highest peak of Lebanon. There are at present, I should think, about 200 in number, all fresh and green. They look, on approaching them, like a grove of firs; but, on coming nearer, are found to be in general much larger, though the foliage still keeps its resemblance. There are about 20 that are very large; and, among them, several that have trunks from 10 ft. to 12 ft. in diameter, with branches of a corresponding size, each of them

2274



like large trees, extending outwards from the parent stock, and overshadowing a considerable piece of ground." (*Travels among the Arab Tribes*, p. 475.) The general appearance of these cedars, about the time Buckingham saw them, is represented in *fig. 2274*. Dr. Pariset visited Mount Lebanon in August, 1829, and has given some account of the cedars in a letter published in Loiseleur Deslongchamps's *Histoire du Cèdre*. There are not, he says, above a dozen large trees, but there may be from 400 to 500 small ones. Lamartine, who visited the trees in 1832, says:—"We alighted and sat down under a rock to contemplate them. These trees are the most renowned natural monuments in the universe: religion, poetry, and history, have all equally celebrated them. The Arabs of all sects entertain a traditional veneration for these trees. They attribute to them not only a vegetative power, which enables them to live eternally, but also an intelligence, which causes them to manifest signs of wisdom and foresight, similar to those of instinct and reason in man. They are said to understand the changes of seasons; they stir their vast branches as if they were limbs; they spread out or contract their boughs, inclining them towards heaven or towards earth, according as the snow prepares to fall or to melt. These trees diminish in every succeeding age. Travellers formerly counted 30 or 40; more recently, 17; more recently still, only 12. There are now but 7. These, however, from their size and general appearance, may be fairly pre-

sumed to have existed in biblical times. Around these ancient witnesses of ages long since past, there still remains a little grove of yellowed cedars, appearing to me to form a group of from 400 to 500 trees or shrubs. Every year, in the month of June, the inhabitants of Beschierai, of Eden, of Kanobin, and the other neighbouring valleys and villages, climb up to these cedars, and celebrate mass at their feet. How many prayers have resounded under these branches; and what more beautiful canopy for worship can exist!" Geramb was on Mount Lebanon in 1832, and reckoned about the same number of large trees as Pariset. (*Pèlerinage à Jérusalem, &c.*, vol. ii. p. 355.) M. Laure, an officer in the French marine, in company with the Prince de Joinville, visited Mount Lebanon in September, 1836. "After having quitted the village of Eden, the chief place of the Maronites," says M. Laure, "and having followed for two or three hours a path bordered sometimes by cultivated fields and plantations of mulberries, but more frequently by rocks, we arrived at El-Herzé, an almost level space or plain entirely surrounded by the steep peaks of the mountains. In this space, or rather hollow, are the celebrated cedars; and the circuit, not of the forest but of the plain, is not more than three or four miles. Fifteen of the sixteen old cedars mentioned by Maundrell are still alive, but are all more or less in a state of decay; and one of them is remarkable for three immense trunks, proceeding from the same stump, at a short distance above the soil. Another, one of the healthiest of the old trees, though perhaps the smallest, measured 33 ft. French (35 ft. 9 in. English) in circumference. All the trees are much furrowed by lightning, which seems to strike them more or less every year. In the middle of these old trees are about forty other cedars comparatively young, though the trunk of the smallest of them is from 10 ft. to 12 ft. in circumference. At the base of eight or nine of the old cedars are altars constructed with large and rough stones, which were formerly used by the inhabitants of the Maronite villages, who, headed by their pastor, went to El-Herzé on the day of the Transfiguration. At this festival all the priests said mass at the same time, each priest officiating at the foot of the cedar belonging to his village. Disputes having, however, arisen from this practice, the patriarch of the Maronites has made a new arrangement; and now, though the Maronites still continue on the festival of the Transfiguration to repair to El-Herzé, only one mass is celebrated, which is performed on the altar of a different cedar every year, in order that the trees of all the villages in turn may enjoy the same privilege. There is not one young cedar in all the wood of El-Herzé. The soil of the forest of Lebanon, on which there was not a single blade of grass growing in September, 1836, is covered to the thickness of half a foot with the fallen leaves, the cones, and scales of the cedars, so that it is almost impossible for the seeds of the trees to reach the ground and germinate." (*Laure in the Cultivateur Provençal*, p. 317. to 323, as quoted in *Deslongchamp's Histoire du Cèdre*, p. 63.)

The date of the introduction of the cedar into England is uncertain. Aiton, in the *Hortus Kewensis*, makes it 1683, the date of the planting of the trees in the Chelsea Botanic Garden; but, as these trees were 3 ft. high when planted, the introduction of the tree must at least be placed somewhat sooner, even supposing these trees to have been the first planted in Europe. The tree at Enfield is, however, probably as old. (See p. 48.) This tree, and the equally celebrated one at Hendon, blown down in 1779 (see p. 57.), are said to have been planted by Queen Elizabeth; but it is not likely that the cedar was introduced till long after her reign, as Turner does not mention it in his *Names of Herbes*; and Gerard and Parkinson, though they describe it in detail, speak of it as a plant that they have never seen. It is most probable that Evelyn was the introducer of the cedar, as he says, after praising it as a "beautiful and stately tree, clad in perpetual verdure," that it grows "even where the snow lies, as I am told, almost half the year; for so it does on the mountains of Libanus, from whence I have received cones and seeds of those few remaining trees. Why, then, should it not thrive in old England? I know not, save for want of industry and trial." It is extremely improbable that a man so fond

of trees as Evelyn, and so anxious to introduce new and valuable sorts into his native country, should have suffered "cones and seeds" of such a tree as the cedar to be in his possession, without trying to raise young plants from them; particularly as he was a man of leisure, residing in the country, and fond of trying experiments. (See Sir John Cullum's paper on this subject, in the *Gent. Mag.* for March, 1779.) Supposing Evelyn to have raised plants from his cones, the great cedar at Enfield may have been given by him to Dr. Uvedale; as Evelyn's *Sylva* was written in 1664, and Dr. Uvedale resided at Enfield from 1665 to 1670 (see *Hunter's Evelyn*, ii. p. 3.); between which years his cedar must have been planted. The story of the Enfield tree having been brought by one of the doctor's pupils from Mount Lebanon (p. 48.) rests solely on tradition; like that of the Enfield and the Hendon trees having been planted by Queen Elizabeth; and, possibly, one tale is not more worthy of credit than the other. Lord Holland is of opinion it was introduced by his ancestor, Sir Stephen Fox. In a letter to us dated November 23. 1836, His Lordship mentions a cedar at Farley, near Salisbury, the native village and burial place of Sir Stephen Fox, "the very first, I believe, ever planted in England. It was standing in 1812, near the vault of Sir Stephen Fox, who had imported it from the Levant; and who planted other cedars in the gardens at Chelsea." The cedar at Farley, His Lordship informs us in a subsequent letter, dated February 16. 1837, was, when he saw it in 1812, "barked, and some part of it lopped, in preparation for the axe. It was nearly the largest in girth that I had ever seen, but the branches, judging by what remained of them, did not grow boldly out from the trunk, but were more perpendicular, or cypress or poplar-tree fashioned, than is usual with cedars of Lebanon. That tree, or those at Chelsea or at Chiswick, all, I believe, planted under Sir Stephen Fox's direction, were unquestionably the first introduced into England. The circumstance is mentioned in Evelyn." We have not been able to find the passage alluded to. The particulars of the tree at Farley, Lord Holland had the kindness to procure for us from Mr. Thomas Parsons, who had them from the person who cut it down, and measured it. "He gave me," says Mr. Parsons, "the following information. The tree was stripped of its bark in 1812; the next winter it was grubbed down. He had 7*l.* for grubbing it down. I do not know what the expense of sawing off the root was. The expense of cutting the tree in quarters, viz., two cuts as it lay, each 14 ft. long, was 10*l.* The total weight of the tree was above 13 tons, without the bark; all the wood at and above 24 in. round included. All the rest went for firewood, of which there was an immense quantity. I remember, a few years before it was cut, there was a bough broken off by the weight of the snow.—*T. P. Farley, Feb. 2. 1837.*" According to a tradition in the family of Ashby, whose seat is at Quenby Hall, in Leicestershire, one of the first cedars raised in England was from seeds brought from the Levant by Mr. William Ashby, a Turkey merchant, and given by him to his nephew George Ashby, Esq., called in his time, and also on his monument, 'honest George Ashby, the planter,' who is supposed to have planted the old cedar in front of Quenby Hall, between 1680 and 1690. (See *Nichol's Hist. Leicest.*) William Ashby Ashby, Esq., the present possessor of Quenby Hall, has kindly endeavoured to find among his ancestor's papers some specific document respecting the introduction of the cedar, but could give us nothing farther than the general family tradition; except that Evelyn is said to have paid a visit to Quenby. The tree at Quenby Hall was, in 1837, 47½ ft. high, the trunk 7 ft. 9 in. in circumference at 1 ft. from the ground, and the diameter of the head about 71 ft.

When first introduced, the cedar, being a native of the hot climate of Syria, was supposed to be tender. Sir Hans Sloane, in a letter to Mr. Ray dated March, 1684-5, says:—"I was the other day at Chelsea, and find that the artifices used by Mr. Watts have been very effectual for the preservation of his plants; insomuch, that this severe weather has scarce killed any of his fine plants. One thing I much wonder to see, that the *Cedrus Montis*

Libani, the inhabitant of a very different climate, should thrive here so well as without pot or green-house, to be able to propagate itself by layers this spring. Seeds sown last autumn have, as yet, thriven very well, and are likely to hold out. The main artifice I used to them has been to keep them from the winds, which seem to give great additional force to the cold in destroying tender plants." (*Ray's Letters, &c.*, p. 176.)

The cedars at Chelsea, as before observed, and several of those at Chiswick, in the grounds of the villa of the Duke of Devonshire, still exist, and these may, as they generally are, be considered the oldest yet standing in Britain. Evelyn had, doubtless, planted some cedars about the same time at Sayes Court; because in his letter to the Royal Society, detailing the effect of the previous severe winter, dated Sayes Court, Deptford, April 16. 1684, he says, "As for exotics, my cedars, I think, are dead." (*Misc. Writings, &c.*, p. 693.)

Whoever introduced the cedar, one of the greatest planters of it, in Miller's time, was the Duke of Richmond, who, as Collinson informs us, introduced many hundred plants in his park at Goodwood. Peter Collinson left the following MS. memorandum on this subject, in his copy of Miller's *Dictionary*. "I paid John Clarke, (a butcher at Barnes, who was very successful in raising cedars and other exotics,) for 1000 cedars of Lebanon, June 8th, 1761, 79l. 6s. in behalf of the Duke of Richmond. These 1000 cedars were planted at five years old, in my 67th year, in March and April, 1761. In September, 1761, I was at Goodwood, and saw these cedars in a thriving state. This day, October 20th, 1762, I paid Mr. Clark, for another large portion of cedars, for the Duke of Richmond. The duke's father was a great planter, but the young duke much exceeds him; for he intends to clothe all the lofty naked hills above him with evergreen woods. Great portions are already planted, and he annually raises for that purpose infinite numbers of pines, firs, and cedars." (MS. notes, communicated by Mr. Lambert to the *Linn. Soc. Trans.*, vol. x. p. 275.) Of the cedars at Goodwood, the present Duke of Richmond informed us, in 1837, that 139 remain. The cedar appears to have first produced cones in England, in the Chelsea Botanic Garden, about 1766: since which, partly from imported cones, and partly from cones ripened in this country, it has been extensively multiplied, and there are now few gentlemen's seats in Great Britain that do not possess several trees.

The first cedars planted in Scotland appear to have been some at Hopetoun House, which, tradition says, were brought thither by Archibald Duke of Argyll, in 1740. (See p. 102.) The date given by Dr. Walker, is 1748; but the same author elsewhere states that the cedar was not planted anywhere in Scotland till after 1730, thereby showing that he had no positive data as to the year of its introduction. Boucher, writing in 1775, says that he had raised more cedar trees than any other man in Scotland; and that he was the first who made them common in that part of the island. When it was introduced into Ireland is uncertain. (See p. 114.)

The cedar was not introduced into France till 1734, when Bernard De Jussieu, returning from his first visit to England, brought with him two plants, so small, that, to preserve them more securely, he is said to have carried them in the crown of his hat. One of these plants was placed on the mount in the Jardin des Plantes (see p. 137. and p. 2405.); and it was not known what had become of the other, till, in 1832, it was discovered by M. Mérat, at the Château de Montigny, near Montereau, a little town about eighteen leagues from Paris. This château was built by Daniel-Charles Trudaine, Intendant des Finances under Louis XV., and embellished by his son, Trudaine de Montigny; but, in 1836, it was in the possession of an English nobleman. (*Ann. d'Hort. de Paris*, xviii. p. 114.) The tree in the Jardin des Plantes was measured by Loiseleur Deslongchamps in January, 1812, and again in March, 1837. At the former period, the circumference of the trunk was 8 ft. 8 in.; and, at the latter, 10 ft. It was observed to this author, by Professor Desfontaines, that this cedar had been greatly injured by an accumulation of soil, which was

heaped up round the base of its trunk, as high as 3 ft., about 30 years ago; and indeed, had not the tree been planted on a mound of rubbish, which was dry, and consequently pervious to the atmosphere, the accumulation of soil must have killed it. The cedar at Montigny, planted at the same time as that in the Jardin des Plantes, but in a good soil, has a trunk at least one third larger than that of the tree in the Jardin des Plantes. A cedar planted on the estate of Du Hamel, at Vrigny, near Pithiviers, in 1743, had, in 1835, a trunk 12 ft. 8 in. in circumference, at the height of 6 ft. from the ground, and 16 ft. in circumference at the base. This tree is between 70 ft. and 80 ft. high, French (between 75 ft. 10 in. and 86 ft. 8 in. English), and is in a very flourishing state, resembling a magnificent pyramid. M. Loiseleur Deslongchamps mentions two other fine cedars at Vrigny, and several at Denainvilliers; both estates which belonged to the celebrated Du Hamel, and which are now the property of his grand-nephew, M. Fougeroux. Other remarkable cedars in the neighbourhood of Paris are, one in the ancient garden of the Maréchal des Noailles, at St. Germain; that in the garden Marbœuf, in the Champs-Élysées; those of Trianon, which are from 8 ft. to 10 ft. in circumference, at the height of a man from the ground; and one in the park at Franconville, seven leagues north from Paris, the property of M. A. Leroux, which, in May, 1837, had a trunk 12 ft. 3 in. in circumference at the base, and which was planted by a man who was still alive in 1837, and who was then 90 years of age. (*Hist. du Cèdre du Liban*, &c., p. 39.)

It appears from the ages and dimensions of these trees, that the cedar thrives fully as well in France as it does in England; and, as there is a great want of evergreens in the neighbourhood of Paris, and in all those parts of France which have an equally cold climate, it seems very desirable that the cedar should be more generally planted in that country than it at present is. The greatest planter of cedars in France appears to have been the father of the present Viscount Hericart de Thury, who, in 1780, planted many trees on the mountain of St. Martin-le-pauvre, Department de l'Oise. These trees, in 1837, Loiseleur Deslongchamps informs us, were in a state of the most vigorous vegetation. (*Ibid.*, p. 45.) The tree is propagated in all the principal French nurseries; partly from imported cones, and partly from cones ripened in the country.

The botanical history of the cedar is short. Dodonæus, and other ancient obtanists, called it *Cedrus magna*, the great cedar, adding other epithets; but all agreeing that it was one of the Conifera. Tournefort considered it a larch, and called it *Larix orientalis*; in which he was followed by Du Hamel. Miller called it *Larix Cædrus*. Linnæus considered it to be a pine; and his name for it of *Pinus Cædrus* has been adopted by most of the Continental and British botanists. Poiret, in his *Dictionnaire Encyclopédique*, calls it *Abies Cædrus*; and he has been followed by Loiseleur Deslongchamps, in his very able article on the cedar in the *Nouveau Du Hamel*, and in his *Histoire du Cèdre*, &c., received by us since this article has been in type; and by Dr. Lindley, in the *Penny Cyclopædia*. Barrelier, in his posthumous work, *Plantæ per Galliam, Hispaniam, et Italiam observatæ*, published in 1714, at Paris, by Jussieu, makes it a distinct genus, and calls it *Cædrus Libani*.

Poetical Allusions. The cedar is frequently mentioned by the Latin poets; but most of the allusions appear to have reference to the junipers that are called cedars, rather than to the cedar of Lebanon. Virgil, speaking of the forests of Caucasus, says,—

—“Dant utile lignum
Navigiis pinos, domibus cedrosque, cupressosque.”

Geor., ii. 442.

—“Heaven their various plants for use designs;
For houses cedars, and for shipping pines.

Dryden's Trans.

Ovid, in the first of his *Elegies*, says that an illuminated title, and paper stained with the juice of the cedar, would ill agree with the unhappy circumstances of their author:—

“Nec titulus minio, nec cedro charta notetur.”

Trist., i. 7.

Alluding to the custom of anointing the leaves of books with cedar juice, to preserve them from the depredations of the worm.

Lucan speaks of it as the breeding-place of the eagle; and Horace hopes that his verses will be as lasting as its wood.

Among the British poets, Spenser thus describes a cedar:—

“ High on a hill a goodly cedar grew,
Of wondrous length and straight proportion,
That far abroad her dainty odours threw,
’Mongst all the daughters of proud Lebanon.”

Churchill says,—

“ The cedar, whose top notes the highest cloud,
Whilst his old father Lebanon grows proud
Of such a child, and his vast body, laid
Out many a mile, enjoys the filial shade.”

Mason describes the cedar as spreading:—

— “ Cedars here
Coeval with the sky-crown’d mountain’s self,
Spread wide their giant arms.”

Thomson gives a beautiful picture:—

— “ On some fair brow
Let us behold, by breezy summers cool’d,
Broad o’er our heads the verdant cedar wave.”

Shakspeare’s lines on the fall of Warwick are well known:—

“ Thus yields the cedar to the axe’s edge,
Whose arms gave shelter to the princely eagle,
Under whose shade the ramping lion slept,
Whose top branch overpeer’d Jove’s spreading tree,
And kept low shrubs from winter’s powerful wind.”
Third Part of Henry VI., act v. sc. 3.

In the last scene of Henry VIII., Cranmer says, speaking of James I.,—

— “ He shall flourish,
And, like a mountain cedar, reach his branches
To all the plains about him.”

Shakspeare makes several other allusions to the cedar. Drayton calls it “ the tufted cedar;” and Fairfax, “ the proud cedar.” Spenser also calls it “ the cedar proud and tall;” and Sir Philip Sydney terms it “ queene of the woods.”

Many allusions to this tree are also found among the modern poets:—

— “ On high the cedar
Stoops, like a monarch to his people bending,
And casts his sweets around.” BARRY CORNWALL.

“ Down in a vale, where lucid waters play’d,
And mountain cedars stretch’d their downward shade.” MONTGOMERY.

The following lines from Southey allude to the power supposed to be possessed by the cedar of freeing itself from the snow. (See p. 2410.)

— “ It was a cedar tree
That woke him from the deadly drowsiness;
Its broad round-spreading branches, when they felt
The snow, rose upward in a point to heaven,
And, standing in their strength erect,
Defied the baffled storm.” *Thalaba.*

Moore says,—

“ Now upon Syria’s land of roses
Softly the light of eve reposes,
And, like a glory, the broad sun
Hangs over sainted Lebanon.” *Paradise and the Pert.*

“ As Lebanon’s small mountain flood
Is render’d holy by the ranks
Of sainted cedars on its banks!” *Lalla Rookh.*

The following verses of Racine are so well known, and so much admired, in France, that we quote them:—

“ J’ai vu l’impie adoré sur la terre :
Pareil au cèdre, il cachait dans les cieux
Son front audacieux ;
Il semblait à son gré gouverner le tonnerre,
Foulaît aux pieds ses ennemis vaincus :
Je n’ai fait que passer, il n’était déjà plus.”

Many other examples might be given; but these will suffice to show the use the poets have made of this tree.

Properties and Uses. The wood of the cedar is of a reddish white, light and spongy, easily worked, but very apt to shrink and warp, and by no means durable. The horizontal section, as Loiseleur Deslongchamps justly observes, exhibits the annual layers very distinctly marked. Each year has apparently two layers; the one narrow, close-grained, hard, and of a reddish brown; and the other three or four times broader, loose, spongy, and whitish. In general, the section of the trunk of a cedar bears a nearer resemblance to that of the silver fir, than to that of any other of the *Abiétinæ*. When the tree has grown on mountains, the annual layers are much narrower, and the fibre much finer, than when it has grown on plains; so much so, that a piece of cedar wood brought from Mount Lebanon by Dr. Pariset, in 1829, and which he had made into a small piece of furniture, presented a surface compact, agreeably veined, and variously shaded; and which on the whole may be considered handsome. (*Hist. du Cèdre*, &c., p. 43.) The weight of the wood of the cedar, according to Varennes de Fenille, is 29 lb. 4 oz. per cubic foot; but Mussenbrack makes it 42 lb. 14 oz., and Hassenfratz 57 lb. This enormous difference, says Baudrillart in the *Dictionnaire des Eaux et Forêts*, is enough to convince us that the wood could not be in the same state of dryness. The average of these weights gives 43 lb. per cubic foot; but it is doubtful whether the wood of the cedar weighs so much. Varennes de Fenille considers it as the lightest of the resinous woods; and he adds that it contains very little resin, that its grain is coarse, and that he thinks the wood can be neither so strong nor so durable as it has the reputation of being. He continues, that we cannot suppose that the temples of Jerusalem and Ephesus were of the dimensions stated; or, if they were, that the wood of the cedar of Lebanon was used in their construction. He is still more incredulous as to the statue of Diana having been sculptured of so soft a wood, and one the grain of which was so unequal and subject to crack; besides which, he says that the smell of the wood, so far from being fragrant, greatly resembles that of the pine. It is very liable to warp and split in drying, on which account it does not hold nails well (a remark which was made by Pliny); and it is unfit for use, except in large masses. A table which Sir Joseph Banks had made out of the Hillingdon cedar was soft, without scent (except that of common deal), and possessed little variety of veining; and the same remarks will apply to a table which we have had made from the plank already referred to, as having been kindly presented to us by J. Gostling, Esq., of Whitton Park. The wood of the cedar burns quickly, throwing out many sparks, though but little heat in comparison with that of the oak or the beech; though the flame of the cedar wood is more lively and brilliant, on account of the resin which it contains. The charcoal formed from it is very light, produces little heat, and becomes quickly covered with ashes, like the charcoal of the poplar and of the willow. The bark may be used in tanning; and, according to an analysis made by Professor Chevreuil, its astringent properties are, to that of the oak, as 12.75 is to 19.75. The resin of the cedar resembles that of the larch, but it is much less abundant. It flows from wounds made accidentally or by design in the bark, and from the scales of the cones, but no use is made of it. The resin is very abundant in the seeds, being, according to an analysis made by Professor Chevreuil, 41 per cent; while in those of the *Pinus Cembra* it is 21 per cent, in those of the *P. Pinaster* 24 per cent, and in those of the *P. Pinæa* 9½ per cent. The leaves which fall from the trees remain on the ground for several years before they become mould; and Loiseleur Deslongchamps, having seen a plantation of cedars of 15 years' growth, with a layer of decaying leaves and mould on the ground underneath the branches of ½ in. in thickness, and having learned also that this layer under the old trees of Mount Lebanon is above a foot thick, suggests the idea of planting the cedar on the poorest soils, with a view of ultimately enriching them, and rendering them fit for the growth of pasture

or corn. The pollen of the male flowers, which is produced in immense quantities, is a fine powder, of a lively yellow, without taste or smell; which inflames readily, and burns brightly, like that of the powder of the *Lycopèdon*, which it greatly resembles. It has been analysed by M. Macaire Prinsep (*Bib. univers. de Genève*, 1830, p. 45.), but it has not been yet applied to any useful purpose.

The wood called cedar by the ancients was supposed so incorruptible, that the expression of *dignus cedro* (worthy to be preserved in cedar) was applied to anything thought worthy of immortality; and, in allusion to this, Persius says, in his first satire, "*Et cedro digna locutus*" (worthy to be placed in cedar). The words "*cedro digna*" are often applied as a compliment at the present day. The resinous products of the tree were, like the wood, highly valued by the ancients. The Romans believed that the gum which exuded from this tree, and which they called *cedria*, had the property of preserving incorruptible every thing that was steeped in it. Vitruvius states that the leaves of papyrus, when rubbed with it, were never attacked by the worms; and Pliny, that the books of Numa, which were found uninjured in the tomb of that prince, 500 years after his death, had been steeped in the oil of cedar. The Egyptians also used this *cedria* in embalming their dead; and Pliny, Dioscorides, Scribonius Largus, &c., recommend the *cedria* for curing the toothache, and for various other complaints.

As an ornamental object, the cedar is one of the most magnificent of trees; uniting the grand with the picturesque, in a manner not equalled by any other tree in Britain, either indigenous or introduced. On a lawn, where the soil is good, the situation sheltered, and the space ample, it forms a gigantic pyramid, and confers dignity on the park and mansion to which it belongs; and it makes an avenue of unrivalled grandeur, if the trees are so far apart as to allow their branches to extend on every side. If planted in masses, it is, like any other species of the pine and fir tribe, drawn up with a straight naked trunk, and scarcely differs in appearance from the larch, except in being evergreen. This is exemplified at Kenwood, at Claremont, and other places near London. On the other hand, where the cedar is planted in masses, and a distance of 50 ft. or 60 ft. allowed between each tree, nothing in the way of sylvan majesty can be more sublime than such a forest of living pyramids. This is exemplified around the cedar tower at Whitton, and on the cedar bank at Pepper Harrow.

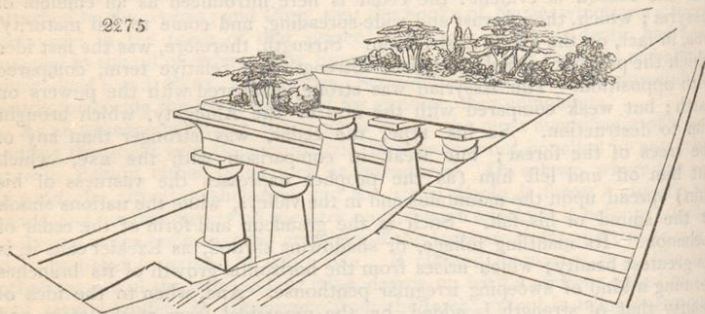
Gilpin, speaking of the cedar of Lebanon, says:—"To it preeminence belongs, not only on account of its own dignity, but on account of the respectable mention which is every where made of it in Scripture. Solomon spake of trees, from the cedar of Lebanon, to the hyssop that springeth out of the wall; that is, from the greatest to the least. The Eastern writers are, indeed, the principal sources from which we are to obtain the true character of the cedar, as it is an Eastern tree. In the sacred writers particularly, we are presented with many noble images drawn from its several qualities. It is generally employed by the prophets to express strength, power, and longevity. The strength of the cedar is used as an emblem to express the power even of Jehovah:—"The voice of the Lord breaketh the cedars of Lebanon." David characterises the palm tree and the cedar together, both very strongly.—'The righteous shall flourish like a palm tree, and spread abroad like a cedar of Lebanon.' The flourishing head of the palm, and the spreading abroad of the cedar, are equally characteristic. But the prophet Ezekiel hath given us the fullest description of the cedar:—"Behold, the Assyrian was a cedar in Lebanon, with fair branches, and with a shadowing shroud, and of a high stature; and his top was among the thick boughs. His boughs were multiplied, and his branches became long. The fir trees were not like his boughs, nor the chestnut trees like his branches, nor any tree in the garden of God like unto him in beauty." In this description, two of the principal characteristics of the cedar are marked: the first is the multiplicity and length of its branches. Few trees divide so many fair branches from the main stem, or spread over so large a compass of ground. 'His boughs are multi-

plied,' as Ezekiel says, 'and his branches become long;' which David calls spreading abroad. His very boughs are equal to the stem of a fir or a chestnut. The second characteristic is, what Ezekiel, with great beauty and aptness, calls his shadowing shroud. No tree in the forest is more remarkable than the cedar for its close-woven leafy canopy. Ezekiel's cedar is marked as a tree of full and perfect growth, from the circumstance of its top being among the thick boughs. Every young tree has a leading branch or two, which continue spiring above the rest till the tree has attained its full size: then it becomes in the language of the nurseryman, clump-headed; but, in the language of Eastern sublimity, its top is among the thick boughs; that is, no distinction of any spiry head, or leading branch, appears; the head and the branches are all mixed together. This is generally, in all trees, the state in which they are most perfect and most beautiful; and this is the state of Ezekiel's cedar. But, though Ezekiel hath given us this accurate description of the cedar, he hath left its strength, which is its chief characteristic, untouched. But the reason is evident: the cedar is here introduced as an emblem of Assyria; which, though vast and wide-spreading, and come to full maturity, was, in fact, on the eve of destruction. Strength, therefore, was the last idea which the prophet wished to suggest. Strength is a relative term, compared with opposition. The Assyrian was strong, compared with the powers on earth; but weak compared with the arm of the Almighty, which brought him to destruction. So his type, the cedar, was stronger than any of the trees of the forest; but weak in comparison with the axe, which cut him off and left him (as the prophet expresses the vastness of his ruin) spread upon the mountains and in the valleys, while the nations shook at the sound of his fall. Such is the grandeur and form of the cedar of Lebanon. Its mantling foliage, or shadowing shroud, as Ezekiel calls it, is its greatest beauty; which arises from the horizontal growth of its branches forming a kind of sweeping irregular penthouse. And, when to the idea of beauty that of strength is added, by the pyramidal form of the stem, and the robustness of the limbs, the tree is complete in all its beauty and majesty. In these climates, indeed, we cannot expect to see the cedar in such perfection. The forest of Lebanon is, perhaps, the only part of the world where its growth is perfect; yet we may in some degree perceive its beauty and majesty from the paltry resemblances of it at this distance from its native soil. In its youth, it is often with us a vigorous thriving plant; and, if the leading branch is not bound to a pole (as many people deform their cedars), but left to take its natural course, and guide the stem after it in some irregular waving line, it is often an object of great beauty. But, in its maturer age, the beauty of the English cedar is generally gone: it becomes shriveled, deformed, and stunted; its body increases, but its limbs shrink and wither. Thus it never gives us its two leading qualities together. In its youth, we have some idea of its beauty, without its strength; and in its advanced age, we have some idea of its strength, without its beauty: the imagination, therefore, by joining together the two different periods of its age in this climate, may form some conception of the grandeur of the cedar in its own climate, where its strength and beauty are united. The best specimen of this tree I ever saw in England was at Hillingdon, near Uxbridge. The perpendicular height of it was 53 ft., its horizontal expanse 96 ft., and its girth 15 ft. 6 in. When I saw it in 1776, it was about 118 years of age; and, being then completely clump-headed, it was a very noble and picturesque tree. In the high winds, about the beginning of the year 1790, this noble cedar was blown down. Its stem, when cut, was 5 ft. in diameter." (*For. Scen.*, i. p. 81.) On these observations of Gilpin we shall only remark, that there are now, 1837, 60 years after Gilpin saw the cedar at Hillingdon, many hundred cedars in England more grand and picturesque than that tree; and, not to go further than Syon, Whitton, and Pain's Hill, there are at these places, cedars which are both higher, and cover a larger space with their branches, than that at Hillingdon. With respect to the age which Gilpin assigns to the Hillingdon

tree, it is probably incorrect; if otherwise, it must have been upwards of 20 years older than those at Chelsea.

Mr. Thompson, an artist, writing in the *Gardener's Magazine* on the effect of the cedar in landscape scenery, observes that "there is something even architectural in the form of the cedar; the thick upright stem, and the horizontal branches which it supports, in a great measure accord with the pillars and copings of buildings. This may be seen by reference to the inspired pictures of Martin, when Assyrian history has been the subject of his pencil. He has realised all that the most vivid imagination could conceive of Eastern splendour; and the famous hanging gardens have not been forgotten. In them the cedar is the most prominent tree, which he has shown mixed with cypresses and a few low shrubs and flowers, forming a mass simple but grand, and quite in unison with the architectural character of the scene. The accompanying sketch (*fig. 2275.*) is from an etching of the destruction of Babylon, and represents part of the hanging gardens. Thus it may be inferred that

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cedars should always be the accompaniment of palaces, public buildings, and superior residences. The finest cedars I have seen are at Blenheim; but even there they are not much contrasted with the architecture, but are spread generally throughout the whole of the gardens; and they appeared to me in a great measure lost, from being so mixed up with other trees and shrubs: however, they serve to maintain the character of grandeur which belongs to the place. On the banks of the great lake, where the present duke, since he left White Knights, has formed his new flower-garden, extending from the house to the cascade, there are some very fine cedars; and it is curious to observe how well they accord with the simplicity of garden scenery: but this may be accounted for by their being supported by other large trees, from the extensiveness of the gardens, and from every thing around them being on so grand a scale. There are some garden scenes in which cedars would be found not only misplaced, but out of character, and injurious: as, for example, in the grounds of a small modern villa, they would be quite at variance with our ideas and associations as to what should attach to such a place. The accompanying sketch (*fig. 2276.*), though it forms a tolerable picture, will, I trust, illustrate what I have been stating. The villa is rendered insignificant by the stately presence of the cedars; and the cedars seem to have been there before the villa was built, as if they came by accident, and were foreign to the scene. In the next sketch (*fig. 2277.*), where I have supplied their place with a few pendent and appropriate trees, the picture produced seems more consistent, more complete, and in better keeping. The form and character of the cedar are not suited to anything on a small scale, or that betrays want of effect in its architectural features, or in the disposition of the ground: thus, one would not place them in the centre of a home meadow or arable field, where oaks and elms are sometimes met with having a very good effect; nor should they ever appear where the scenery is either domestic, homely, or tame. Nothing is more offensive, than to find a cedar, a cypress, or other stately tree, con-

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trasting itself with hay-ricks, corn stacks, and dovecots, in the garden of some old farm-house; which, though little remains of its former greatness, might originally have been the residence of the lord of the manor, or of some titled person. When, however, any of these old-fashioned red-brick residences are to be met with in their original state, their terraces adorned with vases and figures; their gardens in the old geometric style, with costly iron palisading, &c.; a few venerable cedars will generally form a highly grand and picturesque addition to the scene. Cedars will not bear to be planted too thickly, or too close together: they should be placed by twos and threes, in conspicuous situations, such as on small mounds, or by the side of water, next to bridges or temples; sometimes on lawns, or rising grounds, that command extensive prospects, where they may serve as a foreground; but they must not be made common by being seen at every turn. Too many cedars, in any situation, will always destroy their own effect: they are of such an exclusive character, that they are more calculated to act upon a scene as figures do in landscape composition, than to form the basis of it. A red-coated soldier or two would enliven a view, but a file of them would be any

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thing but picturesque: unless, indeed, in a battle scene, where they formed the principal feature. So it should be with the cedars: if they must be together, let them form a grove; they would then have a character of gloomy magnificence, which might be a very fine addition to a residence. I should imagine that such a grove of full-grown cedars would be highly interesting and attractive. We will just suppose that the banks of an artificial river or lake were bounded on one side by grassy hills, planted with a few evergreens and birches, and that the other side was a gentle slope, covered with a grove of cedars; that a winding and almost natural path conducted you among their



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ponderous trunks; that the grass was kept tolerably free from weeds; that hollyhocks, peonies, roses, and other flowers of a large and imposing character, were raising their heads here and there; and that the woodbine was also twining around some of the trees: then suppose a clear summer evening, the water reflecting the yellow light of the sunset, and the trunks of the cedars touched by its rays; and I think we shall have conceived one of the calmest and most solemn scenes that could be found in nature, or that it is in the power of art to create. In the above sketch (*fig. 2278.*), I have endeavoured to convey some idea of the subject; but the smallness of the scale, and the absence of colour, are much against my portraying such a scene.

“I would not recommend the introduction of cedars into plantations or belts, as they are generally lost amidst the other trees; and, if brought to the margin of the plantation, they form too violent a contrast with what is around them. They may be sparingly introduced in clumps; but, when they are, they should always take the lead: a few dwarf round-headed trees or shrubs, with the poplar or cypress, are the best forms to group with them. (*See fig. 2279.*)

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However, they are much better solitary; and in the fore courts of palaces, or other buildings of sufficient consequence, I would have nothing but a cedar or two. It is said that the New Palace at Pimlico is to have a large area before it, surrounded by a railing of mosaic gold: the broad carriage-way, the dark grass, and a few cedars, are all that I would introduce in it; unless it were a very few flowering shrubs, hollyhocks, or standard roses, and these not in dug beds, but on the grass. There are two cedars on a small mound at Syon House, which may be viewed from the Thames, and which are sure to attract

the attention of every artist. I have seen numerous sketches and drawings of the scene around them, and I may venture to say that it was the cedars, and they only, that were the inducement. Those in the Botanic Garden at Chelsea (see fig. 2270. in p. 2405.) are never passed unheeded; thus showing how valuable cedars are in landscape composition, and, consequently in landscape-gardening." (*Gard. Mag.*, i. p. 122.)

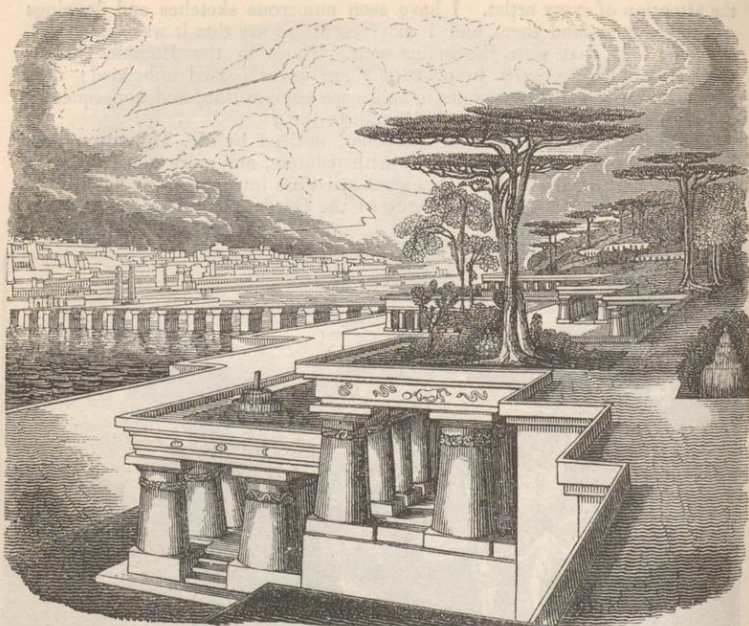
The architectural character of the cedar, noticed by Mr. Thompson, has rendered this tree a great favourite with painters, and more especially with the justly celebrated Martin. This great artist has introduced the flat head of the aged cedar into his imaginary view of the Garden of Eden (*fig. 2280.*);

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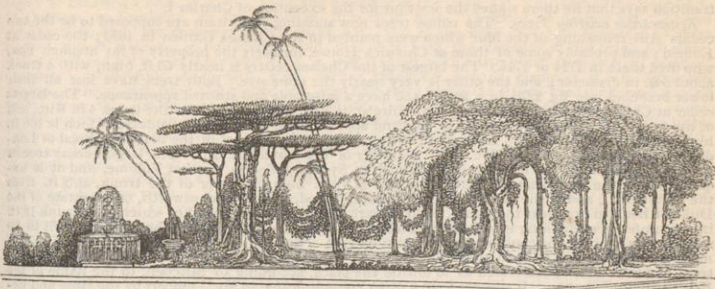
into the terraces of the gardens of Babylon (*fig. 2281.*); and into his *beau idéal* of the gardens of Nineveh (*fig. 2282.*), as shown in his celebrated picture of the fall of that city.

Soil, Situation, Propagation, &c. The cedar, as may have been observed in the case of the Chelsea trees, thrives well in dry gravelly soils, where the roots can have access to water; which may be said to be the case with most of the *Abiétinæ*. Perhaps it may be sufficient to observe, that the cedar will grow in every soil and situation suitable for the larch. We are not certain that it will grow equally well with that tree at great elevations; though we have little doubt of it, provided it were planted in masses. In the neighbourhood of London, it has certainly attained the largest size in deep sandy soil, as at Syon, Whitton, and Pain's Hill; but the sand at these places is not poor; and at Whitton, where the tree has attained the greatest height and bulk, the roots are within reach of water. Boutcher observes that no tree will grow in more forbidding, poor, and hungry soil, than the cedar; and he instances, in proof of this, the trees on Mount Lebanon; but these, in point of height and the spread of the branches, are mere bushes in comparison with those at Whitton. The cones, which, as already observed, are not ripe till the autumn of the third year, will keep five or six years after being taken from the tree, so that there is never any risk of getting seeds too old to vegetate, in purchasing the cones that are imported from the Levant. If cones produced in Britain are kept a year after being gathered, they may be opened with greater ease than when recently taken from the tree. To facilitate the operation of extracting the seeds, the cones may be steeped in water for a day or two, and afterwards split by driving a sharp conical iron spike through their



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axis. The scales being then opened with the hand, the seeds readily come out. The following mode of extracting the seeds is recommended by M. Loiseleur Deslongchamps:—"As good seeds are never found within 6 or 8 lines of either the base or the summit of cones, the extreme ends of each cone are first sawn off; the cones, for this purpose, being put into a vice. After this a hole may be drilled through the axis, or they may be split in the manner already recommended. According to M. Loiseleur Deslongchamps, a workman will prepare 20 cones in an hour; each cone, if somewhat large, will contain 100 seeds, and consequently one man may separate 20,000 seeds in a day. The smaller cones contain from 30 to 60 seeds; and the larger from 110 to 170 seeds, exclusive of from 10 to 15 per cent of abortive seeds." (*Hist. du Cèdre, &c.*, p. 50.) These abortive seeds are filled with a soft resinous matter, instead of a kernel; and they may easily be separated from the perfect seeds, by throwing the whole into water before sowing. The seeds ought to be committed to the soil immediately after being taken out of the cones; more especially if the latter have been steeped, because in that case the seeds have swelled, and might be injured, if left to shrink. If the seeds are sown in March or April, they will come up in a month or six weeks; and still sooner if they have been steeped. Like the other *Abiétinæ*, they should be sown in light rich soil, and covered thinly. Sang recommends the covering to be $\frac{3}{4}$ in. deep; and this depth may be diminished or increased, according to the lightness or heaviness of the soil. The seeds may be either sown in beds in the open garden, or in large flat pots or boxes; but the latter is the more convenient mode, as it admits of preserving the whole of the roots in transplanting. The plants rise 3 in. or 4 in. high the first year, with scarcely any taproots; but these increase afterwards, as the plants advance in size. At the end of the first year, the seedlings may be transplanted into nursery lines, or, what is more convenient, into small pots; and, in commercial nurseries, they should every year be shifted into pots a size larger, till they are sold



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In private nurseries, where the plants are not likely to be sent to any distance, they may be planted in the free soil in nursery lines, like the pinaster and other of the more rare pines and firs; and, when they are removed to their final situation, their roots may be protected from the air, by immersing them in mud or puddle. In the nursery culture of the cedar, care must be taken not to injure the leading shoot, which is said not to be readily renewed when broken off. In general, it is advisable to tie the leader to a stake, till the plants are placed where they are finally to remain; after which they may be left to themselves. In their progress from young plants to full-grown trees, they require very little pruning, and suffer severely when large branches are cut off. Miller mentions two of his four trees, which had some branches cut off to admit the rays of the sun into a green-house, whereby they were so much checked, as, in above 40 years' growth, to be little more than half the size of the other two, which were not pruned; and, Boucher having planted two trees, they grew for 16 years amazingly fast, and promised to be noble plants, till an ignorant gardener unadvisedly cut off several of their oldest under branches; after which, he says, they advanced little or nothing in height, lost their leading shoots, and became ragged and bushy. Notwithstanding this, it is the practice of nurserymen to shorten the lateral branches of the larger plants kept for sale; and it does not appear that they suffer much by it. When the cedar is planted in close masses, either alone or with other trees, the side branches are choked, but still the tree continues to grow almost as rapidly as the larch, or silver fir, when similarly treated; so that, after all, the cedar is, perhaps, not more injured by the removal of its side branches, than any other pine or fir would be. All the *Abiétinæ*, as we have before stated, suffer more or less by the shortening or removal of branches, whether small or large, which have not begun to decay.

Accidents, Diseases, &c. The wide-spreading branches of the cedar are apt to be weighed down and broken by heavy falls of snow; but the tree is less liable to be blown down by high winds than the larch, or such pines and firs as do not throw out wide-spreading branches near the ground. It is not subject to diseases, and it is less liable to be attacked by insects, as far as we have heard or observed, than any other species of the pine and fir tribe. The seeds being large are eagerly sought after by squirrels; but these animals, in parks and pleasure-grounds, are generally considered more ornamental than injurious.

Statistics. Recorded Trees. The large tree at Hillingdon has been already mentioned, and its dimensions are given in p. 59. The dimensions of the large cedar at Hendon are given in p. 57.; and those of the Enfield cedar in p. 48. Another remarkable tree, not so well known as the above, is that already noticed as having been planted by Sir Stephen Fox, in his native village, and burial place, of Farley, near Salisbury, about the same time as, or before, those at Chelsea and Chiswick. The Farley cedar was cut down by the late Earl of Radnor in 1812, and was then 66 ft. high; the diameter of the trunk 5 ft. 6 in., and that of the space covered by its branches, from east to west, 130 ft. It was a remarkably sound tree, not a single branch being decayed. The Hammersmith cedar (fig. 2272. in p. 2406.), cut down in 1836, was 59 ft. high, the diameter of the trunk about 5 ft., and

of the head 80 ft. The house to which it belonged was once the residence of Oliver Cromwell; and tradition says that he there signed the warrant for the execution of Charles I.

Remarkable existing Trees. The oldest trees now standing in Britain are supposed to be the two cedars still remaining of the four which were planted in the Chelsea Garden in 1683; the cedar at Enfield; and probably some of those at Chiswick House, formerly the property of Sir Stephen Fox, who died there in 1714 or 1715. The largest of the Chelsea cedars is nearly 60 ft. high, with a trunk about 5 ft. in diameter; and the other is very nearly the same size. Both trees have lost all their lower branches (see fig. 270, in p. 2405.), and have a miserable and stunted appearance. The largest cedar at Chiswick (now the Duke of Devonshire's) is 70 ft. high, diameter of the trunk 4 ft. 6 in., and of the head 65 ft. The loftiest cedar in England appears to be one at Strathfieldsaye, which is 108 ft. high, diameter of the trunk 3 ft., and of the head 74 ft. The highest in the neighbourhood of London is at Claremont, and is 100 ft. high, diameter of the trunk 5 ft. 6 in. The largest cedar tree in England is, probably, the magnificent specimen at Syon, figured in our last Volume, and it is unquestionably the handsomest. This noble tree is 72 ft. high, diameter of the trunk, at 3 ft. from the ground 8 ft., and of the head 117 ft. At Charley Wood, near Rickmansworth, on an estate of the Duke of Bedford are, near the house, eight remarkable cedars, the largest of which has a trunk 18 ft. in circumference, dividing into 12 large limbs, from which spring 32 branches, of a size fit to be measured as timber, and containing 615 solid cubic feet. The head covers a space nearly 100 ft. in diameter, or about the sixth of an acre. The cedars at Wilton, near Salisbury, are also remarkably fine trees, and were once so celebrated as to entitle the place, according to Mitchell, to the name of the British Mount Lebanon. It appears from a paper communicated to Mr. Lambert by the Hon. and Reverend William Herbert, that the cedars at Wilton were probably raised between 1710 and 1720. He adds, that they were kept by "the Countess of Pembroke, in pots at her window; till, growing too large, they were planted upon the lawn between the house and the water; a situation very favourable to their growth." The largest of these trees measured, in 1835, at 3 ft. from the ground, nearly 7 ft. in diameter; and at 1 ft. from the ground, 8 ft. 9 in. in diameter. (See an able paper on the subject of the cedar, by the Rev. J. Mitford, in the *Gent. Mag.*, 2d ser., vol. iv. p. 579.) "There is a cedar, at Osgood Hanbury's, near Coggeshall, in Essex, which is of interest, as it was planted by Collinson's own hand, 67 years since, in 1768. We transcribe the memorandum on the subject very kindly sent us by Mr. Hanbury:—"In token of the love and friendship which has for so many years subsisted between myself and my dear friend John Hanbury and his family, and as a lasting memorial of that friendship, I desire that one guinea may be given to my sincere friend Osgood Hanbury, to purchase of Gordon two cedars of Lebanon, to be planted in two places of the new part of the park last taken in. Let the occasion of the said cedars and of their ages be registered in the Great Bible at Coggeshall, that succeeding generations may know our friendship, and the antiquity of these trees. To my worthy friends Osgood Hanbury and his son, I recommend their care and protection. P. Collinson." (*Ibid.*, p. 579.)

Cedrus Libani in the Environs of London. At Syon is the tree already mentioned, and another (var. *glauca*), which is 77 ft. high, diameter of the trunk 5 ft. 6 in., and of the head 57 ft. This is a fine upright tree, with a different character from the first. At Mount Grove, Hampstead, it is 65 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 68 ft. At Whitton Place, Twickenham, there are many large cedars, one of which is 75 ft. high, with a trunk 5 ft. in diameter. At Pope's Villa, it is 85 ft. high, with a trunk 4 ft. in diameter. At Kenwood, Hampstead, 40 years planted, it is 90 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 40 ft. At Ham House, it is 42 ft. high; the diameter of the trunk 3 ft. 6 in., and of the head 73 ft.; another has a trunk 4 ft. 4 in. in diameter at 5 ft. from the ground. At Gunnersbury Park, it is 69 ft. high, the diameter of the trunk 5 ft. 6 in., and of the head 86 ft.; and there are many other fine specimens. At Charlton, it is 55 ft. high, diameter of the trunk 4 ft. At Stamford Hill, it is 63 ft. high, diameter of the trunk 5 ft. 6 in., and of the head 109 ft. At Hanwell is one with a trunk 5 ft. 4 in. in diameter.

Cedrus Libani South of London. In Devonshire, at Luscombe, 30 years planted, it is 47 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 40 ft.; at Haldon House, 35 years planted, it is 40 ft. high; at Endsleigh Cottage, 30 years planted, it is 35 ft. high. In Dorsetshire, at Melbury Park, 10 years planted, it is 28 ft. high. In Hampshire, at Strathfieldsaye, it is 108 ft. high, the diameter of the trunk 3 ft., and of the head 74 ft.; at Farnham, 50 years planted, it is 70 ft. high, the diameter of the trunk 4 ft., and of the head 75 ft.; at Testwood, 70 years planted, it is 51 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 44 ft. In Somersetshire, at Leigh Court, 14 years planted, it is 30 ft. high; at Nettlecombe, 64 years planted, it is 37 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 61 ft.; at Crowcombe Court are two remarkably fine specimens, from 50 ft. to 70 ft. high, the diameter of their trunks 6 ft., and of their heads 80 ft. to 90 ft. In Surrey, at Bagshot Park, 22 years planted, it is 25 ft. high; at St. Ann's Hill, it is 50 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 72 ft.; this tree was planted, about 1794, by the Honourable Mrs. Fox; at Claremont, in front of the house, it is 100 ft. high, with a trunk 5 ft. 4 in. in diameter; and another in the park is 100 ft. high; at Ockham Park, 34 years planted, it is 45 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 36 ft.; at Walton on Thames, 60 years planted, it is 63 ft. high, with a head 60 ft. in diameter; at Deepdene, 9 years planted, it is 16 ft. high. In Sussex, at Goodwood Park, are 139 cedars, the highest of which is between 60 ft. and 70 ft.; they are all on thin dry soil on chalk: at Cowdrey, it is 60 ft. high, with a trunk 4 ft. 6 in. in diameter; at Kidbrooke, 25 years planted, it is 40 ft. high; at Westdean, 90 years planted, it is 64 ft. high, the diameter of the trunk 4 ft., and of the head 80 ft.; at Slaugham Park, 10 years planted, it is 18 ft. high. In Wiltshire, at Bowood, 50 years planted, it is 60 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 62 ft.; at Wilton House are several large cedars, 170 years old, one of which has a trunk 8 ft. 8 in. in diameter at 1 ft. from the ground.

Cedrus Libani North of London. In Bedfordshire, at Woburn Abbey, are many fine cedars, nine of which are noble trees, varying from 62 ft. to 84 ft. in height, and their trunks from 4 ft. to nearly 6 ft. in diameter; at Ampthill is a cedar 85 years planted, which is 55 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 80 ft.; at Flitwick, 19 years planted, it is 20 ft. high, with a trunk 1 ft. 1 in. in diameter; at Southill, 70 years planted, it is 50 ft. high, the diameter of the trunk 3 ft., and of the head 45 ft. In Berkshire, at High Clere, are several fine cedars; the two oldest were to their present situation when 30 years old; and the largest was raised from a cone borne by the Wilton cedars, in 1772; at Bear Wood, 10 years planted, it is 15 ft. high; at Ditton Park, 90 years planted, it is 80 ft. high, with a trunk 5 ft. in diameter; at White Knights, 75 years planted, it is 50 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 60 ft. In Buckinghamshire, at Temple House, 40 years planted, it is 45 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 33 ft.; at Beaconsfield, planted by Waller the poet, 80 ft. high, with a trunk 2 ft. 6 in. in diameter. In Cambridgeshire, at Gamlingay, 112 years old, it is 60 ft. high, the diameter of the trunk 3 ft. 9 in. In Cardiganshire, at Hafod, 40 years planted, it is 32 ft. 6 in. high, diameter of the trunk 1 ft. 2 in. In Cheshire, at Kimmel Park, 30 years planted, it is 30 ft. high; at Eaton Hall, 13 years planted, it is 16 ft. high. In Caermarthenshire, at Golden Grove, it is 50 ft. high. In Den-

highshire, at Llanbede Hall, 14 years planted, it is 18 ft. high. In Derbyshire, at Hassop, it is 24 ft. high; at Elvaston Castle, it is 73 ft. high, the diameter of the trunk 4 ft. 8 in., and of the head 76 ft. In Durham, at Southend, 28 years planted, it is 30 ft. high. In Essex, at Audley End, 72 years old, it is 60 ft. high, the diameter of the trunk 4 ft., and of the head 73 ft.; at Hylands, 10 years planted, it is 26 ft. high; at Faulkbourne Hall, it is 80 ft. high, the diameter of the trunk 6 ft. 6 in., and of the head 100 ft.; at Thorndon Hall, it is 40 ft. high, with a trunk 4 ft. in diameter; at Short Grove is a remarkable cedar, 80 ft. high, with a trunk 4 ft. 4 in. in diameter at 1 ft. from the ground. About 13 ft. from the ground is a large limb, very nearly the size of the trunk; and a small branch from this limb grows, or is inoculated into the trunk. There are 68 cedars on this estate. In Gloucestershire, at Doddington Park, 35 years planted, it is 36 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 60 ft. In Herefordshire, at Eastnor Castle, 18 years planted, it is 30 ft. high; at Hatfield, 13 years planted, it is 25 ft. high. In Hertfordshire, at Aldenham Abbey, 34 years planted, it is 50 ft. high, the diameter of the trunk 2 ft., and of the head 30 ft.; at Cashio-bury, 30 years planted, it is 45 ft. high, the diameter of the trunk 2 ft., and of the head 42 ft.; at Cheshunt, 20 years planted, it is 22 ft. high. In Lancashire, at Latham House, 30 years planted, it is 23 ft. high. In Leicestershire, at Quenby Hall, a cedar supposed to be among the first planted in England, the seeds of which were brought from the Levant by Mr. William Ashby, a Turkey merchant, between 1680 and 1690 (see *Gard. Mag.*, vol. vii. p. 423.); at Wharton House, 30 years planted, it is 36 ft. high, the diameter of the trunk 2 ft. 2 in., and of the head 48 ft.; at Donnington Park, 80 years planted, it is 62 ft. high, the diameter of the trunk 8 ft. 6 in., and of the head 68 ft. In Lincolnshire, at Scrievelsby, there are many fine cedars of different varieties, and of great age and size. In Northumberland, at Woolsington, 20 years planted, it is 20 ft. high. In Norfolk, at Merton, is a cedar 78 ft. high, with a trunk nearly 4 ft. in diameter. In Nottinghamshire, at Clumber Park, var. *glauca* is 80 ft. high, the diameter of the trunk 3 ft. 11 in., and of the head 44 ft.: at Worksop Manor, it is 64 ft. high, the diameter of the trunk 4 ft., and of the head 63 ft.; another, 100 years old, is 63 ft. high, the diameter of the trunk 5 ft., and of the head 61 ft. In Northamptonshire, at Castle Ashby, one 80 years old is 72 ft. high, with a trunk nearly 5 ft. in diameter, and a conical well-shaped head; another, 68 ft. 7 in. high, has a trunk about the same size: at Wakefield Lodge, 20 years planted, it is 25 ft. high. In Oxfordshire, at Oxford, in the Botanic Garden, 40 years planted, it is 30 ft. high, the diameter of the trunk 1 ft. 3 in., and of the head 27 ft. In Pembrokeshire, at Stackpole Court, 35 years planted, it is 38 ft. high, the diameter of the trunk 2 ft. 8 in., and of the head 51 ft. In Rutlandshire, at Belvoir Castle, 28 years planted, it is 30 ft. high. In Shropshire, at Hardwicke Grange, 10 years planted, it is 19 ft. high; at Willey Park, 19 years planted, it is 26 ft. high; another, 15 years planted, is 38 ft. high; at Kinet, it is 27 ft. high, the diameter of the trunk 2 ft., and of the head 26 ft. In Staffordshire, at Trentham, it is 60 ft. high, the diameter of the trunk 4 ft., and of the head 50 ft.; at Blithfield, 48 years planted, it is 52 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 36 ft.; at Teddesley Park, 14 years planted, it is 26 ft. high; at Rolleston Hall, 30 years planted, it is 25 ft. high; at Wrottesley House, it is 60 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 42 ft. In Suffolk, on the lawn at Hardwicke, it is 50 ft. high, the diameter of the trunk 5 ft., and of the head 43 ft.; at Finborough Hall, 80 years planted, it is 80 ft., the diameter of the trunk 4 ft. 3 in., and of the head 80 ft.; at Stretton Parsonage, there is one 90 years old, with a trunk 5 ft. in diameter; at Wolveston Hall, it is 65 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 80 ft.; at Campsey Ash is a group of 8 or 10, with trunks from 4 ft. to 6 ft. in diameter; at Ampton Hall, is one with a trunk 5 ft. in diameter, and the diameter of the head 90 ft. In Warwickshire, at Combe Abbey, it is 47 ft. high, the diameter of the trunk 4 ft., and of the head 80 ft. In Worcestershire, at Hagley, is one with a trunk 5 ft. 4 in. in diameter, and the diameter of the head 85 ft.; at Croome, 80 years planted, it is 100 ft. high, the diameter of the trunk 5 ft., and of the head 120 ft. In Yorkshire, at Hackness, 12 years planted, it is 11 ft. high; at Grimston, 13 years planted, it is 12 ft. high.

Cedrus Libani in Scotland. In the Experimental Garden at Inverleith, 10 years planted, it is 10 ft. high; at Gosford House, 30 years planted, it is 20 ft. high; at Beil, 110 years old, it is 54 ft. 6 in. high, the diameter of the trunk 4 ft. 7 in., and of the head 67 ft.; at Hopetoun House, 86 years planted, it is 68 ft. high, the diameter of the trunk 4 ft. 6 in., and of the head 81 ft.; at Ratho are many fine cedars, with trunks from 3 ft. to 5 ft. in diameter. In Ayrshire, at Loudon Castle, it is 30 ft. high, with a trunk 4 ft. in diameter. In Berwickshire, at the Hirsch, 30 years planted, it is 23 ft. high. In Kirkcudbright, at Cassinacrie, it is 50 ft. high, the diameter of the trunk 3 ft. In Haddingtonshire, at Tynninghame, 24 years planted, it is 27 ft. high, the diameter of the trunk 1 ft., and of the head 27 ft. In Aberdeenshire, at Thainston, 20 years planted, it is 9 ft. high. In Argyllshire, at Toward Castle, 15 years planted, it is 13 ft. high; at Roseneath Castle, 45 ft. high, the diameter of the trunk 2 ft. 6 in. In Bute, at Mount Stewart, 12 years planted, it is 13 ft. high. In Banffshire, at Gordon Castle, it is 33 ft. high, with a trunk 1 ft. in diameter; at Huntley Lodge, 10 years planted, it is 14 ft. high; at Cullen House, it is 44 ft. high, the diameter of the trunk 2 ft., and of the head 44 ft. In Fifeshire, at Danibristle Park, 12 years planted, it is 12 ft. high. In Forfarshire, at Gray House, it is 60 ft. high, the diameter of the trunk 5 ft. 6 in., and of the head 65 ft.; at Invergowie is one with a trunk 4 ft. in diameter. In Perthshire, at Taymouth, 40 years planted, it is 35 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 20 ft.; at Perth, in the nursery of Messrs. Dickson and Turnbull, 15 years planted, it is 19 ft. high. In Ross-shire, at Brnash Castle, 50 years planted, it is 40 ft. high, the diameter of the trunk 2 ft., and of the head 36 ft. In Stirlingshire, at Blair Drummond, 50 years planted, it is 45 ft. high, diameter of the trunk 1 ft. 6 in., and of the head 25 ft.; at Airthrey, 35 years planted, it is 36 ft. high, the diameter of the trunk 11 in., and of the head 19 ft.; at Callender Park, 15 years planted, it is 21 ft. in height.

Cedrus Libani in Ireland. In the Glasnevin Botanic Garden, 35 years planted, it is 24 ft. high, the diameter of the trunk 2 ft., and of the head 27 ft.; at Cypress Grove is a cedar of dwarfish growth, 10 ft. high, and covering a space 6 ft. in diameter; at Terenure, 20 years planted, it is 18 ft. high; at Glasnevin is a fine specimen, with a trunk 2 ft. 6 in. in diameter, and clear to the height of 20 ft.; at Colonel Conolly's, Castletown, it is 28 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 50 ft. In Antrim, at Antrim Castle, 10 years planted, it is 17 ft. high. In Fermanagh, at Florence Court, 35 years planted, it is 36 ft. high, the diameter of the trunk 2 ft., and of the head 30 ft. In Louth, at Oriel Temple, 35 years planted, it is 33 ft. high, the diameter of the trunk 1 ft. 8 in., and of the head 28 ft.

Cedrus Libani in Foreign Countries. In France, in the Jardin des Plantes, 100 years old, it is 80 ft. high, the diameter of the trunk 3 ft. 6 in., and of the head 85 ft.; at Fromont, 32 years planted, it is 58 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 36 ft.; in the Botanic Garden at Toulon, 18 years planted, it is 22 ft. high; at Barres, 28 years planted, it is 28 ft. high; at Nantes, in the nursery of M. Nerrières, 40 years planted, it is 50 ft. high, with a trunk 4 ft. in diameter; in the Botanic Garden at Avranches, 24 years planted, it is 40 ft. high. In Germany, it will not stand out

without protection, and, consequently, there are no large trees. In Saxony, at Wörlitz, is one 16 years planted, which is 25 ft. high. In Italy, in Lombardy, at Monza, 24 years planted, it is 24 ft. high, the diameter of the trunk 16 in., and of the head 24 ft.

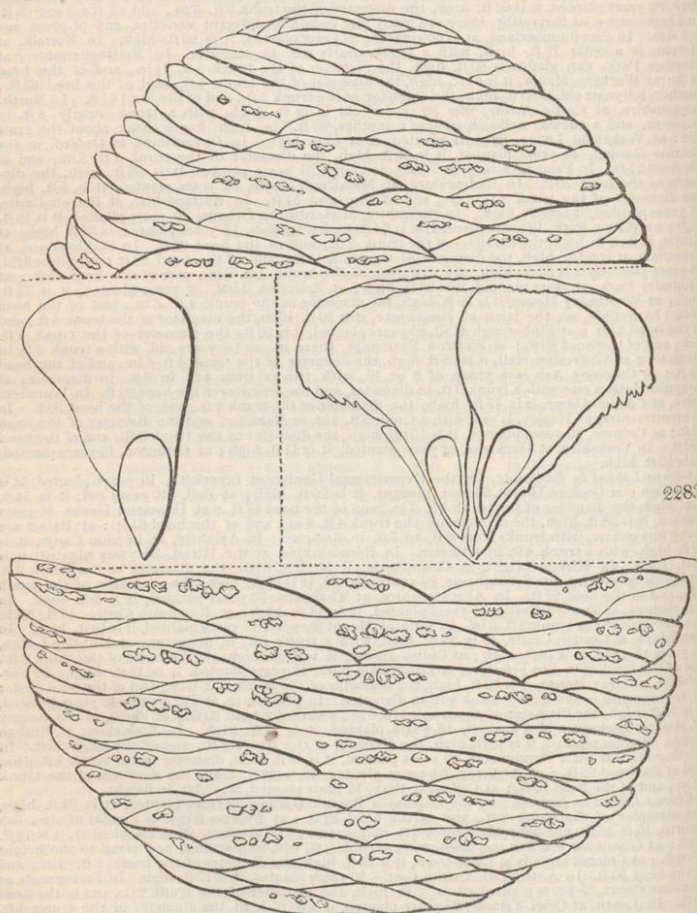
Commercial Statistics. Price of cones, in London, 6*d.* each; plants in pots, 1 ft. high, 2*s.* 6*d.* each; 2 ft. high, 3*s.* 6*d.* each; 5 ft. high, 5*s.* each: and 10 ft. high, 1*l.* each. At Bollwyller, plants 1 ft. high, from 2 to 4 francs; and at New York, from 2 to 3 dollars.

† 2. *C. Deodàra* Roxb. The Deodara, or Indian, Cedar.

Identification. Roxb. Fl. Ind. ined.; Laws. Man., p. 381.

Synonymes. *Pinus Deodàra* Lamb. Pin., ed. 2., t. 52.; *Abies Deodàra* Lindl. in Penn. Cyc.; *Devadara*, or *Deodara*, *Hindostance*; the sacred Indian Fir.

Engravings. Lamb. Pin., ed. 2., t. 52.; our fig. 2283. to our usual scale; and figs. 2284. and 2286. of the natural size.



Spec. Char., &c. Leaves fascicled, evergreen, acute, triquetrous, rigid. Cones twin, oval, obtuse, erect; scales adpressed. (*Lamb. Pin.*) Cones from 4½ in. to 5 in. long; and from 3½ in. to 3¾ in. broad. Seed with the wing nearly 1½ in. long; scale about the same length, and 2 in. broad. A native of

the Nepal and Indo-Tataric mountains, at 10,000 ft. or 12,000 ft. above the level of the sea. Introduced in 1822.

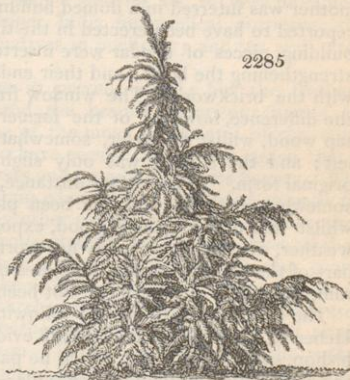
Varieties. According to Dr. Lindley, two varieties, or perhaps nearly allied species, called the Shinlik and Christa rooroo, are mentioned by Moorcroft as natives of the forests of Ladakh. (*Penn. Cyc.*)

Description. A lofty and very graceful tree, sometimes attaining the height of 150 ft., with a trunk 30 ft. in circumference, or even more; and rarely, in the Himalayas, falling very far short of these dimensions. The branches are ample and spreading; ascending a little near the trunk of the tree, but drooping at the extremities. The wood is compact, of a yellowish white, and strongly impregnated with resin. The bark is greyish, and, on the young branches, covered with a glaucous bloom. The leaves are either solitary or tufted, and are very numerous: they are larger than those of *C. Libani*, and of a bluish but dark green, covered with a light glaucous bloom. The male catkins are upright, without footstalks; cylindrical, somewhat club-shaped; and yellowish, tinged with red. The cones are upright, generally in pairs, on short, thick, woody footstalks; of nearly the same shape as those of the cedar of Lebanon, but broader and longer; slightly tapering at the base, and somewhat more pointed at their summit. They are of a rich reddish brown, very resinous, and with the margins of the scales slightly marked with green; about 4 in. in length, and from 1 in. to $2\frac{1}{2}$ in. broad. The scales are nearly of the same size and shape as those of *C. Libani*; but they fall off when ripe, like those of the silver fir. The seed is light brown, and irregularly shaped, with a large bright brown wing. The rate of growth, in the climate of London, appears to be much the same as that of the cedar of Lebanon; and it is equally hardy. A plant in the Horticultural Society's Garden, of which *fig.* 2285. is a portrait, after being 7 years planted, was, in 1837, 8 ft. high, with the habit of the common cedar; but differing in the glaucous or silvery hue of its leaves, and in the points of its branches being more pendulous.

Geography and History. The *Cèdrus Deodàra*, the deodar, or kelon, of the hills, according to Royle, is the most celebrated coniferous plant of the Himalayas. It is found in Nepal, Kamaon, and as far as Cashmere, at elevations of from 7,000 ft. to 12,000 ft. from Sirmore and Kurhawal; as, for example, on Mouma, Deohan, Choor, Kederkauta, and Najkanda. Roxburgh calls it an inhabitant of the mountains in Eastern India, in Nepal, and Thibet. According to Dr. Royle, the deodar cedar is mentioned by Avicenna. It appears, in the quality and durability of its wood, its fragrance, and the quantity of resin which it produces, to accord so well with the cedar of the ancients, as to be by some identified with that tree. Its loftiness and its spreading branches accord admirably with the descriptions given of the cedar in Holy Writ; and its wood (which is said to be incorruptible), from its hardness and the fineness of its grain, might easily have been wrought as that is

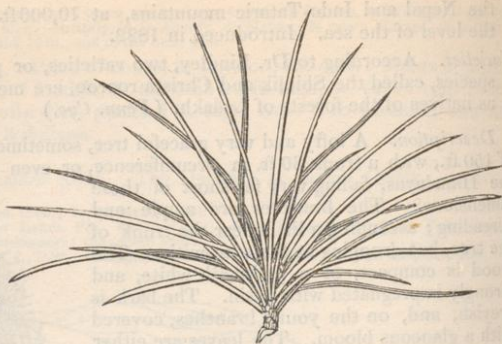


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described to have been which was used in the construction of Solomon's Temple. The principal difficulty, with reference to its being the cedar of Holy Writ, is, that it has never been found on, or near, Mount Lebanon. It is regarded by the Hindoos as a sacred tree, and is called by them *Devadera*, or the Tree of God. In some places it is highly venerated, and



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never used but to burn as incense on occasions of great ceremony; but, in others, it is employed for building houses, &c., as a valuable timber tree. Mr. Moorcroft, in his *Journal*, as quoted in Lambert's *Pinus*, gives the following proofs of the durability of the wood of this tree:—"A few years ago a building erected by the order of the Emperor Akbar was taken down, and its timber (which was that of the deodar) was found so little impaired as to be fit to be employed in a house built by Rajah Shah. Granting that the former edifice was constructed at the same time as the fort of Nagurunger, A. H. 1006, or A. D. 1597, its age must have been 225 years. Zenool Abudeen began to reign over Kashmeer A. H. 820, or A. D. 1417; and died A. H. 878, or A. D. 1473. His mother was interred in a domed building of excellent brick and mortar work, reported to have been erected in the time of the Hindoo sovereigns. In this building, pieces of deodar were inserted in the walls, by way, apparently, of strengthening the bond; and their ends or sides were left on the same plane with the brickwork. The window frames were of the same material, with the difference, however, of the former being squared and deprived of their sap wood, whilst the latter, somewhat carelessly, had part of the sap wood left; and the surface was only slightly smoothed, and partly retained its original form. In the latter instance, the crust of the wood was generally somewhat crumbly, and had been pierced by a worm about $\frac{1}{2}$ in. in depth; whilst that of the squared wood, exposed much more to the influence of the weather, was neither crumbly nor wormeaten, but was jagged, from the softer part of the wood, between the plates or ribs, having been often washed by the rain, though its structure had not been attacked by the worm."

The tree alluded to in the following extract from a letter from Bishop Heber to Lord Grenville appears evidently to have been the deodara. The bishop, speaking of a visit which he paid to the Himalayan Mountains, and of the pines which he found there, adds:—"Another, and of less frequent occurrence, is a splendid tree, with gigantic arms and dark narrow leaves, which is accounted sacred, and chiefly seen in the neighbourhood of ancient Hindoo temples, and which struck my unscientific eye as very nearly resembling the cedar of Lebanon. I found it flourishing at nearly 9000 ft. above the level of the sea, and where the frost was as severe at night as is usually met with at the same season (November and December) in England." In Burnes's *Travels in the Mysore*, he states that "the frameworks of the houses are made of deodara cedar, which is floated down with the inundations of the river Schem, or Hydaspes, from the Himalaya. The durability and fragrance of the wood recommend it for buildings of every description. We saw a cedar tree," he continues, "lying on the banks of the Hydaspes, with a circumference of 13 ft. On this river the Macedonians constructed the fleet by which they navigated the Indus; and it is a remarkable fact, that in none of the Punjab

rivers are such trees floated down, nor do there exist anywhere else such facilities for the construction of vessels." (*Travels, &c.*, vol. i. p. 50.) The cedars which Victor Jacquemont found on the Himalayas and on the mountains of Cashmere, at 5360 ft. above the level of the sea (see *Corresp.*, &c., vol. i. p. 291., and vol. ii. p. 74.), were, doubtless, this species, and not cedars of Lebanon.

Properties and Uses. The wood of the *Cèdrus Deodàra* possesses, as we have before observed (p. 2429.), all the qualities attributed by the ancients to that of *C. Libani*. It is very compact and resinous, and has a fine, fragrant, refreshing smell, like that felt when walking in pine groves towards evening, or in moist weather; and very different from that of the cedar of Lebanon. Its wood has a remarkably fine close grain, capable of receiving a very high polish; so much so, indeed, that a table formed of the section of a trunk nearly 4 ft. in diameter, sent by Dr. Wallich to Mr. Lambert, has been compared to a slab of brown agate. Dr. Royle informs us that the wood is particularly valued for its durability, and is much used in the construction of Himalayan houses. In Cashmere, according to Mr. Moorcroft (*Lamb. Pin.*, ii. p. 94.), it is used for buildings, both public and private, and for bridges and boats. Strips of it are also employed for candles. Dr. Lindley states that "Mr. Moorcroft procured specimens from the starlings of the Zein ool Kuddul bridge in Ladakh, where it had been exposed to the water for nearly 400 years." (*Penn. Cyc.*) The following extract is from a letter from the Honourable W. Leslie Melville to the secretary of the Highland Society of Scotland, dated Calcutta, January, 1836, and printed in Lawson's *Manual*:—"The timber is employed for roofing, and other purposes; and, if sheltered from the weather, is very durable. It is found perfectly sound in the roofs of temples which cannot have stood less than 200 years. For out of door purposes, I understand it requires paint, which, however, perfectly protects it."

The turpentine from this tree, Dr. Royle informs us, is very fluid, and, though coarse, is much valued in Upper India for medical purposes; the leaves and twigs are also used by the natives in medicine; and tar and pitch are procured from the trunk.

In England, the specimens of it are at present small; but the feathery lightness of its spreading branches, and the beautiful glaucous hue of its leaves, render it, even when young, one of the most ornamental of the coniferous trees; and all the travellers who have seen it full grown agree that it unites an extraordinary degree of majesty and grandeur with its beauty. The tree thrives in every part of Great Britain where it has been tried, even as far north as Aberdeen; where, as in many other places, it is found hardier than the cedar of Lebanon. It is readily propagated by seeds, which preserve their vitality when imported in the cones, but scarcely otherwise. It also grows freely by cuttings, which appear to make as handsome free-growing plants as those raised from seed. It has been inarched on the larch; but the latter tree being deciduous, it may be doubtful whether plants so propagated will attain a large size, and be of great duration. It has been grafted in the wedge manner on the common cedar, in considerable numbers, by Mr. Barrow, gardener to the Earl of Harrington, at Elvaston Castle. Mr. Barrow has given a detailed account of his process, and of the success which attended it in *Gard. Mag.*, vol. xiv. p. 80. The nursery culture, and the soil and situation in which it is to be finally planted, may be considered in all respects the same as those of the common cedar.

Statistics. In the neighbourhood of London, in the Horticultural Society's Garden, 7 years planted, it is 8 ft. high; at Kew, it is 3 ft. high; at the Duke of Devonshire's villa, at Chiswick, it is 3 ft. high; at Hendon Rectory, it is 3 ft. 6 in. high. In Bedfordshire, at Flitwick, it is 2 ft. high. In Berkshire, at Dropmore, it is upwards of 6 ft. high: it was sown in March, 1831, and planted out in the autumn of the same year. In Derbyshire, at Chatsworth, it is 3 ft. 8 in. high. In Devonshire, at Bicton, it is 4 ft. high. In Kent, at Redleaf, it is 6 ft. high. In Wiltshire, at Boyton, it is 3 ft. high.—In Scotland, in the Experimental Garden, it is 4 ft. 6 in. high. In Aberdeenshire, in Roy's Nursery, it is 1 ft. 6 in. high. In Fifeshire, at Lahill, it is 3 ft. high.—In Ireland, there are plants in the Trinity College Botanic Garden, in the Glasnevin Garden, and at Tiltour, near Mount Kennedy. In Paris, there are plants in the nursery of M. Daniell, on the Boulevard Mont Parnasse. In Germany, it is in the Berlin Botanic Garden, and in the Flötbeck Nurseries.

Commercial Statistics. The price of plants, in the London nurseries, is two guineas each.

GENUS VI.



ARAUCARIA Ruiz et Pav. THE ARAUCARIA. *Lin. Syst. Dicc'cia* Monadélphia.

Synonymes. Eutássa *Sal.*, Colymbèa *Sal.*, Dombèya *Lamb.*, Cuprésus *Forst.*, the Southern Pine.

Derivation. From *Araucanos*, the name of the people in whose country *Araucaria imbricata* grows in Chili.

Description, &c. Magnificent evergreen trees, natives of South America, Polynesia, and Australia; one of them, the *Araucaria imbricata*, as hardy in the climate of Britain as the cedar of Lebanon.

† I. A. IMBRICATA Pav. The imbricate-leaved Araucaria, or Chili Pine.

Identification. Pav. Diss. in *Mém. Acad. Reg. Méd. Mat.*, 1. p. 197.; Willd. *Sp. Pl.*, 4. p. 850.; Ait. *Hort. Kew.*, 5. p. 412.; *Lamb. Pin.*, ed. 2., No. 52.; *Laws. Man.*, p. 395.

Synonymes. A. Dombèyi *Rich. Mém. sur les Conif.*, p. 86.; *Lindl. in Penn. Cyc.*; *Pinus Araucaria Mol. Sag. sulla Stor. Nat. del Chili*, p. 182.; *Colymbèa quadrifaria Salisb in Linn. Trans.*, 8. p. 315.; *Dombèya chilensis Lam. Encyc.*; *Pino de Chili, Span.*; *Peghuen in the Andes*; *Sir Joseph Banks's Pine.*

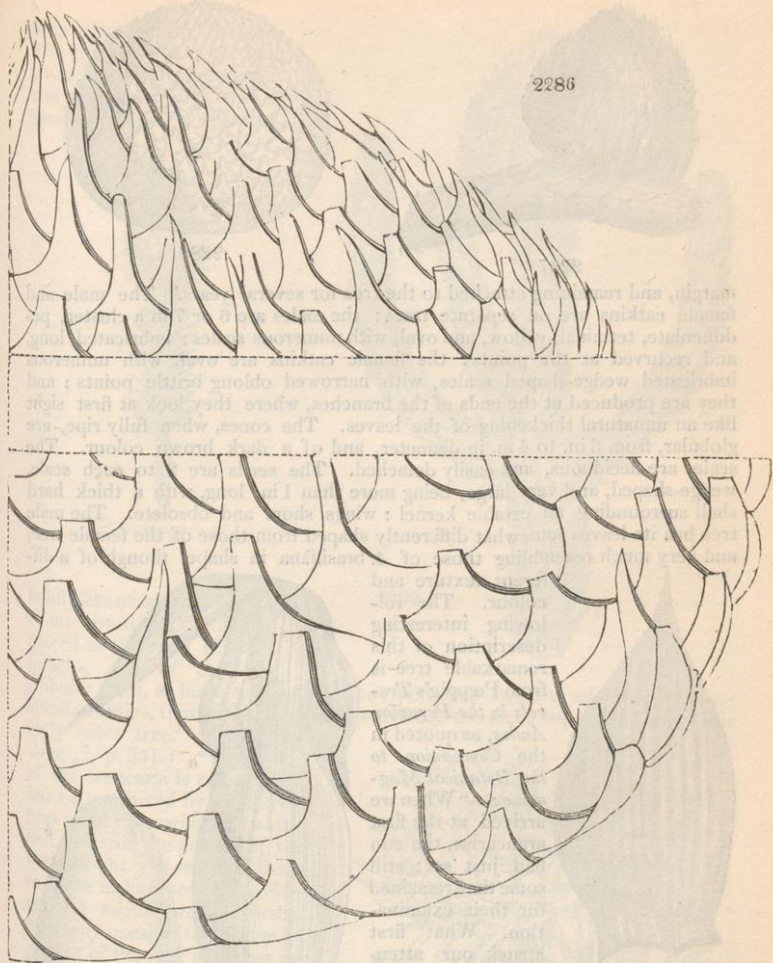
The Sexes. There is a tree at Kew which bore female catkins in 1836; and a male plant at Boyton, which blossomed in the same year.

Engravings. *Lamb. Pin.*, ed. 2., t. 56. and 57.; *Rich. Mém. sur les Conif.*, t. 20. and 21.; and our figs. 2286. to 2293. *Fig. 2287.* is a cone or female catkin in a young state, from Lambert; *fig. 2292.* is a specimen of the female tree at Kew; *fig. 2291.* is a portion of the male tree with the full-grown catkin, from Lambert's *Monograph*; and *fig. 2288.* is the full-grown female cone; all to our usual scale, that is, a sixth part of the natural size. *Fig. 2286.* is a portion of a cone of the natural size. *Fig. 2290. a.* is a seed with the scale and wing of the natural size, and *b* is the kernel; and *fig. 2289.* is a leaf of the natural size.

Spec. Char. Leaves in eights, imbricated, ovate-lanceolate, with persistent mucros. (*Pav.*) A tree, growing to the height of 150 ft.; a native of the Cordilleras, in Chili. Introduced in 1796, and flowering from September to November.

Description. Flowers diœcious. — Male. Catkin dipsacus- (teasel-) shaped, ovate-cylindrical. Scales numerous, sessile, closely imbricated round a common conical axis; filament-like, obovate, somewhat woody; with an oblong reflexed point. Anthers numerous, oblong, 2-celled; connate a little below the points of the scales, afterwards dependent; free, at first adpressed to the scales, afterwards, having shed their pollen, divaricate. — Female. Catkin ovate. Scales numerous, wedge-shaped, 2-flowered. Germen wedge-shaped, compressed in the two opposite sides. Style none. Stigma 2-valved, callous, thick: exterior valve ovate-acuminate, larger, concave, with a linear inflexed point; interior smaller, somewhat linear, obtuse, erect. Pericarp: cone spherico-ovate; scales connivent, coriaceous and woody, wedge-shaped, terminated by a long awl-shaped point, 2-seeded. Seed: nut wedge-shaped, terminated at the apex by a short, callous, marginal wing, bluntly tetragonal at the base; afterwards gibbous, compressed, with opposite sides: tegument coriaceous. Nucleus of the same figure. (*Pavon Dissert. in Mém. Acad. Reg. Méd. Matrit.*, i. p. 197., as quoted by Lambert.) Cone from 8 in. to 8½ in. broad, and from 7 in. to 7½ in. long; seed 2½ in. long, and ⅞ in. broad.

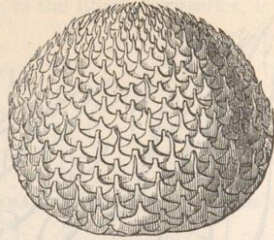
This is a very remarkable tree, the female of which, according to Pavon, is about 150 ft. high; while the male is seldom more than 40 ft. or 50 ft. high. The trunk is quite straight, and without knots, with a strong arrow-like leading shoot, pushing upwards. It is covered with double bark, the inner part of which, in old trees, is 5 in. or 6 in. thick; fungous, tenacious, porous, and light; and from it, as from almost every other part of the tree, resin flows in great abundance: the outer bark is of nearly equal thickness, resembling cork



cleft in different directions, and equally resinous with the inner bark. In young trees, the bark of the trunk is studded with leaves from the base of the tree upwards, which remain attached for 12 or 15 years. The branches are produced in whorls of 6, 7, and sometimes 8, in a whorl, the greater number being nearest the ground; and the branches diminish in length as they ascend higher up the tree, till at the top they terminate in a kind of pyramidal head. They are horizontal, inflexed, and ascending at the extremities. These large horizontal arms, clothed with closely imbricated leaves, resemble, in young trees, snakes partly coiled round the trunk, and stretching forth their long slender bodies in quest of prey. The leaves are sessile, somewhat thickened at the base, ovate-lanceolate, stiff, straight, somewhat keel-shaped below, and strongly mucronate at the apex; verticillate, with 7 or 8 in a whorl; imbricate, and closely encircling the branches; concave, rigid, glabrous, shining, marked with longitudinal lines, dotted on both sides; leathery, with a cartilaginous



2287



2288

margin, and remaining attached to the tree for several years. The male and female catkins are on separate trees: the males are 6 or 7 in a cluster, pedunculate, terminal, yellow, and oval, with numerous scales; imbricated, long, and recurved at the points: the female catkins are oval, with numerous imbricated wedge-shaped scales, with narrowed oblong brittle points; and they are produced at the ends of the branches, where they look at first sight like an unnatural thickening of the leaves. The cones, when fully ripe, are globular, from 3 in. to 4 in. in diameter, and of a dark brown colour. The scales are deciduous, and easily detached. The seeds are 2 to each scale, wedge-shaped, and very large, being more than 1 in. long, with a thick hard shell surrounding an eatable kernel: wings short and obsolete. The male tree has its leaves somewhat differently shaped from those of the female tree, and very much resembling those of *A. brasiliæna* in shape, though of a dif-

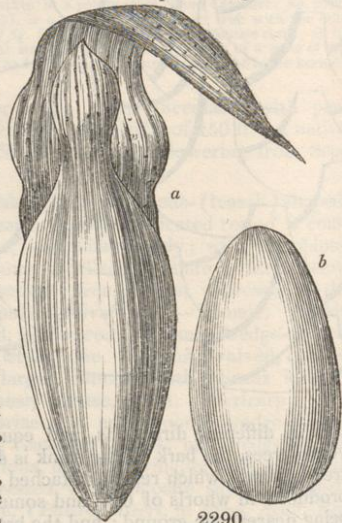


2289

ferent texture and colour. The following interesting description of this remarkable tree is from Pœppig's *Travels in the Peruvian Andes*, as quoted in the *Companion to the Botanical Magazine*:—"When we arrived at the first araucarias, the sun had just set: still some time remained for their examination. What first struck our attention were, the thick roots of these trees,

which lie spread over the stony and nearly naked soil, like gigantic serpents, 2 ft. or 3 ft. in thickness: they are clothed with a rough bark, similar to that which invests the lofty pillar-like trunks of from 50 ft. to 100 ft. in height.

The crown of foliage occupies only about the upper quarter of the stem, and resembles a large depressed cone. The lower branches, eight or twelve in number, form a circle round the trunk: they diminish till they are but four or six in a ring, and are of most regular formation, all spreading out horizontally, and bending upwards only at their tips. They are thickly invested with leaves that cover them like scales, and are sharp-pointed, above an inch broad, and of such a hard and woody texture, that it requires a sharp knife to sever them



2290

from the parent branch. The general aspect of the araucaria is most striking and peculiar, though it undeniably bears a distant



2291



2292

family likeness to the pines of our country. The fruit, placed at the ends of the boughs, are of regular globular form, as large as a man's head; and each consists of beautifully imbricated scales, that cover the seeds, which are the most important part of this truly noble tree." (*Comp. Bot. Mag.*, i. p. 351.) "The wood of the araucaria is red where it has been affected by the forest fires; but otherwise it is white, and, towards the centre of the stem, bright yellow. It yields to none in hardness and solidity, and might prove valuable for many uses, if the places of growth of the tree were less inaccessible. For ship-building it would be useful; but it is much too heavy for masts. If a branch be scratched, or the scales of an unripe fruit be broken, a thick milky juice immediately exudes, that soon changes to a yellowish resin, of which the smell is agreeable, and which is considered by the Chilians as possessing such medicinal virtues, that it cures the most violent rheumatic headaches when applied to the spot where the pain is felt." (*Ibid.*)



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Of the rate of growth of this tree in its native country very little is stated by travellers. It is probably slow, as appears to

be the case with plants in the climate of London; though scarcely any of these have yet had full justice done to them. The largest specimen in Europe, which is that at Kew, and of which *fig.* 2293. is a portrait taken in 1836, was then 12 ft. high, after having been above 40 years planted; but young plants, established in the open ground at Dropmore, make shoots, occasionally, of above a foot in length. It may be remarked of the araucaria in Britain, that young plants sometimes remain a whole year without making any shoot whatever; and that, at other times, the same plants require two years to produce one shoot; that is, the shoot continues slowly increasing in length, from the midsummer of one year to that of the year following.

Geography. The araucaria is a native of South America, in a part of the Andes inhabited by the Araucanians, a people who are said by Molina to pride themselves on their name, its signification being frank, or free. (See *Molina's History of Chili, &c.*) The tree is found in large forests on the mountains Caramavida and Naguelbuta, in Chili, belonging to the Llanista, Peghuen, and Araucano Indians. This chain, or Cordillera, of the Andes, says Pavon, as quoted by Mr. Lambert, "offers to the view, in general, a rocky soil, though in parts wet and boggy, on account of the abundance of rain and snow which falls in these regions, similar to many provinces in Spain." It is also found in the neighbourhood of Concepcion, in Chili. Pæppig says:—"The araucaria forest of Antuco is the most northerly that is known in Chili; so that the northern boundary of this king of all the extra-tropical American trees may be estimated at 36° south latitude. The extreme southern limit is not so clearly ascertained; which is not surprising, when we consider how little, comparatively, is known of Western Patagonia: it seems probable, however, that it does not stretch far beyond lat. 46°. Between Antuco and Valdivia, this tree only grows among the Andes, and, as the Indians assert, solely on their western declivities, and nowhere lower than from 1500 ft. to 2000 ft. below the snow line, up to which they frequently reach. Further to the south, the araucaria appears at a lower elevation; and, in the country of the Cuncos, and about Osorno, is said to occur on mountains of a very moderate altitude, near the sea. The Corcovado, a mountain that rises opposite Chiloe, is said to be studded, from its foot to the snow line, with large groups of these beautiful trees. Of all other vegetation, the araucarian forests are as bare as the pine woods, offering but few plants which can interest the botanist. Steep rocky ridges, where there is no water, are its favourite habitat." (*Pæppig in Comp. Bot. Mag.*)

History. The Spaniards, having settlements in the immediate vicinity of the country of the Araucanians, employed Don Francisco Dendariarena, in 1780, to examine the trees, with a view of discovering if any of them were suitable for ship-building. The result of his experiments was to select this species (the Peghuen of the natives), which was accordingly made use of to repair the Spanish squadron, then lying at anchor in the port of Talcaguano. The Abbate Molina, who was then writing his *Civil and Natural History of Chili* (published at Bologna in 1782) supposed the tree to be a *Pinus*; and he described it in his work under the name of *Pinus Araucana*. In 1782, the Spanish government commissioned Don Joseph Pavon to search for this tree; and he, finding both its flowers and fruit, ascertained that it was a distinct genus, and called it *Araucaria imbricata*. Don Joseph Pavon (who had previously visited Chili, in company with Don Hippolito Ruiz and the French botanist Dombey, in 1777,) sent specimens of *Araucaria imbricata* to France, to the care of Dombey, who showed them to MM. Lamarck and De Jussieu, in Paris; the former of whom called it *Dombeya chilensis*, while Jussieu retained the name of *Araucaria*. Don Joseph Pavon, however, complains, in his account of this tree, published in the first volume of the *Memoirs of the Royal Academy of Sciences at Madrid*, that both Jussieu and Lamarck made several mistakes in their description of the botanical characteristics of the species, which had been avoided by both Molina and himself. In 1795, Captain Vancouver touched at the coast of Chili; and Mr. Menzies, who

accompanied the expedition, procured cones, seeds from which he sowed on board the ship, and brought home living plants, which he presented to Sir Joseph Banks, who planted one of them in his own garden at Spring Grove, and sent the others to Kew. From this circumstance, the tree was called at first, in England, Sir Joseph Banks's pine. The tree at Kew was kept in the green-house till about 1806 or 1808, when it was planted out where it now stands, by Mr. M'Nab, the present superintendent of the Edinburgh Botanic Garden. After it was planted out, not being considered quite hardy, it was protected, during winter, with a temporary frame, covered with mats; and, having become habituated to this mode of treatment, it has been considered unsafe to leave it off. The species is, however, now found quite hardy at Dropmore, and other places; and we have no doubt that, as soon as plants can be procured from seed at a reasonable rate, it will be as generally planted as the cedar of Lebanon, or the deodar, and will be found to be quite as hardy as these trees.

The *Araucaria imbricata* was introduced into France before 1822, and was treated there as a hot-house plant. Dr. Pæppig, who introduced it into Germany, gives the following description of the difficulty which attended his procuring seeds: — "We were obliged to seek water at a considerable distance from our bivouac; but, our frugal supper not requiring much cooking, we soon stretched ourselves on the hard rock to sleep, under the lullaby of a storm, to which the lofty summits above us imparted the most singular tones. All of us who had been accustomed to such primitive beds might have rested well enough, if a fog had not descended upon us about midnight, which was so dense as nearly to extinguish our fire. Matters became still worse, when violent thunder and hail apprised us that not even a forest of araucarias could shelter the traveller from the wrath of the Cordillera. We all trembled; my companions, however, chiefly from fear and superstition; though the temperature was sufficiently low to occasion a shudder in thinly clad travellers. The anxiously looked-for morning brought a brighter sky, and the means of kindling a cheerful and genial fire. A young man, who had joined us the preceding day, succeeded (by means of his lasso, which he threw over one of the lowest branches) in ascending a tree, from which he brought down many branches, loaded with their truly colossal fruit, which have since arrived safely in Germany." (*Pæppig's Travels in the Peruvian Andes*, as quoted in *Comp. Bot. Mag.*, vol. i. p. 355.) "The reason," he adds, "why many of the seeds of the araucaria that have been sent to Europe did not vegetate is, because the collectors did not procure them from the Indian country, but bought them in the market at Valparaiso, where they are offered for sale boiled and dried. My excursion to Quillay-Leuvu obtained for me fresh seeds of the araucaria, which reached Germany in October, 1829, being seven months after they were ripe; and, being sowed immediately, the period was just that of the Chilian spring. Of some hundreds, about 30 came up; but ignorance of the true climate, which led to the error of placing the young plants in a hot-house, killed the greater part during the first year. To my great satisfaction, however, about six individual plants have been preserved in different places. The specimen in the Botanic Garden at Leipzig flourishes beautifully: it is (? 1832) about 1 ft. 8 in. high, and already bears four long branches in whorls." (*Ibid.*)

Properties and Uses. Don Joseph Pavon describes the wood of this tree as of a yellowish white, fibrous, and full of beautiful veins, capable of being polished and worked with facility. He also states that it is well adapted for ship-building, as was proved by the experiments of Don Francisco Dendarriarena, in 1780. The resin, abounding in all parts of the tree, is white; its smell is like that of frankincense, and its taste not unpleasant. It is applied as a plaster to contusions, and for various medical purposes. The Indians consider the fruit as a very nourishing food: they eat it raw, as well as boiled and roasted; and they distil from it a kind of spirituous liquor. They have stated times to collect the fruit, which they preserve to make use of as

required. (See *Lamb. Pin.*, ed. 2., ii. p. 108.) Dr. Pœppig says:—"The araucaria is the palm of those Indians who inhabit the Chilian Andes, from lat. 37° to 48° ; yielding to these nomade nations, a vegetable substance that is found in the greater plenty the more they recede from the whites, and the more difficult they find it to obtain corn by commerce. Such is the extent of the araucarian forests (*pinares*), and the amazing quantity of nutritious seeds that each full-grown tree produces, that the Indians are ever secure from want; and even the discord that prevails frequently among the different hordes does not prevent the quiet collection of this kind of harvest. A single fruit (*cabeza*, a head,) contains between 200 and 300 kernels; and there are frequently 20 or 30 fruits on one stem; and, as even a hearty eater among the Indians, except he should be wholly deprived of every other kind of sustenance, cannot consume more than 200 nuts in a day, it is obvious that 18 araucarias will maintain a single person for a whole year. The kernel, which is of the shape of an almond, but double the size, is surrounded with a coriaceous membrane, that is easily removed; though relishing, when prepared, it is not easily digestible, and, containing but a small quantity of oil, is apt to cause disorders in the stomach with those who are not accustomed to this diet. When the scarcely matured seeds are dried in the sun, a sugary substance exudes, which appears to reside chiefly in the embryo. The Indians eat them either fresh, boiled, or roasted; and the latter mode of cooking gives them a flavour something like that of a chestnut. For winter's use, they are dried after being boiled; and the women prepare a kind of flour and pastry from them. The collecting of these fruits would be attended with great labour, if it were always necessary to climb the gigantic trunks; but, as soon as the kernels are ripe, towards the end of March, the cones drop off of themselves, and, shedding their contents on the ground, scatter liberally a boon, which nothing but the little parrot (*Psittacus choræus Mol.*), and a species of cherry finch, divide with the Indians. In the vast forests, of a day's journey in extent, that are formed by these trees in the districts of Pehuenches and Huilliches, the fruits lie in such plenty on the ground, that but a very small part of them can be consumed. In former times, a great quantity came to Concepcion and Valdivia, by trading with the Indians; and thence they found their way to Valparaiso and Lima; but now they are seldom met with any where near the coast, till they are too old to be palatable." (*Ibid.*)

Propagation, Culture, &c. The treatment of this tree, when raised from seeds, may be considered in all respects the same as that of the cedar; regard being had to the different size of the seeds, which will, of course, require a thicker covering. Plants may be raised from cuttings; and these, we have no doubt, will in time assume a leading shoot, like that of seedlings; but, as the plant has been only a short time propagated in this way, the only instance in which we are certain of this having taken place is at Dropmore; where, in consequence of all the shoots of a plant raised from a cutting, now 6 or 8 years old, having been pegged down to the ground, a vigorous erect shoot, which, in 1837, was 2 ft. high, has been protruded from the collar, and promises to make as handsome a tree as any seedling plant whatever.

Statistics. The largest specimen in the neighbourhood of London is that at Kew, which, in 1836, was 12 ft. high, having been raised from seed in 1796, and planted out in the open air in 1806. In the Horticultural Society's Garden, 8 years planted, it is 6 ft. high. In Bedfordshire, at Flitwick, 4 years planted, it is 3 ft. 5 in. high. In Berkshire, at Dropmore, are several from 8 ft. to 9 ft. high. In Hertfordshire, at Cheshunt, 3 years planted, it is 3 ft. 6 in. high; at Bayfordbury, it is 4 ft. 2 in. high. In Kent, at Redleaf, it is 5 ft. high. In Lancashire, in the Manchester Botanic Garden, 2 ft. 8 in. In Northumberland, at Belsay, it is 5 ft. 1 in. high.—In Scotland, in the Experimental Garden at Inverleith, 6 years planted, it is 3 ft. high; and in the Botanic Garden, 3 ft. 6 in. high; in Lawson's Nursery, 3 years planted, it is 2 ft. 6 in. high. At Aberdeen, in Roy's Nursery, it is 2 ft. 6 in. In Stirlingshire, at Buchanan, 3 ft. high. In all these places, except Kew, it stands without the slightest protection; and, at Aberdeen, is found more hardy than the common cedar of Lebanon.—In France, in the garden of M. Brunel, at Avranches, 6 years planted, it is 11 ft. high.

Commercial Statistics. Plants, in the London nurseries, are rarely to be met with, and they are charged from 2 to 5 guineas each, according to their size.

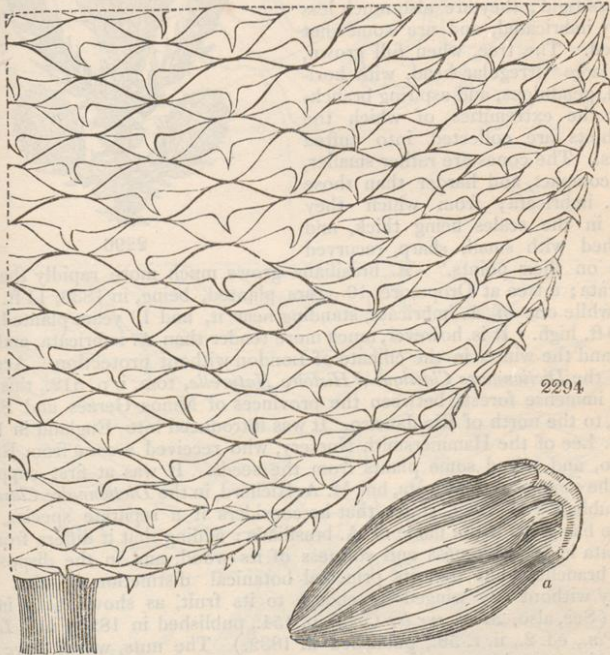
‡ 2. A. BRASILIANA Rich. The Brazil Araucaria, or Brazil Pine.

Identification. Richard in Dict. Class. d'Hist. Nat., 1. p. 152.; Mém. sur les Conif., p. 154.; Lamb. Pin., ed. 2., t. 58, 59, 60.; Lawson's Manual, p. 396.

Engravings. Lamb. Pin., ed. 2., 2. t. 58, 59, 60.; our figs. 2295. and 2296. to our usual scale; and fig. 2294. of the natural size.

The Sexes. It is uncertain whether both are in Britain or only one; only a male plant, at Boyton, having flowered in 1836.

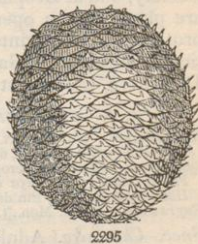
Spec. Char., &c. Leaves loosely imbricated, lanceolate, mucronate, glaucous green, keeled beneath. Female catkins roundish-oval; scales recurved at



2294

the apex. (Lamb. Pin.) A large tree, a native of the Brazils. Introduced in 1819, requiring protection during winter, or a green-house.

Description, &c. A tree, in general appearance and size, like *A. imbricata*; but much more loose and spreading. Branches numerous, leafy, approximate, sometimes almost verticillate; branchlets, in the young trees, flexible, spreading, twiggy, round, covered with a green smooth bark. Leaves lanceolate, mucronate, quite entire, a little cartilaginous, much more loose, and three times thinner than in *A. imbricata*; somewhat pliant, smooth; concave above, light green, and shining; beneath glaucous and keeled; 1 in. to 2 in. long, $\frac{1}{4}$ in. broad; marked on both sides, but especially on the lower, with many dotted lines; scattered on the young tree, spreading, linear-lanceolate, attenuated, 2 in. long, scarcely 2 lines broad. Male catkins not yet known. Female, roundish-ovate, solitary on the apex of the branches, sessile, similar in size and appearance to the heads of flowers of *Dipsacus sylvestris*; scales thick, compressed, wedge-shaped-oblong, quadrangular, of a firm corky substance, closely placed together above a conico-cylindrical receptacle, each terminated by a lanceolate, acute, recurved ap-



2295

pendage, hollow within at the base of the upper side, and furnished with a young monospermous nut. Nut, in size and colour, like the preceding. (*Lamb.*) The *Araucaria brasiliãna* forms a tree from 70 ft. to 100 ft. high. It bears considerable resemblance to *A. imbricatã*; but the leaves are larger and less rigid; they are also much less closely imbricated, and are somewhat reflexed. The tree, when full grown, has a large "irregular head, with horizontal, pendulous, and aspiring branches, at the extremities of which the branchlets are collected into tufted masses. The cones are rather smaller, more compact, and harder than those of *A. imbricatã*; from which they differ in the scales being thick, and furnished with small, sharp, recurved spines on their points." *A. brasiliãna* grows much more rapidly than *A.*



2296

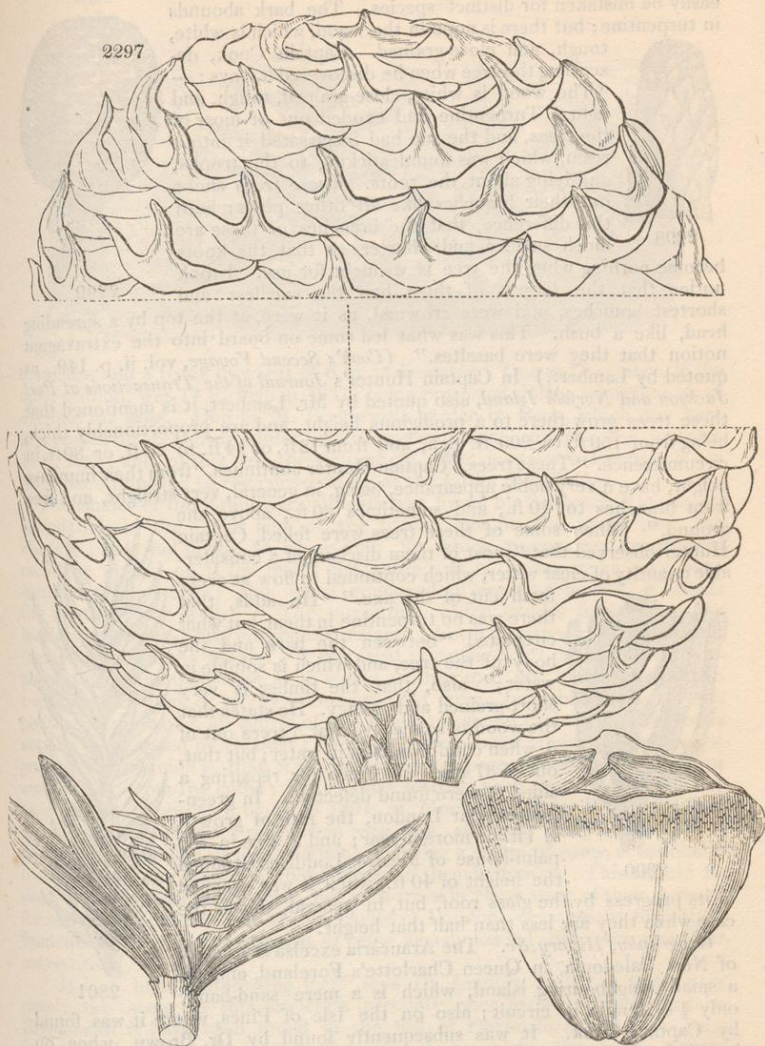
imbricatã; a tree at Dropmore, 10 years planted, being, in 1836, 11 ft. 6 in. high, while one of *A. imbricatã*, standing near it, and 13 years planted, was only 8 ft. high. It is, however, much more tender than *A. imbricatã*, and will not stand the winter in the climate of London without protection. According to the *Dictionnaire Classique d'Histoire Naturelle*, tom. i. p. 512., this tree forms immense forests between the provinces of Minos Geraes and Saom-Paulo, to the north of Rio Janeiro. It was introduced into England in 1819, by Mr. Lee of the Hammersmith Nursery, who received a cone from Rio de Janeiro, and raised some plants from the seeds. It was at first supposed to be the same as *A. imbricatã*, but M. A. Richard, in the *Dictionnaire Classique*, &c., published in 1822, states that he considers it a separate species, and that he has given it the name of *A. brasiliãna*; adding that it differs from *A. imbricatã* in the whiteness and softness of its wood, and in the disposition of its branches; but that its principal botanical distinction is, that it is entirely without any winged appendage to its fruit, as shown at *a* in fig. 2294. (See, also, *Mém. sur les Conif.*, p. 154., published in 1826; and *Lamb. Gen. Pin.*, ed. 2., ii. t. 58., published in 1832.) The nuts, which have very little resin, are sold as an article of food in the market of Rio de Janeiro; and the resin, which exudes from the trunk of the tree, is mixed with wax to make candles. Seeds are frequently sent to England; but they will seldom vegetate unless sent over in the cone. It propagates freely from cuttings; and Mr. Lambert has now several plants raised in that manner. In Britain, it can only be considered as fit for the green-house; though in the Horticultural Society, and at Dropmore, Woburn, Cheshunt, and various other places, there are plants in the open ground, from 3 ft. to 10 ft. high, which, however, are protected during winter, so as to exclude the frost. The plant in the Horticultural Society's Garden, after being 3 years planted, is 5 ft. high; that at Dropmore, the largest plant, was, in 1837, 12 ft. high.

‡ 3. *A. EXCËLSA* Ait. The lofty *Araucaria*, or *Norfolk Island Pine*.

Identification. Ait. in *Hort. Kew*, ed. 2., 5. p. 412.; Rich. *Mém. sur les Conifères*, p. 154.; *Lamb. Gen. Pin.*, ed. 2., 2. t. 61, 62.; *Lindl. in Penn. Cyc.*; *Lawson's Manual*, p. 396.
Synonymes. *Eutassa heterophýlla* Sal. in *Lin. Trans.*, 8. p. 316.; *Cupressus columnaris*, &c., *Forst. Fl. Ins. Aust.*; *Dombeya excelsa* *Lamb. Monog.*, ed. 1., p. 87. t. 39, 40.; *Altingia excelsa* *Loud. Hort. Brit.*, p. 403.; *Pin de Norfolk*, *Fr. Engravings.* *Lamb. Mon.*, t. 39, 40., *Pin.*, t. 61, 62.; and our figs. 2297. to 2302.

Spec. Char., &c. Adult leaves closely imbricated, bent inwards, mutic. (*Ait.*) A lofty tree, a native of Norfolk Island and New Caledonia. Introduced in 1793; and requiring protection during winter, or to be kept in a green-house; being still more tender than *A. brasiliãna*.

2297



Description. A majestic tree, growing to the height of from 160 ft. to 228 ft., with a trunk sometimes 11 ft. in diameter, and free from branches to the height of 80 ft. or 100 ft. " Its trunk rises erect, and, in old trees, is sparingly covered with long, drooping, naked branches, towards the extremities of which the leaves are clustered: these latter, when the plant is young, are long, narrow, curved, sharp-pointed, and spreading, as shown in *fig. 2301*; but, when the tree is old, they become shorter and broader, and are pressed close to the branches, as shown in *fig. 2300*. to our usual scale, and *fig. 2298*. of the natural size. (*Lindl. in Penn. Cyc.*) In consequence of this difference in the disposition of the leaves, old and young trees are so little alike, that they might

easily be mistaken for distinct species. The bark abounds in turpentine; but there is none in the wood, which is white, tough, and close-grained. Captain Cook, describing the tree when he discovered it, says:—
 “The wood is white, close-grained, tough, and light. Turpentine had exuded out of most of the trees, and the sun had inspissated it into a resin, which was found sticking to the trunks, and lying about the roots. These trees shoot out their branches like all other pines; with this difference, that the branches of these are much smaller and shorter, so that the knots



2298



2299

become nothing when the tree is wrought for use. I took notice that the largest of them had the smallest and shortest branches, and were crowned, as it were, at the top by a spreading head, like a bush. This was what led some on board into the extravagant notion that they were basaltes.” (*Cook's Second Voyage*, vol. ii. p. 149., as quoted by Lambert.) In Captain Hunter's *Journal of the Transactions at Port Jackson and Norfolk Island*, also quoted by Mr. Lambert, it is mentioned that these trees grow there to a prodigious height, and are proportionably thick, being from 150 ft. to 200 ft. high, and from 12 ft. or 14 ft. to 28 ft. or 30 ft. in circumference. “These trees,” Captain Hunter continues, “from their immense height, have a very noble appearance, being, in general, very straight, and free from branches to 40 ft., and sometimes 60 ft., above the ground.” When some of these trees were felled, Captain Hunter observed that “most of them discharged a considerable quantity of clear water, which continued to flow at every fresh cut of the axe.” He adds, that there was no turpentine in them, but what circulated “between the bark and the body of the tree, and which is soluble in water;” also, that the timber is very short-grained and spongy. He states that the wood is so heavy, that 5 trees out of 6, when cut down, sank in water; but that, out of 37 trees cut down for repairing a ship, 27 were found defective. In green-houses near London, the rate of growth is 1 ft. or more a year; and a tree in the palm-house of Messrs. Loddiges attained the height of 40 ft., when it was stopped



2300



2301

in its progress by the glass roof, but, in general, this is the case when they are less than half that height.

Geography, History, &c. The *Araucaria excelsa* is a native of New Caledonia, in Queen Charlotte's Foreland, and on a small neighbouring island, which is a mere sand-bank, only $\frac{3}{4}$ of a mile in circuit; also on the Isle of Pines, where it was found by Captain Cook. It was subsequently found by Dr. Brown, when on board the Investigator, with Captain Flinders, growing in great abundance on several parts of the east coast of New Holland; but it was there not above 60 ft. or 70 ft. in height. It was introduced, according to Lambert, by Governor Philip; but, according to the *Hortus Kewensis*, by Sir Joseph Banks, in 1793. The plant is not uncommon in green-house collections, in most of which, in a few years, it grows as high as the roof will admit. One at Kew, which was at one time the largest in the country, was tried in the open air, and died the first winter. One in the conservatory in the Hammersmith Nursery, which was planted in April, 1804, in seven years rose as high as the glass, and was obliged to be cut down; and this has been the case repeatedly since. It has now wide-spreading, pendulous, deep green

2302



branches, and a trunk upwards of 6 in. in diameter. One at Dropmore, in the open ground, was 14 ft. high in 1837; being protected during winter, so as to exclude the frost. One in M. Boursault's garden in Paris, which was kept in a conservatory during winter, and turned out during summer, was, in 1828, 12 ft. high; and, of this tree, the vignette fig. 2302. contains a portrait; it has since been removed to the conservatory at the Jardin des Plantes.

The timber of the *Araucaria imbricata* was found by Governor King to be sound only in the lower part of the trunk; but, in the upper part, too knotty, hard, and brittle to be useful; for which reason, no dependence could be placed on it for masts and yards. It is, however, he says, very suitable for buildings; and, when employed in erecting houses, it stands the weather very well. "The turpentine, which exudes freely from the bark, is of a milk-white glutinous substance; but it is rather remarkable that there is none in the timber. It was tried in paying boats, and for other purposes, but without success, as it would neither melt nor burn; it was also tried to make pitch or tar, by burning the old trees; but, there being no turpentine in the wood, all efforts of this kind were found useless." The fronds may be propagated by cuttings; and, when these have attained 5 or 6 years' growth, our opinion is, that, if the branches were pegged down, an erect shoot would arise from the collar; but this has scarcely been proved, except in the case of a plant observed by us in 1801, at Mongewell, near Wallingford, in Berkshire. A necessary precaution with this, and with every other species of the more valuable of the *Abietinæ*, is, during a storm of snow, occasionally to shake from the branches what adheres to them in masses. This should be done not only with young trees, but with trees in every stage of their growth; for the largest cedars, even in the climate of London, occasionally have their branches broken, in consequence of being heavily loaded with snow near their extremities.

"It is a highly interesting fact," says Dr Lindley, "that a plant very nearly the same as this *araucaria* certainly once grew in Great Britain. Remains of it have been found in the lias of Dorsetshire, and have been figured in the *Fossil Flora*, under the name of *Araucaria primæva*." (*Penn. Cyc.*, ii. p. 249.)

‡ 4. A. CUNNINGHAMII Ait. Cunningham's *Araucaria*, or the *Moreton Bay Pine*.

Identification. Ait. MS.; Swt. Hort. Brit., p. 475.; Lamb. Pin., 3.

Synonyme. *Altigia Cunninghamii* G. Don in Loud. Hort. Brit., p. 408.

Engravings. Lamb. Pin., 3. t. 96.; our fig. 2304. to our usual scale; and fig. 2303. of the natural size.

Spec. Char., &c. Decandrous. Leaves of the young tree vertically compressed, spinuloso-mucronate, straight; those of the full-grown tree lanceolate, acute, imbricated. Cones ovate; scales acuminate at the apex,

recurved, with membranaceous wings on the margin, replicate. (*Lamb. Pin.*, iii.) A tall tree, a native of New Holland. Introduced in 1824, and requiring the protection of the greenhouse.

Description. A tall tree, but more loose than *A. excelsa*; varying from 60 ft. to 100 ft. in height, with a very straight naked trunk, covered with a brownish bark, from 4 ft. to 8 ft. in diameter. Branches verticillate, spreading. Leaves smooth, shining green, of different forms: in the young tree, vertically compressed, divaricate and spreading, 2-rowed in a quincunx manner, linear-awl-shaped, spinulose and mucronate, straight, rigid, decurrent at the base, $\frac{1}{2}$ in. long; in the full-grown tree horizontal, and in a close spiral, incurved, loosely imbricated, lanceolate from the broad base, acute, glabrous, thick and coriaceous; flattish above keeled beneath, $\frac{1}{2}$ in. long. Male catkins terminating the branchlets, solitary, sessile, cylindrical, obtuse, 3 in. long, about as thick as the finger, a little contracted at the apex and base; scales peltate, stalked, closely imbricated, discoid and flattish, semi-ovate, mucronulate, callous; stalk linear compressed, bluntly keeled before, scarcely longer than the disk. Anthers many (10), linear, parallel, inserted under the disk of the scales, in 2 rows, and there connate, but in other respects free, pendent. Pollen rather large, spherical, smooth. Young cones only seen, terminal, solitary, sessile, ovate, 3 in. long, and of nearly the same thickness; about the size of the head of *Dipsacus fullonum*: scales wedge-shaped, thick, coriaceous, dark yellow, $\frac{1}{2}$ in. long, membranaceous and winged on the margin, replicate and wavy; point linear awl-shaped, spinulose and mucronate, recurved, callous, $\frac{1}{3}$ the length of the scale. Ovule conferruminate with the scale (flattened pericarpium), not free, but, as it were, concealed in the scale. Mature seed not seen. (*Lamb.*)

Geography, &c. The Moreton Bay pine is found, as the name imports, on the shores of Moreton Bay: it has also (according to a statement published by Mr. Allan Cunningham, the colonial botanist, in the 3d volume of Lambert's *Pinus*), a range



2303



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of 900 miles between the parallels of 14° and $29\frac{1}{2}^{\circ}$, on the eastern coast of New South Wales. On the alluvial banks of the Brisbane River, $27^{\circ} 30'$, it rises to the height of from 100 ft. to 130 ft., with a girth of from 14 ft. to 16 ft., and a clear trunk of 80 ft. It is found at a short distance from the river, in lat. 28° , and to the extent of 80 miles inland; but the trees are there comparatively small; and farther inland they entirely disappear. "Its maximum, therefore," says Mr. Cunningham, "is evidently on the coast, immediately within the influence of the sea air." This tree was first seen by Sir Joseph Banks and Dr. Solander, in 1770; but when the *Araucaria excelsa* was discovered on Norfolk Island in 1774, it was supposed to be the same species; the two trees, in their full-grown state, being very much alike. The Norfolk Island and Moreton Bay pines were consequently considered the same till the year 1824; when Mr. Allan Cunningham, visiting Moreton Bay in company with the late Mr. Oxley, satisfied himself "that it was a very distinct species, not simply in its habit of growth, which is very remarkable, but in the character of its leaves." Mr. Cunningham adds that "this pine bears young cones in the month of September. Its wood is of a pale yellowish deal, and is commonly used in house carpentry for making common furniture; and in boat-building at Brisbane Town. In the green state, its spars have been formed into masts for vessels of 200 tons, which are said to stand so long as the sap continues in them; but, after becoming dry, they are not to be depended on." It was sent from Sydney to Kew Gardens in 1824, and several plants have subsequently been imported. There are handsome specimens at Kew, Messrs. Loddiges's, Dropmore, and other places. That at Dropmore, presented to Lord Grenville by George IV., and of which fig. 2305, is a portrait, was, in 1837, 10 ft. high, after having been 7 years planted. It is carefully protected during winter, like the other tender species of this genus.



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GENUS VII.

CUNNINGHAMIA R. Br. THE CUNNINGHAMIA. *Lin. Syst. Monœ'cia*
Monadélphia.

Synonymes. *Pinus Lamb.*, *Bélis Salisb.*

Derivation. Named by Mr. Brown in honour of Mr. James Cunningham, "an excellent observer in his time, by whom this plant was discovered; and in honour of Mr. Allan Cunningham, the very deserving botanist who accompanied Mr. Oxley in his first expedition into the interior of New South Wales, and Captain King, in all his voyages of survey of the coast of New Holland." (*Bot. Mag.*, t. 2743.)

Description. Only one species has been discovered, which is an evergreen moderate-sized tree, a native of China. Introduced in 1804.

† 1. *C. SINE'NSIS Rich.* The Chinese Cunninghamia, or Broad-leaved
Chinese Fir.

Identification. *Rich. Conif.*, p. 149. t. 18.; *Lamb. Pin.*, ed. 2., 2. t. 53.

Synonymes. *Bélis jaculifolia Salisb.* in *Lin. Trans.*, 8. p. 316.; *Pinus lanceolata Lamb. Monog.*, ed. 1., t. 34.; *Abies major sinensis, &c., Pluk. Alm.*, 1. t. 351. f. 1.; *Cunninghamia lanceolata R.*

Br.; *Araucaria lanceolata Hort.*
Engravings. *Rich. Conif.*, t. 18.; *Lamb. Monog.*, ed. 1., t. 34.; *Pluk. Alm.*, t. 351., f. 1.; *Lamb. Pin.*, ed. 2., t. 53.; *Bot. Mag.*, t. 2743.; our fig. 2307. to our usual scale; and fig. 2306. of the natural size.

Description, &c. A middle-sized tree, having the general appearance of *Araucaria*. Branches for the most part verticillate, spreading horizontally. Leaves sessile, deflexed, and spreading in every direction, $1\frac{1}{2}$ in. long; lanceo-

late, much pointed, rigid, flat, quite entire, somewhat scabrous on the margin. Male catkins terminal, fascicled, cylindrical, scarcely 1 in. long. Cones about the size of a walnut, sessile, drooping, globose, smooth. Scales ovate-acuminate, coriaceous, sharply denticulated on the margin. (*Lamb.*) This remarkable tree is a native of China, and was introduced in 1804, by Mr. Wm. Kerr, by direction of the Honourable Court of Directors of the East India Company. It was first supposed to belong to the genus *Pinus*, and was called *Pinus lanceolata*, from its sharp lanceolate leaves; but, on more careful examination, it was made a separate genus by Mr. Salisbury, in the *Linnean Transactions*, under the name of *Bélis*, from *belos*, a javelin; from the

leaves somewhat resembling in form the head of that weapon. The name of *Béllis* having been already applied to the daisy, that of *Bélis* was considered to bear too strong a resemblance to it, and accordingly it was afterwards changed by Mr. Brown to *Cunninghãmia*; by which name it was first described by M. Richard, in his *Mémoires sur les Conifères*. For many years after it was first introduced, it was kept in the green-house; but, in 1816, a plant was turned out into a sheltered part of the pleasure-ground at Claremont, where it has continued to live without protection; and, though injured more or less by severe winters, it was, in 1837, 18 ft.

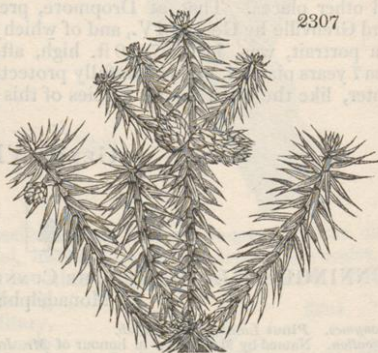
high, the diameter of the trunk 7 in., and of the head 16 ft. A tree at White Knights, which had stood without the slightest protection for upwards of 10 years, was, in 1837, upwards of 25 ft. high, and formed a most beautiful object. A tree at Dropmore, planted in the open ground in 1822, was, in 1837, 17 ft. high. It was matted up every winter for several years after it was planted out; but, since 1828, it has received no protection whatever, and is now a very fine tree. This species is very readily propagated

by cuttings; and there are some trees at Dropmore, raised in this manner, which have thrown up erect stems from the collar, which will doubtless form as handsome trees as seedlings. The practice of pegging down the branches of plants of *Coniferae* raised from cuttings, with a view to the production of erect stems, appears to have been first exemplified in this species, and by Mr. Stewart Murray, the curator of the Glasgow Botanic Garden, who has given the following account of it in the *Gardener's Magazine*: — "In the Glasgow Botanic Garden, in 1825, were two plants, 2 ft. or 3 ft. high, struck from cuttings several years previously, the tops of which, though the trees were in very luxuriant health, still retained the appearance of a branch, which, even when tied up to a stake, always seemed as if endeavouring to regain its horizontal position. During the winter of 1825," continues Mr. Murray, "I loosened the top of one from its stake, and fastened it down quite in a horizontal direction; in about six weeks afterwards, a very vigorous shoot made its appearance from below the surface of the earth in the pot. When this shoot had attained the height of 8 in. or 9 in., I cut away the old top entirely, and at

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2307



this time (February, 1827) the centre shoot produced is nearly 2 ft. high, and is furnished all round with three sets, or tiers, of regular horizontal branches. I may add that this plant flowered with us in January, 1827, and was figured in the *Botanical Magazine*, t. 2743. In 1826, I repeated my experiment on the other plant with the very same success." (*Gard. Mag.*, ii. p. 410.)

Statistics. In the environs of London the largest plant is in the Hammersmith Nursery, which is upwards of 10 ft. high, and would have been twice that height had it not been cut down, upwards of 10 years ago, on account of its being too high for the house in which it then stood. At Fulham Palace, it is 5 ft. high; and there are plants of about this height in the Horticultural Society's Garden, Messrs. Loddiges's arboretum, Cheshunt, Bayfordbury, and various other places. Those at Claremont, and White Knights, have been already mentioned. At Redleaf, it is 8 ft. 2 in. high. At Edinburgh, in the Botanic Garden, it is 4 ft. 6 in. high; and in the Experimental Garden, 2 ft. 6 in. high. In Ireland, there are plants in the different botanic gardens; and at Oriel Temple there is one, which, in 1834, after being 12 years planted, was 7 ft. high. In Austria, at Vienna, at Laxenburg, where it receives protection during winter, 5 years planted, it is 6 ft. high. In Italy, at Monza, 10 years planted, it is 20 ft. high. Price of plants, in the London nurseries, one guinea each.

GENUS VIII.

DAMMARA Rumph. THE DAMMAR, or AMBOYNA, PINE. *Lin. Syst.*
Monœcia Monadélphia.

Synonymes. *Pinus Lamb.*,
A'gathis Sal.

Derivation. From *dam-*
mar, the name, in Am-
boyna, of the resin which
it produces.

Description. Large,
broad-leaved, evergreen,
timber trees, abounding
in resin; natives of Am-
boyna and New Zealand;
and requiring, in England,
the protection of a green-
house.

† 1. *D. ORIENTA-*
LIS Lamb. The
Oriental Dammar
Pine, or Amboyna
Pitch Tree.

Identification *Lamb. Pin.*,
t. 54.

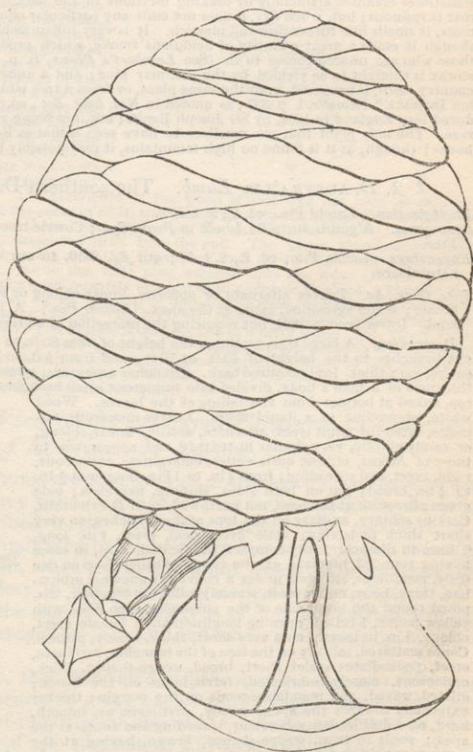
Synonymes. *Pinus Dám-*
maria Willd. Sp. Pl., 4.
p. 503., *Lamb. Monog.*,
ed. 1., p. 32., *Ait. Hort.*
Kew., ed. 2., 5. p. 321.;
Dám-mara álba Rumph.
Amboyn., 2. t. 57.; *A ga-*
this loranthifolia Sal. in
Ann. Trans., 8. p. 312.,
Lindl. in *Penn. Cyc.*;
A. Dám-mara *Rich.*
Conif., p. 83.; *A'rbor*
javanénsis, &c., Raii
Hist., 3., *Dendr.* p. 130.

Engravings *Lamb. Pin.*,
t. 54.; *Lin. Trans.*, 8.
t. 15.; *Rich. Conif.*, t.
81.; *Lamb. Monog.*,
ed. 1., t. 38., and our *fig.*
2309. to our usual scale,
and *fig.* 2308. to the nat-
ural size.

Spec. Char., &c. Leaves
opposite, oval-oblong,
parallel-veined, attenu-
ated at the base. Cones
turbinate; scales ad-
pressed, round at the
apex. (*Lamb. Pin.*) A

large tree, a native of Amboyna. Introduced in 1804.

Description, &c. Rumphius describes it as a very tall tree, with a straight, upright, cylindrical



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trunk, smooth bark, and rather small head. Branchlets leafy and tetragonal. Leaves alternate or opposite, lanceolate, oblong, quite entire, glabrous, of a coriaceous texture, and a glaucous green; about 2 in. long, and nearly 1 in. broad, slightly striated longitudinally. The flowers are unisexual; the male catkins are ovate-oblong-shaped, about the size of a pigeon's egg, on a short peduncle, thick, and placed a little above the axes of the leaves. The male catkins are composed of a great number of obtuse imbricated scales: each scale is wedge-shaped, and abruptly curved inwardly at its upper extremity; the lower extremity is occupied by from 8 to 15 anthers, disposed in two rows. The female catkins are of the same form as the males; and they also are formed of obtuse, imbricated, thick, coriaceous scales. The dammar is distinguished from the pines and firs by its female flowers being solitary and not twin; and by the form and structure of its male flowers. It approaches nearest to the genus *Araucaria*, from which it differs in the form of its scales, in the absence of a bractea to each female flower, and by its seed being winged only on one side. (*A. Rich. in Dict. Class. d'Hist. Nat.*, t. 5. p. 321.) The tree is found



on the very summit of the mountains of Amboyna and Ternate, and in many of the Molucca Islands. The wood is said to resemble that of the cedar, and to be light and of inferior quality, wholly unfit for any situation exposed to the action of the weather, but answering tolerably well for indoor purposes. The most interesting produce of the tree, however, is its resin. (See *Dr. Lindl. in Penn. Cyc.*) The resin, when it first flows from the tree, is soft and viscous; but in a few days it becomes as hard as stone, and has all the transparency and whiteness of crystal, especially that which adheres to the trees, and sometimes hangs from them in the shape of icicles. These crystals are sometimes 3 in. or 4 in. broad, and 1 ft. long, and exhibit an elegant striated appearance. They are very brittle, and when broken, shine like glass. The resin does not retain its whiteness more than five or six months; after which it assumes a beautiful amber colour. Though the resin generally exudes naturally in great abundance, it is sometimes obtained artificially by making incisions in the bark. The smell of fresh and soft dammar is resinous; but, when dry, it does not emit any particular odour. When thrown upon burning coals, it smells like turpentine and mastic. It is very inflammable, and burns without crackling, though it emits a great quantity of acidulous smoke, which produces a very unpleasant effect on those who are unaccustomed to it. (See *Lambert's Pinus*, ii. p. 99.) Dr. Lindley says: "Liquid storax is thought to be yielded by the dammar pine; and a substance called in India dammer, or country resin, is procured from the same plant, or from a tree which Dr. Buchanan calls *Chloroxylon Dussada*." (*Ainslie*, i. p. 337., as quoted in *Nat. Syst. Bot.*, ed. 2., 1836.) This species was introduced into England in 1804, by Sir Joseph Banks; but, not being readily propagated, it is extremely rare. The only plant that we recollect to have seen is that at Kew, where it is kept in the greenhouse; though, as it is found on high mountains, it may possibly be as hardy as *Cunninghamia*.

† 2. *D. AUSTRALIS* Lamb. The southern Dammar, or *Kauri*, Pine.

Identification. Lamb. Pin., ed. 2., 2. t. 55.

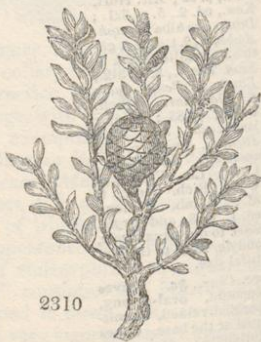
Synonymes. *A'gathis australis* Lindl. in *Penn. Cyc.*; Cowrie tree, New Zealand Pitch tree, Kowrie Pine.

Engravings. Lamb. Pin., ed. 2., 2. t. 55.; our fig. 2310. to our usual scale; and fig. 2311. of the natural size.

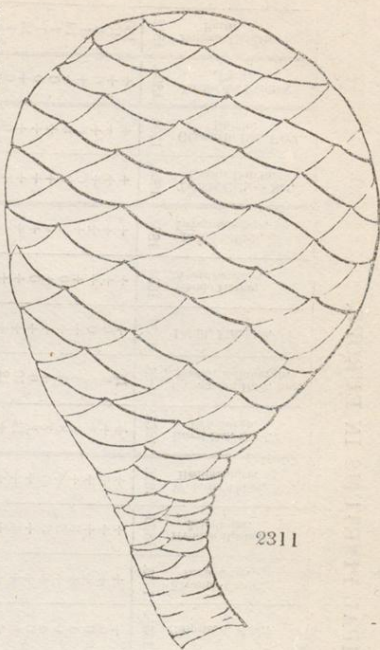
Spec. Char., &c. Leaves alternate or opposite, linear-oblong or elliptic, veinless, rigid. Cones turbinate; scales spreading, acute at the apex. (*Lamb. Pin.*) A large tree, a native of New Zealand. Introduced in 1821, but requiring the protection of a greenhouse.

Description. A large tree, attaining the height of from 80 ft. to 140 ft. Trunk very straight, without branches to the height of 40 ft. or 70 ft., and from 4 ft. to 7 ft. in diameter; covered with an entire, very thick, lead-coloured bark. Branches numerous, spreading, somewhat remote, about the thickness of a man's body, divided into numerous small branches; ascending and leafy towards the top, naked at bottom from the falling of the leaves. Wood white, abounding in a liquid resin. Leaves numerous, opposite, often (in adult trees) alternate, sessile, linear-oblong, or rarely elliptic, very similar in texture and appearance to those of *Buxus*, obtuse, quite entire, emarginate, coriaceous, rigid, erect, and spreading; from $\frac{1}{2}$ in. to $1\frac{1}{2}$ in. long; and $\frac{1}{2}$ in. to $\frac{3}{4}$ in. broad; flat on both sides, shining, nerveless; pale green; broadish at the base, not narrowed, as in *D. orientalis*. Catkins solitary, axillary on the tops of the branches, on very short thick footstalks; male cylindrical, erect, 1 in. long, 2 lines in diameter, very compact, imbricated, hard, in some having rounded bractea at the base. Anthers 5-6 on one scale, pendulous, situated under a convex, somewhat orbiculate, thick, bony, entire crest, scarcely adhering together, disposed round the lower side of the columella, each filled with yellow pollen, 1-celled, opening longitudinally; female erect, oblong, 1 in. in length, on a very short, thick, woody, pedicel. Cones scattered, solitary on the tops of the branches, turbinate, erect, pedicellate; scales short, broad, wedge-shaped, thick, coriaceous, closely imbricated, ferruginous on the inside; dilated, waved, and membranaceous on the margin; thicker externally towards the apex, woody, cartilaginous, smooth, hard, of a dull leaden ash-colour, spreading and acute at the apex: seeds in twos, wedge-shaped, brown, having at the apex on one side a membranaceous, quite entire, oblique, pale-coloured wing. (*Lamb.*)

Geography, History, &c. The *kauri* pine is a native of New Zealand, on the banks of the river there which Captain Cook named the Thames. It was discovered in the year 1769, on Captain Cook's first voyage, and an enormous tree of it was then cut down. The straightness of the trunk,



and fine grain of the wood, made Captain Cook think that, if it proved light enough, it would make excellent masts. In consequence of his report, but several years afterwards, a small spar was brought to England by the Catharine whale-ship, which proved, to use the seamen's phrase, "a stick of first-rate quality." Captain Cruise was afterwards sent out in the Dromedary to bring home some spars of this wood. He found many trees with trunks 100 ft. high, without a single branch, and then forming large heads; while the trunks of others, not so tall, were 40 ft. in circumference. It was, however, very difficult to procure spars, as the large trees grew on the very summit of the highest hills. Two ships were afterwards sent out under Captain Downie, who not only brought home timber, but a living plant, which was presented to the Horticultural Society about 1831. (See *Lamb. Pin.*, ed. 2., 2. p. 103.) In 1833, another expedition was sent out for kauri pine in His Majesty's ship Buffalo; and it was accompanied from Sydney by the late Mr. Richard Cunningham, who found "many fair and noble specimens of the undisputed monarch of the forest, the kauri pines with their vast heads towering above the other gigantic timbers of those deeply shaded regions, supporting on their upper branches large tufts of those tillandsia-like epiphytes, the species of *Astelia*, originally discovered by Sir Joseph Banks. These plants are much valued by the natives for the sweetness of the stem on which the flowers grow. They (the natives) will climb, says Mr. Gates, the highest tree, in search of these epiphytes; and, when they have gathered them, they will sit for a long time at the bottom of the tree, sucking out the juice of the stem; which to them, especially on a hot day, is peculiarly grateful. These plants give the smaller groves the appearance of an English rookery, and there only wants the tui (*Meros cinnamatus* Lath.), that polyglot bird of the woods of New Zealand, to imitate the cawing of the rook, to make the deception complete."



2311

(*Comp. to Bot. Mag.*, ii. p. 217.) The excellence of the wood of this tree has been already mentioned, and Mr. Lambert adds to his account of it, that, on an experiment being tried as to the comparative strength of the wood, and that of the Riga pine, the result was as follows:— Both pines were 1½ in. square, 3 ft. long, and suspended 10 in. from the end. The kauri pine bore a weight of 1 cwt. 2 qr. and 15 lb. before it broke, and the Riga pine only 1 cwt. 2 qr. and 1 lb.; but the kauri pine weighed 1 lb. 13 oz., while the Riga pine weighed only 1 lb. 8 oz. (*Lamb. Pin.*) In 1837, a contract was made to send a large quantity of wood of this pine to England. The tree yields, both spontaneously and by incision, a great quantity of pure limpid resin, which hardens by exposure to the air, and which is excellent as varnish. In 1837, Mr. Lambert received an immense mass of this resin, 6 in. or 8 in. in diameter. The outside is opaque, and of a dirty white; but, where broken, it has a glassy transparent look, and a pale green tinge. The *Dammara australis* was first treated as a hot-house plant in England, but has since been found to thrive better in the green-house. There is a tree planted out at Dropmore, which, in 1837, was 5 ft. high. It was, however, very unhealthy, and requires to be strongly protected in winter.

App. i. *A Tabular View of the principal Pinetums, or Collections of Abietinæ, in Europe.*

The names of the pinetums are arranged, as nearly as could be ascertained, in the order in which they were commenced; and the species in the order in which they are described in the preceding pages. The existence of a species in any pinetum is indicated by its height in feet, according to measurements sent us in 1837; but, when the height is not exactly known, the existence of a species or variety in any pinetum or collection is indicated by a cross, thus +. When the species or variety is of doubtful existence in any collection, a point of interrogation is used; and when it is wanting, a cipher is introduced.

It is proper to observe, that our table, which occupies the two following pages, does not contain nearly so many names purporting to be species and varieties, as are in some of the original lists of the collections sent to us. For example, in the catalogue of the pinetum at Flitwick, (which ranks next to that at Dropmore, in the number of kinds,) there are of *Pinus* 59 names of species and varieties, of *Abies* (including *Picea*) 27, and of *Larix* 7. The reason why we have omitted several of these names is, that we are doubtful as to the application of some of them, and consider others as only varieties, or as

synonymes; while some of the names, which we acknowledge to be those of existing varieties, are omitted, because we think the varieties themselves of very little consequence, and scarcely worth notice.

Besides the pinetums and collections shown in the above tabular view, there are others which would have been included in it, had there been room; and a number of collections, more or less complete, which deserve to be recorded, as illustrative of the present taste for the culture of the pine and fir tribe. All of these that we have been able to recollect at the moment are included in the following paragraphs:—

In England, besides the pinetums noticed in the tabular view, there are collections at Syon and Whitton Park, Middlesex; Pain's Hill, Clarendon, and Ockham Park, Surrey; Redleaf and Deepdene, Kent; Bayfordbury, Hertfordshire; White Knights and Bear Wood, Berkshire; Wardour Castle, Bowood, and Boyton House, Wiltshire; Bicton, Devonshire; Croome, Warwickshire; Trentham, Staffordshire; Carlton Hall, Durham; Clumber Park, Nottinghamshire.

The English Nurseries which possess the best collections are those of Messrs. Loddiges, Hackney; Messrs. Whitley and Osborn, Fulham; Messrs. Lee, Hammersmith; Messrs. Brown, Slough; Mr. Donald, Goldworth; and Messrs. Dickson, Chester. The best assortment of pine and fir seeds for sale is kept by Mr. Charlwood, London.

In Scotland, the best collections not included in the tabular view are: at New Posso, Peeblesshire; Oxenford Castle, and Hopetoun House, near Edinburgh; and Methven Castle, Perthshire.

The Scotch Nurseries which contain the best collections are those of Messrs. Cunningham and Messrs. Lawson, Edinburgh; Messrs. Turnbull and Dickson, Perth; and Mr. Roy, Aberdeen. The best collection of pine and fir seeds is kept by Mr. Lawson of Edinburgh.

In France, there are the following collections:—

1. *True Pinetums (Collections botaniques)*. Madame Aglié Adanson, at Balenie, near Moulins, Allier; Dumont de Courset, at Courset, near Sainer, Pas de Calais; M. Ivoy, at Bordeaux.

2. *Botanical Forests (Botanique forestière)*. M. Vilmorin, at Barres, near Nogent sur Vernisson, Loiret.

3. *Amateur Collections less complete than the Pinetums*. Count de Montbron, at Chatellerault; Baron de Tschoudi, at Metz; Viscount Héricart de Thury, in the environs of Paris; M. Bobée, near Châteauneuf, Haute Loire; M. De Lorgeril, at Baumanoir, near Rennes; Marquis de la Boessière, at Malleville, near Ploermel; Baron de Morogues, at La Source, near Orleans; M. Mallet De Chilly, at Sologne, near Orleans; M. De la Giraudière, Sologne, near Blois; M. Macarel, near Gien; M. Doublat, at Epinal; Viscount de Tristan, at Orleans. The late M. De Courson, near St. Briene; the late Du Hamel du Monceau, at Denainvilliers, at Monceau, and at Vrigny, near Pithiviers; and of M. De Malesherbes, at Malesherbes.

4. *Experimental Plantations (Plantations (non plus Collections) forestières expérimentales)*. M. Delamarre, at Harcourt; M. Marcellin Vétillard, at Mans; M. Bérard, sen., at Mans; M. Bataille de Mandelat, at Autun; M. Doucet, La Fay, near Aubigny; and the government plantations in the forests of Fontainebleau, Compiègne, and Villers Cotterets, and in the Bois de Boulogne.

5. *Plantations of particular Species*.—*Pinus Laricio*, by M. Le Roy, at Boulogne-sur-Mer; and the Count Lemarrois. *P. sylvestris*, by the Viscount Ruinard de Brimout at Rheims; and many others in Champagne. *Larix europæa*, by the Count de Rambuteau. *Picea pectinata*, by M. De Candecoste, at Laigle; besides many other plantations in Normandy.

The principal nurseries in France which contain collections of pines and firs are, those of M. Cels, M. Godefroy, and M. Soulange-Bodin, at or near Paris; and that of Messrs. Baumann at Bollwyller. The seedsman who keeps the most extensive collection of pine and fir seeds is M. Vilmorin, Paris.

In Belgium, the collection of the Baron de Serret, at Bruges.

In *Germany*, the principal collections, next to that in the Botanic Garden Berlin are : at Wörlitz, in Saxony ; at Harbecke, in Hanover ; at Brüek on the Leytha, near Vienna ; in the University Botanic Garden, Vienna ; and in the Botanic Garden, Göttingen. The nursery in Germany in which there is the most complete collection of Coniferæ is that of Messrs. Booth, Hamburg, who also keep the best assortment of pine and fir seeds.

In *Russia*, there are collections in the Imperial Botanic Garden, St. Petersburg ; and in the Government Garden at Nikitka, in the Crimea.

In *Denmark*, there is a collection in the Royal Gardens, Rosenberg, Copenhagen.

In *Sweden*, in the Botanic Garden at Lund.

In *Italy*, in the Botanic Garden at Monza, near Milan.

Sect. II. CUPRESSINÆ.



THE Cupressinæ differ from the Abietinæ in being for the greater part shrubs or low trees, instead of lofty trees. They are all evergreen, with the exception of one species of *Taxodium* (*T. distichum*, the deciduous cypress) ; and none of them have the branches disposed in whorls, as is the case with all the pines and firs without exception. The greater part of the species are natives of warm climates, and comparatively few of them are perfectly hardy in British gardens. One only, the common juniper, is a native of Britain ; but between 30 and 40 foreign species and varieties endure the open air in England ; and 8 or 10 of these (exclusive of *Taxodium*), which have been not less than 30 or 40 years in the country, and which have had time to display their shapes, form very handsome or remarkable evergreen low trees, or tall shrubs ; such as the red cedar, the white cedar, the eastern and western arbor vitæ, the Phœnician and tall juniper, the cedar of Goa, the common and spreading cypress, &c. The greater number of the species or alleged species have, however, been but a short time in British nurseries, and are only to be seen as very young plants in the nurseries, or in very choice collections. These lately introduced kinds are so imperfectly known among cultivators, that little dependence is to be placed on the names which are applied to them ; and therefore all that we can recommend is, that they should be as extensively introduced into collections as possible, in order that they may grow up to some size, and be examined in various situations by different botanists. In collecting, with a view to this object, some of the alleged kinds will doubtless turn out duplicates, but the only objection to this, in the case of such very rare and interesting evergreens, is the first cost, which is comparatively a trifle. It may be observed of all the species of Cupressinæ, that it is not easy to describe by words, and scarcely practicable to illustrate by figures, without the fruit, many of the different species of this family ; nevertheless, to a practised eye, it is easy to distinguish the three leading genera, viz. *Thuja*, *Cupressus*, and *Juniperus*, by a portion of the branch, without either flowers or fruit. The flattened, two-edged, scaly, imbricated shoots of all the thujas, including *Callitris* (which may, if the reader chooses, be considered a subgenus), are two-edged, whether the specimen be young or old ; those of *Cupressus* are scaly and imbricated, but angular or roundish, and never two-edged ; and those of *Juniperus*, in the young state of the plants, have distinct acerose leaves, generally glaucous above, and often in threes joined at the base.

Propagation and Culture. All the kinds may be propagated by layers and cuttings ; and the most common species ripen seeds in Britain in abundance. The seeds, which generally lie a year in the ground, may be sown in spring ; and the young plants may be treated in all respects like those of the pine

and fir tribe. When the seeds are sown in autumn, immediately after being gathered, they sometimes come up the following year. Cuttings should be made in autumn, of the wood of the same year, with a small portion of the preceding year's wood attached; and they should be planted in sand, or in a very sandy loam, in a shady border, and covered with hand-glasses. Cuttings put in in September will form callosities at their lower extremities the same autumn, and should be protected by mats during severe frosts in winter: the following autumn they will be ready to transplant. Layers may be made either in autumn or spring.

GENUS IX.

THUJA L. THE ARBOR VITÆ. *Lin. Syst. Monœcia Monadelphica.*

Identification. *Lin. Gen.*, 1078.; *Reich.*, No. 1176.; *Schreb.*, No. 1457.; *Tourn.*, t. 358.; *Juss.*, 413.; *Gaertn.*, t. 91.; *Lamb. Pin.*, ed. 2., 2.

Synonymes. Thuya, or Arbre de Vie, *Fr.*; Lebensbaum, *Ger.*

Derivation. From *thyon*, sacrifice; in consequence of the resin of the Eastern variety being used instead of incense in sacrifices. Why it was called Arbor Vitæ is uncertain. Parkinson says the American species was presented to Francis I. under this name, and that it has been continued ever since, though for what reason he knows not. It was called the Arbor Vitæ by Clusius. Royle mentions that, in the East, the cypress is called the tree of life; and that its berries, &c., are considered a cure for all diseases.

Description, &c. Narrow, pyramidal, evergreen trees, or large fastigate shrubs; natives of Asia, Africa, and North America, and for the most part hardy in British gardens. The species have been divided by Professor Don into the following sections:—

1. *Thuja vèræ.* Cones oblong-compressed; scales consisting of a definite number (4 or 6), coriaceous, smooth, with one tubercle under the apex; two exterior ones shortened, boat-shaped. Seeds compressed, winged. To this belong *T. occidentalis L.*, *T. plicata Donn.*, and *T. chilensis D. Don.* In *T. occidentalis* the seeds are flattened, winged all round, emarginate at the apex.
2. *Biôta.* Cones roundish, squarrose; scales indefinite in number, peltate, woody. Seeds belying, crustaceous, without wings. To this belongs *T. orientalis L.*
3. *Cyparissa.* Cones roundish; scales indefinite in number, peltate, woody. Seeds winged at the apex. To this belong, *T. cupressoides L.*, *T. pennisilis D. Don.*, and *T. pëndula D. Don.*

§ 1. *Thuja vèræ.*‡ 1. *T. OCCIDENTALIS L.* The western, or American, Arbor Vitæ.

Identification. *Hort. Cliff.*, 449.; *Hort. Ups.*, 289.; *Roy Lugd.*, 87.; *Smith in Rees's Cyc.* No. 1.; *Kalm Jün.*, 3. p. 389.; *Mill. Dict.*, No. 1.; *Du Roi Harbk.*, 2. p. 455.; *Blackw.*, t. 210.; *Kniph. Cent.*, 1. No. 91.; *Wang. Amer.*, 7. t. 2.; *Willd. Arb.*, 383.; *Baum.*, 504.; *Sp. Pl.*, 4. p. 508.; *Michx. Arb.*, 3. t. 29.; *N. Du Ham.*, 3. p. 12.; *Pursh Fl. Amer. Sept.*, 2. p. 646.; *Michx. N. Amer. Syl.*, 3. p. 226.; *Rich. sur les Conif.*, p. 43.

Synonymes. *Thuja Theophrasti* *Bauh. Pin.*, 488.; *Arbor Vitæ* *Clus. Hist.*, 1. p. 36.; white Cedar, *Amer.*; Cèdre américain, Cèdre blanc, Arbre de Vie, *Fr.*; gemeiner Lebensbaum, *Ger.*; *Albero de Vita*, *Ital.*

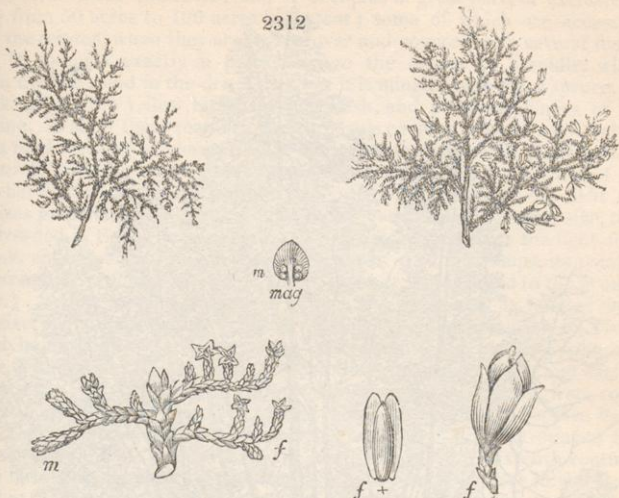
Engravings. *Blackw.*, t. 210.; *Wang. Amer.*, 7. t. 3.; *Michx. Arb.*, 3. t. 29.; *Rich. Con.*, t. 7. f. 1.; our figs. 2312. to 2314.; and the plate of this tree in our last Volume.

Spec. Char., &c. Branchlets 2-edged. Leaves imbricated in 4 rows, ovate-rhomboid, adpressed, naked, tuberculated. Cones obovate; interior scales truncate, gibbous beneath the apex. (*Willd.*) A moderate-sized tree, or large shrub; a native of Canada, and in cultivation in England since 1596; flowering in May, and ripening its cones in the following autumn.

Varieties.

- ‡ 1. *T. o. 2 variegata* *Marsh.*, p. 243.; *T. o. foliis variegatis* *Lodd. Cat.*, 1836; has the leaves variegated. There is a tree in the Horticultural

2312



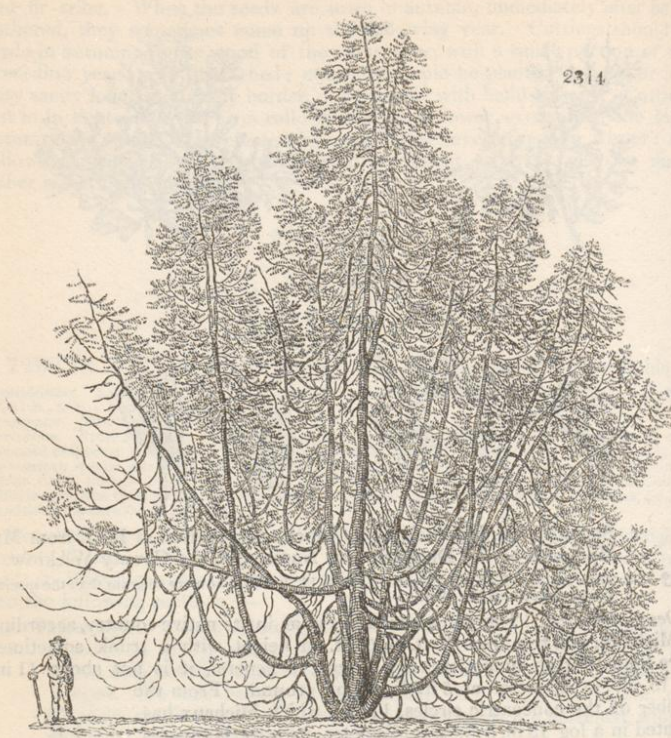
Society's Garden, 8 ft. high, which was received in 1831, from Mr. Hodgkins of the Dunganstown Nursery, in the County Wicklow.

† *T. o. odorata* Marsh., l. c., N. Du Ham., iii. p. 13., is said to be more fragrant than the species. We have not seen the plant.

Description, &c. The American arbor vitæ, in its native country, according to Michaux, is a tree from 45 ft. to 50 ft. in height, with a trunk sometimes more than 10 ft. in circumference; though, in general, it is not above 11 in. or 15 in. in diameter at 5 ft. from the ground. From the number of the concentric circles, 117 of which Michaux has counted in a log 13 in. 5 lines in diameter, its growth appears to be extremely slow. The foliage is numerously ramified, and flattened, or spread out laterally. The leaves are small, opposite, imbricated scales: when bruised, they diffuse a strong aromatic odour. The sexes are separate upon the same tree: the male catkins are in the form of small cones, which, when ripe, are yellowish, about 4 lines in length, and composed of oblong scales, which open throughout their whole length for the escape of several minute seeds, each of which is surmounted by a short wing. The flowers appear early in spring, and the catkins are matured towards the end of September. In America, the full-grown arbor vitæ is easily distinguished from all other trees by its shape and foliage. The trunk tapers rapidly from a very large base to a very slender summit; and it is furnished with branches for four fifths of its height. The principal limbs are widely distant from each other, placed at right angles with the trunk, and have a great number of drooping secondary branches. The bark upon the trunk is slightly furrowed, but smooth to the touch, and very white when the tree stands exposed. The wood is reddish, somewhat odorous, very light and soft, and fine-grained. (*Michx.*) Compared with the Chinese arbor vitæ, the American species is a loose irregular-headed tree, with the branches much more horizontal than in that species. The rate of growth, in the climate of London, is from 6 in. to 1 ft. in a year. In ten years, in favourable soils, it will attain the height of 10 ft. or 12 ft.; and in 30 or 40 years, in moist sheltered situations, drawn up by other trees, it will attain the height of 30 ft. or 40 ft. The largest specimens in the neighbour-



2313



hood of London are at Syon, where it is between 25 ft. and 30 ft. high. At Pain's Hill, in a moist bottom near the water-wheel, there is a tall erect tree, between 30 ft. and 40 ft. high; and, in Studley Park, the spreading tree of which *fig. 2314.* is a portrait to the scale of 1 in. to 12 ft., is 45 ft. high, with a head 40 ft. in diam. This remarkable tree has no main trunk, but divides into several large limbs near the ground. Another tree in the same park, of which *fig. 2313.* is a portrait to the scale of 1 in. to 24 ft., is, on the contrary, 50 ft. high, with the side branches small like those of a larch.

Geography and History. The *Thuja occidentalis* is found in North America, from Canada to the mountains of Virginia and Carolina. According to Pursh, it is rather scarce in the southern states, and is only found there on the steep banks of mountain torrents. Michaux states that it is found on the Hudson in abundance, and near the Rapids of the Potomac, in Virginia. Goat's Island, round which the Niagara divides itself to form the stupendous cataract so universally admired, is bordered with trees of *Thuja occidentalis*. Mr. McNab, in 1834 (see p. 182.), found it in abundance in these habitats, and in various other places between New York and Canada. In Canada, and in the northern parts of the United States, it is called the white cedar; but in the district of Maine it is more commonly known as the arbor vitæ. In Lower Canada, New Brunswick, Vermont, and the district of Maine, the arbor vitæ is the most abundant of the resinous trees, after the black and the hemlock spruces. A cool soil seems to be indispensable to its growth. It is never seen on the uplands among the beeches, the birches, &c., but is found on the rocky edges of the innumerable rivulets and small lakes which are

scattered over these countries; and it occupies in great part, or exclusively, swamps from 50 acres to 100 acres in extent; some of which are accessible only in the winter, when they are frozen over and covered with several feet of snow. It abounds exactly in proportion to the degree of humidity which exists in the soil; and in the driest marshes it is mingled with black spruce, the hemlock spruce, the yellow birch, the black ash, and a few specimens of the white pine. In all of these marshes, the surface is covered with a bed of *Sphagnum*, so thick, and so surcharged with moisture, that the foot sinks half-leg deep into it, while the water rises under the pressure. On the borders of the lakes, where the arbor vitæ has room, and enjoys the benefit of the light and air, it rises perpendicularly, grows more rapidly, and attains a greater size, than when crowded in the swamps, where its thick foliage intercepts the light from the trunk, and impedes the circulation of the air. In the swamps, its trunk is rarely straight, but forms an elliptic curve, more or less inclined to the ground. (*Michx.*) "By a strange mistake of Linnæus, this species is handed down as a native of Siberia; because Gmelin (*Fl. Sib.*, v. i. 182.) mentions a *Thuja*, to which he misapplies the synonymes of the present, but which, by his own account, is different; for he says it is paler than the garden kind, and smaller in all its parts. It was brought to him by a travelling surgeon, from rocks near Pekin in China, and could be no other than *T. orientalis*." (*Smith in Rees's Cyc.*) The American arbor vitæ appears to have been first introduced into Europe in the time of Francis I., at the beginning of the sixteenth century; Clusius having stated that the first tree that he saw of it was one in the Royal Garden at Fontainebleau, which had been sent from Canada as a present to that monarch. It was cultivated in England by Gerard, who observes, writing in 1596, that, though not a native of the country, it grew in his garden very plentifully. As the tree ripens abundance of seeds, it is readily propagated, and, from the time of Gerard, has been one of our commonest hardy evergreens.

Properties and Uses, &c. From the shape of the main stem, Michaux observes, it is difficult to procure trunks of a considerable length, and a uniform diameter; hence, in the district of Maine, the timber of this tree is little employed for the framework of houses, though in other respects it is proper for this purpose. It is softer than the white pine, and gives a weaker hold to nails; for which reason, the Canadians always join it with more solid wood. The elder Michaux, in his journey to Hudson's Bay in 1792, found the church established there by the Jesuits yet standing. This building, constructed in 1728, as was proved by an inscription over the door, was built with square logs of the arbor vitæ, laid one upon another, without covering on either side; and it had remained perfectly sound more than 60 years. The most common use of this tree is for rural fences, for which it is highly esteemed. The posts last 35 or 40 years, and the rails 60 years; or three or four times as long as those of any other species. The posts remain undecayed twice as long in argillaceous as in sandy soils. In Canada, the wood of the arbor vitæ is selected for the light frames of bark canoes. Its branches, garnished with leaves, are formed into brooms, which exhale an agreeable aromatic odour. Kalm affirms that the leaves, pounded and mixed with hog's lard, make an excellent ointment for the rheumatism. (*Michx.*)

In Britain, the American arbor vitæ can only be considered as an ornamental shrub or low tree; thriving well in any soil, even in the most exposed situations, but attaining its largest size in low, sheltered, and moist places. It bears the knife and the shears; and is frequently employed to form hedges for shelter in gardens and nursery grounds. The smaller branches are long, slender, and remarkably tough, and may be used as ties to faggot-wood, or wattles to fences, where strength and durability are required. The tree is readily propagated by seeds, which are procured in abundance from America, or gathered from British trees; or by cuttings.

Statistics. In the environs of London. At Mount Grove, Hampstead, it is 20 ft. high, with a trunk 10 in. in diameter; in the Fulham Nursery, 20 years planted, it is 30 ft. high; at Stanmore, at Abercorn Priory, it is 33 ft. high; at Gunnersbury Park are several cone-shaped trees, 30 ft. high. — South of London. In Hampshire, at Alresford, 15 years planted, it is 19 ft. high. In Surrey, at

Ragshot Park, 12 years planted, it is 20 ft. high. In Berkshire, at White Knights, 34 years planted, it is 25 ft. high. In Buckinghamshire, at Temple House, 40 years planted, it is 16 ft. high. In Essex, at Braybrooke, 51 years planted, it is 35 ft. high. In Nottinghamshire, at Clumber Park, it is 30 ft. high, the diameter of the trunk $1\frac{1}{2}$ ft., and of the head 22 ft. In Radnorshire, at Maeslaugh Castle, it is 30 ft. high, the diameter of the trunk $1\frac{1}{2}$ ft., and of the head 15 ft. In Shropshire, at Kinlet, 60 years planted, it is 30 ft. high. In Staffordshire, at Teddesley Park, 14 years planted, it is 16 ft. high; at Rolleston Hall, 50 years planted, it is 25 ft. high, the diameter of the trunk 1 ft., and of the head 10 ft. In Suffolk, at Finborough Hall, 70 years planted, it is 30 ft. high. In Worcestershire, at Croome, 40 years planted, it is 20 ft. high. — In Scotland. In the environs of Edinburgh, at Gosford House, 80 years planted, it is 20 ft. high; at Hopetoun House, it is 35 ft. high. In Banffshire, at Gordon Castle, it is 30 ft. high. In Berwickshire, at the Hirsell, 30 years planted, it is 21 ft. high. In Haddingtonshire, at Tynningham, 72 years old, it is $17\frac{1}{2}$ ft. high. In Perthshire, at Inverary, it is 28 ft. high; at Taymouth, 50 years planted, it is 12 ft. high. In Ross-shire, at Brahan Castle, 30 years planted, it is 20 ft. high. In Stirlingshire, at Airthrey, 43 years planted, it is 30 ft. high, the diameter of the head 18 ft. — In Ireland. In the environs of Dublin, in the Glasnevin Botanic Garden, 30 years planted, it is 16 ft. high; and at Cypress Grove, 20 years planted, it is 18 ft. high. In King's County, at Charleville Forest, 25 years planted, it is 50 ft. high. In the County Down, at Ballyleedy, 22 years planted, it is 16 ft. high. In Fermanagh, at Florence Court, 50 years planted, it is 26 ft. high. In Louth, at Oriel Temple, 30 years planted, it is 30 ft. high. — In France, near Paris, at Sceaux, 10 years planted, it is 20 ft. high. — In Hanover, in the Göttingen Botanic Garden, 25 years planted, and from 30 ft. to 40 ft. high. — In Austria, at Vienna, in the University Botanic Garden, 20 years planted, it is 36 ft. high; at Laxenburg, 25 years planted, it is 20 ft. high; at Brück on the Leytha, 40 years planted, it is 30 ft. high. — In Prussia, at Berlin, at Sans Souci, 90 years planted, it is 14 ft. high; in the Pfauen-Insel, 40 years planted, it is 14 ft. high. — In Sweden, at the Botanic Garden at Lund, it is 20 ft. high. — In Italy, at Monza, 24 years planted, it is 18 ft. high.

Commercial Statistics Seeds, in London, 4s. per lb. Plants, in the London nurseries, are from 6d. to 1s. each; at Bollwyller, 1 franc; and at New York, 50 cents.

‡ 2. *T. (O.) PLICATA* Donn. The plicate, or Nee's, Arbor Vitæ.

Identification. Donn Hort. Cantab., 6. p. 249; Lamb. Pin. ed. 2., 2. No. 61.; Lodd. Cat. ed. 1836.

Spec. Char., &c. Branchlets compressed, spreading. Leaves rhomboid-ovate, acute, adpressed, imbricated in 4 rows, naked, tubercled in the middle. Cones oblong, nodding. Seeds orbiculate. (*Lamb. Pin.*) A native of Mexico, where it was found by Nee; and of the western shores of North America, at Nootka Sound, where it was found by Menzies. Introduced into Britain by the last botanist, in 1796.

Description, &c. A very branchy, spreading, light green tree. Branches crowded, covered with a reddish brown bark; branchlets dense, often divided, pectinate, compressed. Leaves rhomboid-ovate, acute, closely adpressed, imbricated in 4 rows, crowded together between the nodes; glabrous, quite entire, shining, tubercled in the middle. Cones scattered, solitary, nodding, oblong: scales elliptic, obtuse, flat, obsolete furrowed. Seeds compressed, winged all round, emarginate at the apex, orbiculate-oblong. (*Lamb.*) There are plants in the Horticultural Society's Garden, at Messrs. Loddiges, and in other collections in the neighbourhood of London, where it has every appearance of being a variety of *T. occidentalis*, of which we, at least, have no doubt.

‡ 3. *T. CHILENSIS* Lamb. The Chili Arbor Vitæ.

Identification. Lamb. Pin., ed. 2., 2. p. 128., No. 62.

Synonyme. *Cupressus rhyoides Pavon MSS.*

Spec. Char., &c. Branchlets jointed, spreading, compressed. Leaves ovate-oblong, obtuse, somewhat 3-angled, imbricated in 4 rows, adpressed, naked, furrowed on both sides. Cones oval-oblong; scales 4, compressed, elliptic, obtuse. Seeds winged at the apex, entire. (*Lamb. Pin.*, ii. No. 62.) A native of Chili, on the Andes; where it was found by Nee and by Pavon. Not yet introduced.

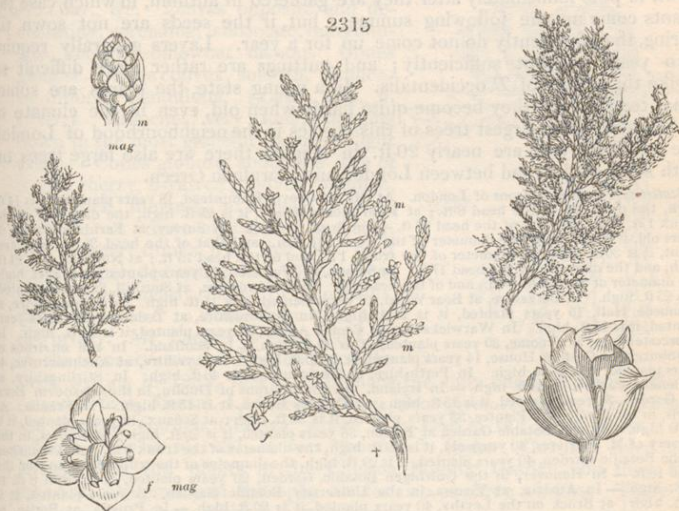
Description, &c. A beautiful, dark green, spreading tree. Branches numerous, drooping, and covered with a greyish-brown bark. Branchlets crowded at the apexes of the branches, often divided, compressed, articulated. Leaves oval-oblong, obtuse, somewhat trigonous, imbricated in 4 rows, adpressed, naked, somewhat distant; internodes distinct, especially in adult ones; glabrous, marked near the edge on both sides with a whitish, broad, depressed furrow, closely joined at the base, sheathing the branchlets. Cones numerous, terminal, drooping, oblong, compressed, 4-valved; exterior valves ovate-oblong, boat-shaped, pointed, externally convex; interior 2, opposite, spatulate, flattened at the apex, roundish, having a smaller nearly obsolete tubercle sometimes fertile. Seeds 2, sometimes inserted into the base of the interior valves, having a head scarious and membranaceous, very blunt; wing at the apex, decurrent at the base.

§ ii. *Biota*.‡ 4. *T. ORIENTALIS* L. The Oriental, or Chinese, Arbor Vitæ.

Identification. Lin. Sp., 1422; Willd. Sp. Pl., p. 509; Baum., p. 505; Du Roi Harbk., 2. p. 458; Thunb. Jap., p. 266; Hort. Cliff., 449; N. Du Ham., 3. p. 11; Rich. Conif., p. 40.
Engravings. Dend. Brit., t. 149; Rich. Conif., t. 7. f. 2; and Gmel. Fl. Sib., i. p. 182; Smith in Rees's Cyc.; and our fig. 2315.

Spec. Char., &c. Branchlets 2-edged. Leaves imbricated in 4 rows, ovate-rhomboid, adpressed, furrowed along the middle. Cones elliptic; interior scales blunt, mucronate beneath the apex. (*Willd.*) A low tree, or fastigiata

2315



shrub; a native of rocky situations in China and Siberia; and also, according to Thunberg, on the mountains of Japan. (*Fl. Jap.*, 266.) Introduced in 1752, and flowering in May.

Varieties.

‡ *T. o. 2 stricta* Hort.; *T. pyramidalis* *Bauh. Cat.*, ed. 1837; and the plate of this tree in our last Volume, from the specimen in the Horticultural Society's Garden; is more fastigiata than the species in its habit of growth, and forms a tall narrow shrub, or low tree.

■ *T. o. 3 tatárica*, *T. tatárica* *Lodd. Cat.*, ed. 1836, has the leaves, and the entire plant, rather smaller than the species. There is a plant in the Horticultural Society's Garden, 6 ft. high.

Description. A low tree or large shrub, distinguishable at first sight from the American arbor vitæ, by its more dense habit of growth, by its branches being chiefly turned upwards, and by its leaves or scales being smaller, closer together, and of a lighter green. The common height of full-grown trees of this species is from 18 ft. to 20 ft. The trunk is straight, with a brownish and somewhat rough bark; the branches are numerous, pointing outwards, so as to form almost a right angle with the stem; but soon afterwards they are turned upwards, in a direction almost parallel to the trunk. The leaves are flattened, and of a darker green in winter than in summer: they are imbricated, opposite, small, obtusely pointed, adpressed against the petioles, convex, furrowed at the back, and furnished with a clear green, smooth, shining gland. The male catkins are somewhat elongated, about 2 lines in length, composed of pointed scales disposed in 4 ranks. The female catkins are roundish, somewhat elongated, and composed of scales pointed at their summit,

which is recurved. When mature, the scales are thick, fleshy, rough, and opening lengthwise. The seeds are naked, ovoid, somewhat angular, reddish brown, and containing a kernel of the same form, but white. The fruit remains on the tree during winter, and opens and sheds its seeds with the first warm weather of spring. It is a native of China and Japan; and, according to Miller, it was first sent to Europe by the French missionaries. It has been in cultivation in England since 1752, and is a more compact-growing and handsomer species than the American *arbor vitæ*. It is quite hardy in the climate of London, where, in fine seasons, it ripens seeds. These are generally sown in pots immediately after they are gathered in autumn, in which case the plants come up the following summer; but, if the seeds are not sown till spring, they frequently do not come up for a year. Layers generally require two years to root sufficiently; and cuttings are rather more difficult to strike than those of *T. occidentalis*. In a young state, the plants are somewhat tender; but they become quite hardy when old, even in the climate of Edinburgh. The largest trees of this species in the neighbourhood of London are at Syon, and are nearly 20 ft. in height; there are also large trees on both sides of the road between London and Turnham Green.

Statistics. In the environs of London. At Mount Grove, Hampstead, 18 years planted, it is 14 ft. high, the diameter of the head 8 ft.; at Ham House, Essex, it is 25 ft. high, the diameter of the trunk 1 ft. 6 in., and that of the head 23 ft. — South of London. In Surrey, at Farnham Castle, 50 years old, it is 45 ft. high, the diameter of the trunk 2 ft. 4 in., and that of the head 30 ft.; at Claremont, it is 30 ft. high, the diameter of the trunk 1 ft., and of the head 15 ft.; at Nutfield, it is 24 ft. high, and the diameter of the head 17 ft. In Sussex, at Westdean, 11 years planted, it is 14 ft. high, the diameter of the trunk 8 in., and of the head 8 ft. In Bedfordshire, at Southill, 22 years planted, it is 25 ft. high. In Berkshire, at Bear Wood, 12 years planted, it is 15 ft. high. In Denbighshire, at Llanbede Hall, 15 years planted, it is 21 ft. high. In Staffordshire, at Teddesley Park, 14 years planted, it is 14 ft. high. In Warwickshire, at Coomb Abbey, 60 years planted, it is 31 ft. high. In Worcestershire, at Croome, 30 years planted, it is 20 ft. high. — In Scotland. In the environs of Edinburgh, at Gosford House, 14 years planted, it is 10 ft. high. In Ayrshire, at Auchencruive, 40 years planted, it is 20 ft. high. In Perthshire, at Taymouth, it is 40 ft. high. In Stirlingshire, at Callendar Park, it is 23 ft. high. — In Ireland. In the environs of Dublin, in the Glasnevin Botanic Garden, 30 years planted, it is 15 ft. high; at Cypress Grove, it is 15 ft. high. — In France. At Paris, in the Jardin des Plantes, 35 years planted, it is 36 ft. high; at Scéaux, 10 years planted, it is 20 ft. high. In the Botanic Garden at Toulon, 35 years planted, it is 29 ft. high; at Nantes, in the nursery of M. Nerrières, 40 years old, it is 29 ft. high, the diameter of the trunk 8 in.; at Avranches, in the Botanic Garden, 40 years planted, it is 29 ft. high, the diameter of the trunk 1 ft., and of the head 15 ft. — In Hanover, in the Göttingen Botanic Garden, 20 years planted, it is from 8 ft. to 16 ft. high. — In Austria, at Vienna, in the University Botanic Garden, 35 years planted, it is 30 ft. high; at Brück on the Leytha, 40 years planted, it is 20 ft. high. — In Prussia, at Berlin, at Sans Souci, 90 years planted, it is 20 ft. high; in the Pfauen-Insel, 6 years planted, it is 10 ft. high. — In Sweden, in the Botanic Garden at Lund, it is 10 ft. high. — In Italy, at Monza, 24 years planted, it is 20 ft. high.

Commercial Statistics. Price of plants, in the London nurseries, 1s. 6d. each; at Bollwyller, 1 franc; and at New York, 50 cents.

§ iii. *Cyparissa*.

5. *T. CUPRESSOIDES* L. The Cypress-like, or African, Arbor Vitæ.

Identification. Willd. Sp. Pl., 4. p. 510.; Lin. Mant., 125.; Thunb. Prod., 110.; N. Du Ham., 3. p. 16.; Ait. Hort. Kew., ed. 2., 5. p. 322.

Synonyme. *T. aphylla* Burm. Prodr., 27.

Engraving. Our fig. 2316. of the natural size.

Spec. Char., &c. Branchlets round. Leaves imbricated in 4 rows, oblong, depressed, smooth. Cones globose, somewhat 4-angled. (*Willd.*) A native of the Cape of Good Hope. Introduced into Kew Gardens, by Dr. Roxburgh, in 1799. *Fig. 2316.*, of the natural size, is from a specimen of a young plant which bears the name of *Thuja cupressoides* in some of the nurseries; but, as none of the plants exceed 2 ft. in height, and very little is known of their origin, the correctness of the application of the name may reasonably be doubted.

6. *T. PENNSILIS* Lamb. The pensile Arbor Vitæ.

Identification. Staunt. Embass., p. 436.; Lamb. Pin., 2., No. 63.



Spec. Char., &c. Leaves alternate, 3-rowed, trigonous, awl-shaped. Cones obovate. Scales cuneate, tubercled. Branches filiform, erect. (*Lamb. Pin.*) A native of China, whence Sir Geo. Staunton brought specimens to England, but there are no living plants in the country.

Description, &c. An elegant much branched tree. Branchlets crowded, filiform. Leaves scattered, 3-rowed, spreading, trigonous, acutely keeled, mucronulate, 2-3 lines long, light green; younger ones closer at the apex of the branchlets, shorter, adpressed. Gabbulus pear-shaped, large, many-valved; scales wedge-shaped, thick, woody, muricate externally; margin crenated. Seeds winged at the apex. (*Lamb.*)

† 7. *T. PENDULA* *Lamb.* The pendulous, or weeping, Arbor Vitæ.

Identification. *Lamb. Pin.*, ed. 2., 2. t. 67.

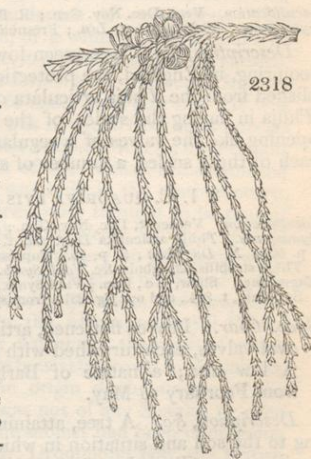
Engravings. *Lamb. Pin.*, ed. 2., 2. t. 67.; our fig. 2318. to our usual scale; and fig. 2317. of the natural size.

Spec. Char., &c. Leaves opposite and decussating, spreading, lanceolate, mucronulate, keeled, somewhat distant. Cones globose. Scales convex, smooth. Branches filiform, pendulous. (*Lamb. Pin.*, ii. t. 67.) Branches very long, hanging down in the most graceful manner; light green. Cones globose, about the size of a wild cherry, 6-valved; valves roundish, very thick, fungous, externally convex, smooth. A native of Tartary, probably,

Mr. Lambert thinks, from that part of it which is included within the Chinese empire; as it is nearly related to *T. pœnsilis*, which is known to come from that part of Tartary. Mr. Lambert's plant was kept in the conservatory at Boyton; and he says, writing in 1832, that it is perhaps the only one in Europe. He received it from Messrs. Loddiges, and has since given it to Mr. Anderson of the Botanic Garden, Chelsea, where it is kept in the green-house; and, when we saw it in 1837, it was about 6 ft. high. Cuttings have been struck from the plants in the Chelsea Botanic Garden, and they have stood at Dropmore in the open air for two or three winters. There is a cupressinous plant, without a name, evidently of the same species as that at Chelsea, in the arboretum at Kew, which, in December, 1837, was upwards of 10 ft. high. Dr. Wallich, in 1830, is said to have recognised this plant as a native of Nepal, but he does not appear to have given it a name. In 1835 it bore fruit, which, Mr. Smith informs us, closely resembled that of a *Juniperus*; and indeed we have little doubt, from the foliage of the plant, that it is likely to prove either a *Juniperus* or a *Cuprëssus*; at all events, we do not think it can be a *Thuja*, two-edged branchlets being in our opinion essential to that genus. But whether a *Cuprëssus* or a *Juniperus*, or, what is not unlikely, worthy to be considered as a distinct genus, this plant deserves to be extensively cultivated, and introduced into every collection. Its long, slender, pendulous shoots bear no resemblance to the branches of any other species of *Cuprëssinæ*; and the fruit, though considered as that of a juniper, does not, in our opinion, present an insurmountable barrier to the identification of the Kew plant with the one figured by Lambert, since the berried appearance in *Juniperus* is merely



2317



2318

owing to the scales which compose the cone being more closely adpressed than they are in *Cuprèssus*. In some species of *Juniperus*, and in some individual berries of other species, such as *J. phænicea*, *J. drupacea*, &c., the scales appear quite distinct, and they terminate in horny-looking prickles or appendages, which give the fruit fully as much the appearance of a *Cuprèssus* as of a *Juniperus*.

App. i. *Species not sufficiently known to be referred to any of the preceding Sections.*

T. filiformis Lodd. Cat., ed. 1836. There are plants in the Hackney arboretum, but they are too small to enable us to determine anything respecting them.

T. dotabrata Lin. Suppl., p. 420., Thunb. Jap., p. 266., Willd. Sp. Pl., 4. p. 509., Lamb. Pin., ed. 2., t. 68., from a specimen in Kæmpfer's herbarium, at the British Museum; *Quai*, vulgo *Fi no ki*, and *Ibuki*, Kempt. Amœn., p. 884. Branchlets 2-edged. Cones squarrose. Leaves broad-ovate, obtuse, imbricated in 3 rows, white, and hollowed beneath. (*Lamb. Pin.*) A large, lofty, and very handsome tree. Branchlets very numerous, alternate, flattened, irregularly divided. Leaves imbricated in 3 rows, ovate, obtuse, thick, much larger than in the other species; convex above, of a beautiful green, shining, furrowed in the middle; concave, margined, and white beneath. Cones squarrose. A native of Japan, where Thunberg observed it in the countries of Oygawa and Fokonia, between Miaco and Jedo, and found it planted along the high road on the hill of Fokonia. He speaks of it as a tree of vast height and dimensions, the most beautiful of all the evergreen tribe, but it has not yet been introduced. Mr. Lambert states that he has no doubt of its being perfectly hardy.

Other Species. There are various names in nursery catalogues, but the plants to which they are applied bear so close a resemblance to those already described, that we cannot venture to consider them distinct.

GENUS X.



CA'LLITRIS Vent. THE CALLITRIS. Lin. Syst. Monœ'cia Monadélphia.

Identification. Vent. Dec. Nov. Gen.; R. Brown in Litt.; Richd. Mém. sur les Conifères, p. 141. *Synonymes.* *Thûja*, part of, Lin.; *Fresnèlia* Mirbel Mém Mus.

Description, &c. Evergreen low trees, natives of Africa and Australia, and requiring, in England, the protection of a green-house. This genus was established from the *Thûja articulata* of Desfontaines. It differs from the genus *Thûja* in having the scales of the female catkins constantly from 4 to 6, all opening like the valves of a regular pericarp; and in having, at the base of each of these scales, a number of seeds winged on the margin.

♁ 1. C. QUADRIVALVIS Vent. The four-valved Callitris.

Identification. Ventenat, Dec. Nov. Gen.; Rich. Mém. sur les Conifères, p. 46.

Synonymes. *Thûja articulata* Desf. Atl., 2. p. 353., *Arb. et Arbriss.*, 2. p. 576., *Willd. Sp. Pl.*, 4. p. 509., *N. Du Ham.*, 3. p. 15.; *Cuprèssus fructu quadrivalvi* Shaw *Afric.*, No. 188., icon;

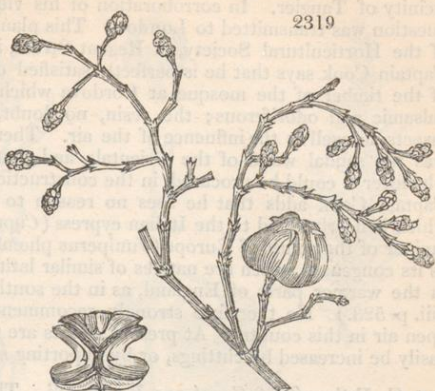
Thûja strôbillis tetragonis, &c. *Vahl. Symb.*, 2. p. 96.

Engravings. Shaw, l. c., icon; *Vahl Symb.*, t. 48.; *Desf. Atl.*, 2. t. 252., *N. Du Ham.*, 3. t. 5., *Lodd. Bot. Cab.*, t. 844., and our fig. 2319. from specimens received from M. Otto of Berlin.

Spec. Char. Leaves flattened, articulate. Female catkin tetragonal, with 4 oval valves, each furnished with a point, and 2 of which bear seeds. (*Desf.*) A low tree; a native of Barbary. Introduced in 1815, and flowering from February to May.

Description, &c. A tree, attaining the height of from 15 ft. to 20 ft., according to the soil and situation in which it grows, with a trunk from 1 ft. to 3 ft. in diameter. Branches forming an open angle with the trunk, with numerous smaller shoots, flattened, striated, articulated, fragile, and of a green colour. Articulations enlarged at their summit; about 3 lines in breadth, and from 9 to 10 lines in length. Leaves very small; straight, unequal, and mucronate, with very small glands at their base. Flowers monœcious. Male

catkin a small cone, somewhat pendent, obtusely tetragonal. Scales disposed in four ranks, pediculate, buckler-shaped, and of a pale yellow. Anthers 3 or 4 at the base of each scale; sessile, somewhat rounded. Female catkins solitary, and situated at the summit of the branches. Cone tetragonal, with obtuse angles; scales 4, woody, thick, heart-shaped, hollowed longitudinally on their exterior surface, convex on the interior, and open from the base to the summit; the two large opposite scales bearing seeds, and the two small ones sterile. Seeds few, small, and with a wing at the side.



2319

A native of Mount Atlas, and of other uncultivated hills on the coast of Africa, where it was discovered by Desfontaines, and seeds sent to the Jardin des Plantes, about 1796. The trees seen by Desfontaines in Algiers were only from 15 ft. to 20 ft. high; but Broussonet states that he had seen larger ones in the kingdom of Morocco. In the climate of Paris, it requires the protection of the conservatory during winter. In the conservatory of the Botanical Garden, at Berlin, there is a plant 15 ft. high, which flowers and fruits every year, but the seeds do not germinate. *Callitris quadrivalvis* was introduced into England in 1815; and there are plants at Messrs. Loddiges's, where, trained against the wall of one of their greenhouses, it grows vigorously, and in January, 1832, flowered for the first time in this country. There are also plants in some other collections, but it is by no means common. In the kingdom of Morocco, according to Broussonet, this tree produces the gum sandarach of commerce. This substance is in tears, clear, shining, diaphanous, of a whitish yellow, and free from impurities. Dissolved in the spirit of wine, it produces a delicate varnish, easily scratched; reduced to a fine powder, it forms a very superior kind of pounce, and is applied to paper and parchment to make them bear ink. It was for a long time thought that the gum sandarach was obtained from some species of *Juniperus*. Captain S. E. Cook, in his *Sketches in Spain*, vol. ii., has brought to light the interesting fact, that the woodwork of the roof of the celebrated mosque, now the cathedral of Cordova, which was built in the ninth century, was of the wood of this tree. It had been previously thought to be that of the larch, from the resemblance of the Spanish word *alerce*, which is applied to the wood of *Callitris quadrivalvis* in Spain and Barbary, to the Latin word *larix*; whence the English word larch. The larch, however, is not found in any part of Spain. After carefully examining the wood in question, and comparing it with the timber of the roofs of the Alhambra, the Alcaza, or Royal Palace of Seville, and other remains of the Moors in Andalusia, the roofs of which are of the *Pinus Pinea*, or stone pine, once extensively grown in Andalusia, Captain Cook came to the conclusion, that the origin of the timber of the mosque must be sought elsewhere, and that it was not of any Spanish or even European, tree. "By a singular coincidence, the subject had been undergoing investigation about the same time in Africa. Mr. Drummond Hay, the British consul at Tangier, had, by tracing the Arabic etymology of the word *alerce*, by availing himself of the extensive botanical researches of the late Mr. Schawboe, the Danish consul in Morocco, and by collating the accounts of the resident Moors, made out that the *alerce* was the *Thuja articulata*, Desf. (*Callitris quadrivalvis* Vent.), which grows on Mount Atlas, in the

vicinity of Tangier. In corroboration of his views, a plank of the timber in question was transmitted to London. This plank, which is still in the rooms of the Horticultural Society, in Regent Street, is 1 ft. 8 in. in diameter; and Captain Cook says that he is perfectly satisfied of its identity with the parts of the timber of the mosque at Cordova which he examined. It is highly balsamic and odoriferous; the resin, no doubt, preventing the ravages of insects, as well as the influence of the air. There is reason to believe that it was the sandal wood of the Orientals, and that this species was employed, whenever it could be procured, in the construction of their religious edifices. Captain Cook adds that he sees no reason to apprehend that this species, which is nearly allied to the Italian cypress (*Cupressus sempervirens*) and the juniper of the south of Europe (*Juniperus phœnicea*), should not be as hardy as its congeners, which are natives of similar latitudes, and which grow as well in the warmer parts of England, as in the south of Europe." (*Gard. Mag.*, xiii. p. 523.) He therefore strongly recommends a trial of the tree in the open air in this country. At present, plants are rather scarce, but they might easily be increased by cuttings, or by importing seeds from Morocco.

‡ *C. Fothergillii*, ? *Cupressus Fothergillii*. There are young plants of this name at Elvaston Castle, and in some of the nurseries, which in general appearance resemble the common evergreen cypress.

‡ *C. triquetra*, *Cupressus triquetra* *Lodd. Cat.*, ed. 1836, is a native of the Cape of Good Hope, introduced in 1820. There are plants at Messrs. Loddiges's, and also at Elvaston Castle, where it has stood out three years, and appears quite hardy.

‡ *C. cupressiformis* *Vent.*, *Loud. Hort. Brit.*, p. 490., is a native of New Holland, introduced in 1826. There are small plants of it in various nurseries.

‡ *C. macrostachya* *Hort.* There is a plant at Elvaston Castle.

App. i. *Species of Callitris Natives of Australia, and not yet introduced into Britain.*

C. rhomboides *R. Brown*, *Rich. Conif.*, p. 47. pl. 118. No. 1. A low tree, with the habit of a cypress, and thin articulated branches. The leaves are imbricated, and closely adpressed to the branch. The female catkins are small, solitary, and terminal. It is a native of New Holland, whence specimens were brought by Mr. Brown, and communicated by him to M. Richard.

C. oblonga *Rich. Mém. sur les Conif.*, p. 49. pl. 18. No. 2., *C. fruticosa* *R. Brown*, has the nut dry and opening, like that of the preceding species, but much larger. It is a native of Port Jackson, and specimens were brought home by Mr. R. Brown.

GENUS XI.



CUPRE'SSUS L. THE CYPRESS. *Lin. Syst.* MONŒCIA Monadélphia.

Identification. *Lin. Gen.*, No. 1079.; *Reich.*, 1177.; *Schreb.* 1458.; *Gartn.*, t. 91.; *Tourn.*, t. 358. *Juss.* 413.; *Lamb. Pin.*, ed. 2.

Synonymes. *Cyprés*, *Fr.*; *Cypresse*, *Ger.*; *Cipresso*, *Ital.*; *Ciprote*, *Port.*; *Cypros*, *Hungarian.*
Derivation. According to some, from *kuō*, to produce, and *parisos*, nearly resembling; in allusion to the regularity of the branches; or from *Cyparissus*, a beautiful youth of the Island of Coos, who was changed into a cypress; or, according to others, from the Isle of *Cyprus*, where one species of the tree was found in abundance.

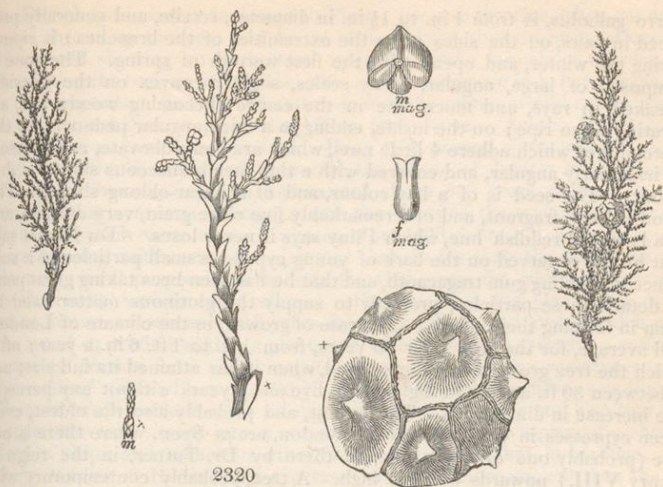
Description. Evergreen low trees; natives of Europe, Asia, and North America; remarkable for the fine grain and durability of their wood.

‡ 1. *C. SEMPERVIRENS* L. The common, or evergreen, Cypress.

Identification. *Willd. Sp. Pl.*, 4. 511.; *Raii Hist.*, 1406.; *Gouan Mons.*, 495.; *Mill. Dict.*, No. 1.; *Scop. Carn.*, No. 1199.; *Fabric. Helms.*, 442.; *Règn. Bot.*; *Hort. Cliff.*, 449.; *Hort. Ups.*, 288.; *Roy Lugdb.*, 88.; *Tourn. Inst.*, 587.; *Bauh. Pin.*, 488.; *Cam. Epit.*, 52.; *N. Du Ham.*, 3. p. 2.; *Lam. Dict.*, 1.; *Lodd. Cat.*, ed. 1836.; *Bon Jard.*, ed. 1837.; *Laws. Man.*, p. 390.

Synonymes. *C. pyramidalis* *Hort.*; *Cyprés pyramidal*, *Cyprés ordinaire*, *Fr.*; *gemeine Cypressenbaum*, *Ger.*; the Italian Cypress.

Engravings. *Dend. Brit.*, t. 155.; *N. Du Ham.*, S. t. 1.; *Lob. Icon.*, 2. p. 222.; *Blackwall's Herb.*, 127.; our fig. 2320.; and the plates of this tree in our last Volume.



Spec. Char., &c. Branchlets quadrangular. Leaves imbricated in 4 rows, obtuse, adpressed, convex. Cones globose; scales mutic. Branches straight. (*Willd.*) An evergreen tree, a native of the south of Europe. Introduced before 1548.

Varieties.

- † *C. s. 1 stricta* Mill. Dict., *Cyprès mâle, Fr.*, has the branches upright, and closely pressed towards the trunk; and is the most common form of the species. (See the plate of *C. sempervirens* in our last Volume.)
- † *C. s. 2 horizontalis* Mill. Dict.; *C. horizontalis N. Du Ham.*, 3. p. 6.; *C. expansa Hort. Par.*; has the branches spreading. (See the plate of this tree in our last Volume.) In the *Nouv. Du Hamel*, it is stated that there is a very fine specimen of a horizontal cypress, which is quite a distinct species, received from the Levant, in the Botanic Garden at Montpellier, which has borne seeds, from which young plants quite true to the parent have been raised. There is a tree in the Horticultural Society's Garden, which is named *C. s. horizontalis*, 12 ft. high, and received about 1825, from Godefroy, near Paris; and another named *C. horizontalis*, received from Audibert's Nursery, in the south of France, also in 1825, but which is only 6 ft. high. Mr. Gordon considers them to be quite distinct; but they appear to us to be the same. There is, also, in the Horticultural Society's Garden, a cypress, received from Messrs. Audibert in 1835, under the name of *C. expansa*; but we do not know whether it is the *C. expansa Hort. Par.*, and it is at present too small, for us to determine whether it is the same as M. Audibert's *C. horizontalis*.

Description. The evergreen cypress is a flame-shaped, tapering, cone-like tree, with upright branches growing close to the trunk, and resembling in general appearance the Lombardy poplar; but, even in its native country, rarely rising above the height of 50 ft. or 60 ft., though it is sometimes found much higher. Its frond-like branchlets are dichotomous, and are closely covered with very small imbricated leaves, which, when old, become more distinct, diverging, and sharp-pointed: they are of a yellowish green, smooth, shining, and persistent, remaining on the tree for 5 or 6 years. The male catkins are yellowish, about 3 lines long, and very numerous. The female catkins are fewer, and of a roundish-oblong form. The cone, or nut, which was called by

Varro galbulus, is from 1 in. to 1½ in. in diameter, sessile, and generally produced in pairs, on the sides or at the extremities of the branches; it ripens during the winter, and opens with the first warmth of spring. The cone is composed of large, angular, corky scales, slightly convex on the outside, streaked in rays, and mucronate in the centre; becoming woody and separating when ripe; on the inside, ending in a thick angular peduncle, to the extremity of which adhere 4 little nuts, which are bony, obovate, compressed, or irregularly angular, and covered with a thin membranaceous skin of a dun colour. The seed is of a bay colour, and of a linear-oblong shape. The wood is hard, fragrant, and of a remarkably fine close grain, very durable, and of a beautiful reddish hue, which Pliny says it never loses. Du Hamel says that he has observed on the bark of young cypresses small particles of a substance resembling gum tragacanth, and that he has seen bees taking great pains to detach these particles, probably to supply the glutinous matter used by them in forming their combs. The rate of growth, in the climate of London, will average, for the first 8 or 10 years, from 1 ft. to 1 ft. 6 in. a year; after which the tree grows more slowly; and, when it has attained its full size, and is between 30 ft. and 40 ft. high, it will live many years without any perceptible increase in dimensions. The largest, and probably also the oldest, evergreen cypresses in the environs of London, are at Syon, where there is one tree (probably one of those planted there by Dr. Turner, in the reign of Henry VIII.) upwards of 52 ft. high. A tree, probably contemporary with this, is now in ruins in the park at Ditton, near Windsor, said to have been



2321



2322

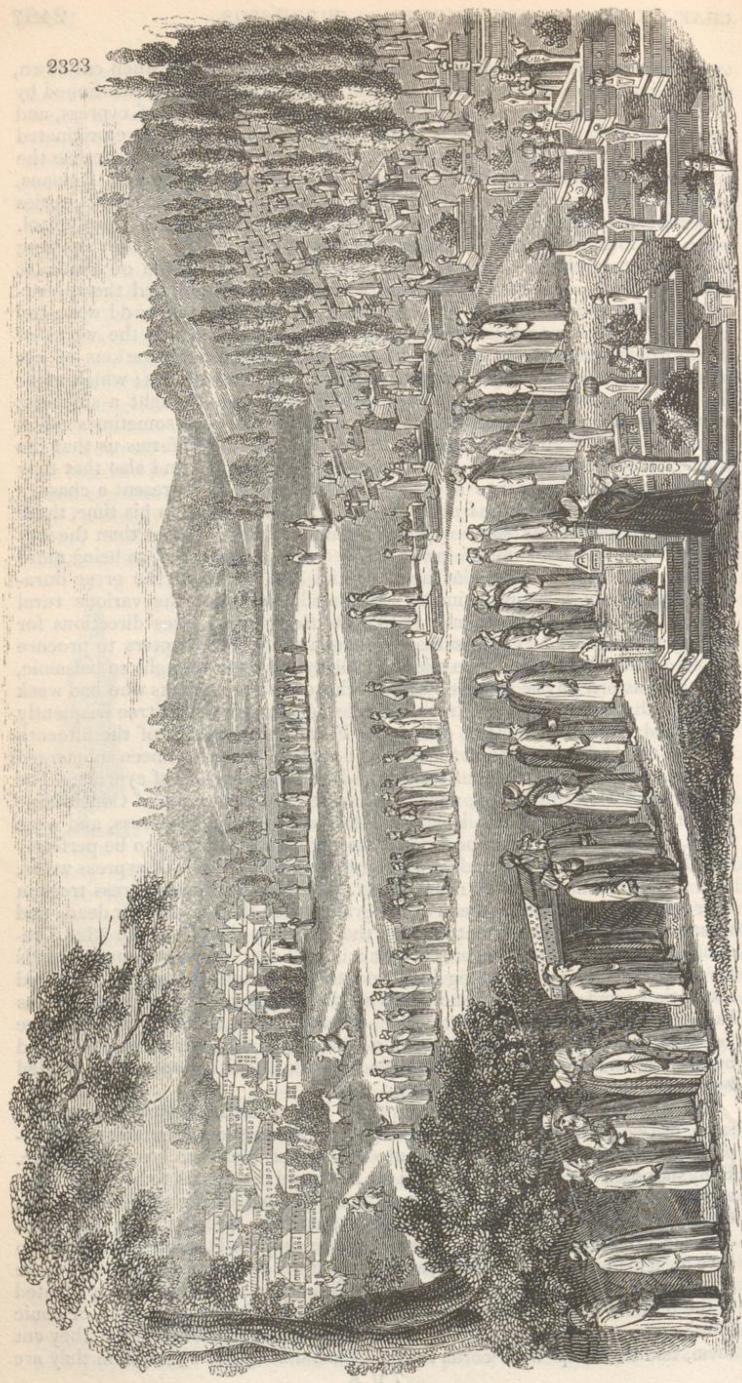
planted by Cardinal Wolsey. The trunk is 8 ft. in circumference; but the head and branches are in a state of great decay. There are some very fine specimens at Croome, of two of which *figs.* 2321. and 2322. are portraits, kindly presented to us by Miss Radcliffe of Worcester. *Fig.* 2321. is a portrait of *C. s. horizontalis*, which, in 1836, after being 30 years planted, was 65 ft. high; and *fig.* 2322. is a portrait of one of several trees of *C. s. stricta*, which, after being 40 years planted, was 35 ft. high. The largest, the oldest, and, doubtless, the most celebrated evergreen cypress in the world, is that at Soma, in Lombardy, which has been already noticed in p. 169., and of which a portrait and the history will be given in a future page.

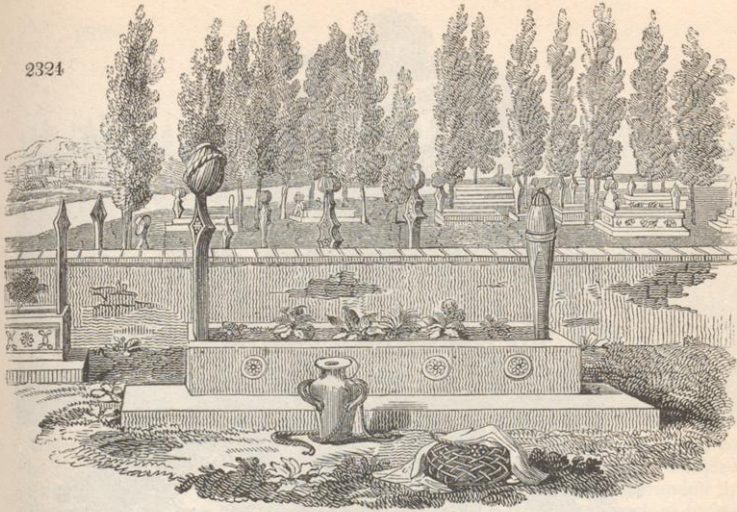
Geography. The common evergreen cypress is a native of the islands of the Archipelago; particularly Candia (the ancient Crete) and Cyprus. It is also a native of Greece and Turkey, and of Persia and Asia Minor. It is found apparently wild in Italy; but Pliny tells us that it was introduced into that country from Greece, and first planted there in the environs of Tarentum. Desfontaines states that he has seen it growing on Mount Atlas, and in some of the gardens at Algiers. It was found in great abundance on Mount Ida, and also, as is mentioned in the *Bible*, on Mount Sion. It flourishes in various soils and surfaces, from moist bottoms to dry rocky precipices; but it is always found of largest size in soils which are deep and sandy, rather dry than moist, somewhat sheltered, and at no great elevation above the level of the sea.

History. The upright cypress is mentioned in Holy Writ, in the Book of Ecclesiasticus:—"I am exalted like the cedar in Lebanon, and like a cypress on Mount Sion." The gopher wood, of which the ark was made, is also supposed by some to be cypress. This tree was known both to the Greeks and Romans. Herodotus tells us that the Egyptians made their mummy-cases of the wood. Theophrastus states that it grew naturally in the Isle of Crete, on the mountains covered with snow (*Hist.*, lib. iv. c. 1.); and that it would not thrive in situations that were too warm. He adds that those who wish to have the cypress flourish, must procure a little of the earth of the Isle of Cyprus for it to grow in. (*Lib.* v. c. 2.) Thucydides says that the Greeks who died for their country had their ashes preserved in cypress. According

to Theophrastus, it was dedicated to Pluto; because the tree, when cut down, never throws up suckers; and hence also, perhaps, the custom mentioned by Horace, of shutting up in the tomb with the dead a branch of cypress, and enveloping the body in its fronds; though some suppose it to have originated in the supposition that the balsamic odour of the cypress would neutralise the infectious exhalations proceeding from the corpse. Among the Romans, many authors mention this tree. Pliny tells several extraordinary stories respecting the durability of its wood; the statue of Jupiter in the Capitol, which was formed of cypress, had existed above 600 years, without showing the slightest symptom of decay; and the doors of the temple of Diana at Ephesus, which were also of cypress, when 400 years old, had the appearance of being quite new. He also says that, in his time, the wood was used for many rural purposes, particularly for vine-props, for which the wood of the horizontal variety was preferred. He adds that the plantations of cypress were cut down every 13 years, for poles, rafters, and joists; which made the wood so profitable, that a plantation of cypress was thought a sufficient marriage portion for a daughter; and, hence, the tree was sometimes called "dos filia." (*Plin.*, lib. xvi. c. 33.) In another place, he informs us that the Romans made verdant walls of cypress in their gardens; and also that they clipped the entire trees into a variety of forms, so as to represent a chase, a fleet of ships, and numerous other fancies. He adds that, in his time, there were standing at Rome some cypresses that were more ancient than the city itself. Plato had his code of laws engraved on cypress wood, as being more durable than brass. Vitruvius and Martial also speak of the great durability and beauty of cypress timber. Columella mentions the various rural uses of the cypress wood; and Cato (*De Re Rustica*) gives directions for making plantations of cypress trees, recommending the planters to procure the seed from Tarentum. The odour of the cypress was thought so balsamic, that the Eastern physicians used to send those of their patients who had weak lungs to the Isle of Crete. In the middle ages, we find this tree frequently mentioned. Leon Alberti, a celebrated Florentine architect of the fifteenth century, tells us that he found the wood of a vessel which had been submerged 1300 years, and which was perfectly sound, to be principally of cypress. The doors of St. Peter at Rome, which had lasted from the time of Constantine to that of Eugene IV. (that is, above 1100 years), were of cypress, and were found, when removed by Pope Eugene, to give place to brass, to be perfectly sound. The popes, in the middle ages, were buried in coffins of cypress wood, from the belief that it would never decay. The Turks plant cypress trees in their cemeteries, one at each end of the grave, when they inter their dead; and these are so numerous at Scutari, that the cemetery there (see *fig.* 2323.) resembles one vast forest of cypress. This magnificent burying-ground extends for miles in length; and, among high and turbaned tombstones, gold-lettered inscriptions, and graves ornamented with flowers, the tall evergreen cypress has a very striking effect. (*Alex. Trav.*, p. 240.) The cemetery at Pera (see *fig.* 2324.) is on a comparatively level surface: it is of great extent, bordered by the sea, and thickly set, in many places, with Turkish monuments, shaded by cypress trees.

The question as to whether the upright and spreading cypresses are the same, or two distinct kinds, has long engaged the attention of botanists. Theophrastus says that they degenerate into each other, and both bear seeds alike. Pliny supposes *C. s. horizontalis* to be the male, and *C. s. stricta* to be the female; and his opinion seems to have been adopted by most of the earlier botanists. Gerard calls the upright, the tame cypress; and the spreading, the wild; but Johnson, in his edition of Gerard, seems to have supposed the upright cypress to have been made so by art. Miller, writing nearly a century later, appears to be almost of the same opinion, as he says: "The cypresses were formerly planted in the borders of pleasure-grounds, and kept shorn into a pyramidal or conic form; and some people, believing them to be subject to be killed if they cut them, tied them up with cords into a pyramidal figure, which form they are





naturally disposed to grow in; but this winding them about prevented the air from entering the inward parts of the branches, so that the leaves decayed, and became unsightly, and greatly retarded their growth." Lamarck, Desfontaines, and some other French writers, assert that, if the seed of either variety be sown, the produce will consist partly of both kinds; but M. Fougereux, in a memoir read to the Royal Agricultural Society of Paris, in 1786, asserts that he has sown the seeds of both varieties repeatedly, and has always found them come true. He adds that the spreading cypress is hardier, and furnishes wood of a better quality, from the air getting free access among the branches, which it cannot do in the upright variety. Dr. Walsh, in his "Notes on the Botany of Constantinople," published in the *Horticultural Transactions* for 1824, is decidedly of opinion that *C. horizontalis* is a distinct species. "The character of the whole tree," he says, "is distinct and permanent. The branches project as horizontally as those of the oak; and the tree more resembles a pine than a cypress. It is in great abundance, mixed with *C. sempervirens*, in all the Turkish cemeteries. Whenever a Turk of respectability buries one of his family, he plants a young cypress at the head of the grave, as well because its aromatic resin qualifies the putrid effluvia of the place, as because its evergreen foliage is an emblem of immortality."

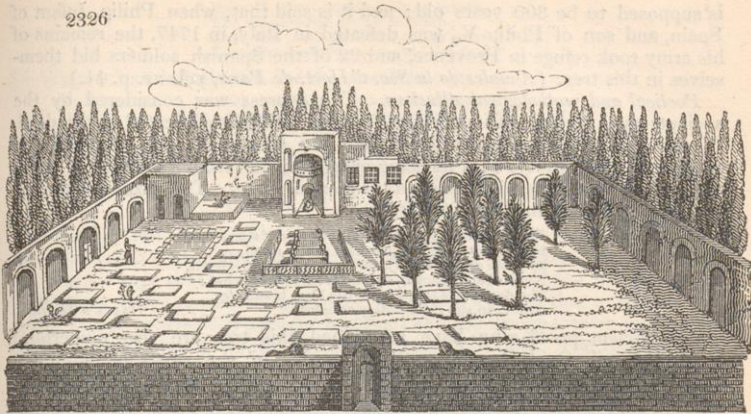
The exact date of the introduction of the cypress into England is uncertain; but Turner mentions it as "growing plentifully at Syon," in the edition of his *Names of Herbes* which was published in 1548, when Turner was physician at Syon; and Gerard, writing in 1597, mentions that there are trees of it at "Syon, a place neere London, sometime a house of nunnnes. It groweth also at Greenwich, and at other places, and likewise at Hampstead, in the garden of Mr. Wade, one of the clerkes of Her Majesties prive councill." (*Herb.*, 1368.) As seeds are ripened abundantly in England, the tree has long been plentiful in British nurseries; and, in consequence, it has been so extensively distributed, that there is scarcely a suburban villa or a country seat in which it is not to be found. In France, in the climate of Paris, it can scarcely be considered as hardy, being killed to the ground by severe winters. It is, however, much cultivated there in pots and tubs, for the decoration of parterres and apartments, in the summer season. In this case, it is always neatly tied, so as to insure the permanence of its pyramidal form. In the south of France, as at Montpellier for example, it attains a large size; but in the north and throughout Germany, it is a green-house plant.



2325

Remarkable Cypresses. Perhaps the oldest tree of which there is any record in the world is the cypress of Soma, or Somma, in Lombardy. This celebrated tree, of which *fig. 2325.* is a portrait (from an original drawing kindly sent to us by Signor Manetti of Monza), is generally supposed to have been planted the year of the birth of Jesus Christ, and on this account is treated with great reverence by the inhabitants of that part of Lombardy where it grows; but the Abbé Belèze informs us that there is an ancient chronicle extant at Milan, which proves that it was a tree in the time of Julius Cæsar, B. C. 42. (See p. 169.)

2326



When measured for us by direction of Signor Manetti, this tree was found to be 121 ft. high, and 23 ft. in circumference at 1 ft. from the ground. Besides its great age, the cypress of Soma is remarkable for having been wounded by Francis I., who is said to have struck his sword into it, in his despair at losing the battle of Pavia; and for having been respected by Napoleon, who, when laying down the plan for his great road over the Simplon, diverged from the straight line to avoid injuring this tree.

The cypress of Hafiz, near Shiraz, is mentioned by several writers. Tavernier, in 1665, says that it required four men to embrace it. Chardin also mentions it; as does Johnson, who visited it in 1817. This tree is said by some to have been planted by the poet himself; and, by others, to have grown over his grave. In Kæmpfer's *Amanitates Exoticae*, &c., however, there is given a plate of the sepulchre of Hafiz (see fig. 2326.), from a Persian drawing; and, in the description, it is stated that Hafiz, who died in 1340, was buried in a square cemetery shaded by poplars, a rare tree in Persia; and that the wall which surrounded it was built to coincide in direction with the boundary of the cypress grove in the adjoining garden, which had belonged to the poet, and was bequeathed by him for the preservation of his cemetery. In this garden, probably, was the celebrated cypress alluded to by the travellers. The small tombstones shown in fig. 2326. are those of persons who wished to be buried under the guardian influence of the poet.

The cypresses of Chartreux were planted by Michael Angelo; and they were seen by M. Simond, who, in his *Travels through Italy* in 1817, visited the garden of the convent of the Chartreux, situated on the site of the baths of Dioclesian at Rome. There are three trees, all nearly the same size; and the trunk of the largest, when measured by M. Simond, was about 13 ft. in circumference.

Los Cypresses de la Reyna Sultana are mentioned by Hunter in his edition of Evelyn's *Sylva*, and by M. Loiseleur Deslongchamps, in his very able article on the cypress in the *Annales de la Société d'Horticulture de Paris*, vol. xv. These noble trees formed an avenue in the gardens of the palace of the Generalife at Granada; and under their shade the last Moorish king of Granada is said to have surprised his wife with one of the Abencerages, which led to the massacre of thirty-six princes of that race. These trees were still in existence in 1832, when (as according to the legend, they were large trees in 1490) they must have been nearly 400 years old.

The oldest and largest cypress in France is one near St. Remy, in Provence. When measured by MM. Audibert and Varrel, in October, 1832, it was 55 ft. 6 in. high, French (above 60 ft. English); the circumference of the trunk was 14 ft. (15 ft. 2 in.), and of the head 75 ft. (82 ft. 3 in.). This tree

is supposed to be 300 years old; and it is said that, when Philip, Infant of Spain, and son of Philip V., was defeated in Italy, in 1747, the remains of his army took refuge in Provence, and 22 of the Spanish soldiers hid themselves in this tree. (*Annales de la Soc. d'Hort. de Paris*, vol. xv. p. 41.)

Poetical and mythological Allusions. The cypress was considered by the ancients as an emblem of immortality, and, as such, was dedicated to the dead. It was also held sacred to Proserpine and Pluto. It was esteemed the emblem of immortality, from its being evergreen, and from its power of rising again when bent down by the wind, or manual force. This power is alluded to in the following lines from Statius:—

“ The mountain cypress thus, that firmly stood
From age to age, the empress of the wood,
By some strong whirlwind's sudden blast declined,
Bends arching down, and nods before the wind:
The deep roots tremble till the blast blows o'er,
And then she rises stately as before.”

HARTE'S *Statius*.

The ancient poets who have mentioned this tree are very numerous: Homer, Virgil, Ovid, Lucan, and many other of the poets of antiquity, make frequent allusions to it. Virgil frequently speaks of its use in funeral ceremonies, particularly at that of Misenus:—

“ Ingentem struxere pyram: cui frondibus atris
Intextum latera, et ferale ante cupressos
Constituunt, decorantque super fulgentibus armis.”

Æneid. vi. 215.

“ And first with massy logs the pile they rear,
Spreading the gloomy fronds above with care.
In front, the tapering cypress rears its head,
And bears the shining armour of the dead.”

The legend of the origin of the cypress is given by Ovid:— A beautiful stag, the favourite of Apollo, was accustomed to come every day to be fed by the god, or his faithful attendant, Cyparissus. One day, the youth was hurling his spear merely for exercise, when, unfortunately, it struck and killed the stag, which was coming bounding from the forest to Cyparissus, expecting to be caressed as usual. The youth's grief at this accident was so great, that Apollo endeavoured in vain to comfort him: he threw himself to the ground in despair,—

“ Praying, in expiation of his crime,
Thenceforth to mourn to all succeeding time.
And now, of blood exhausted, he appears
Drain'd by a torrent of continual tears.
The fleshy colour in his body fades,
A greenish tincture all his limbs invades.
From his fair head, where curling ringlets hung,
A tapering bush, with spiry branches, sprung,
Which, stiffening by degrees, its stem extends,
Till to the starry skies the spire ascends.
Apollo saw, and sadly sighing, cried,
' Be, then, for ever what thy prayer implied.
Bemoan'd by me, in others grief excite,
And still preside at every funeral rite.' ”

OVID, book x.

Claudian, in his poem of the *Rape of Proserpine*, says that the two torches which Ceres employed to seek her daughter were not pine trees, but two cypresses, which grew on Mount Etna.

Tasso, in his *Gerusalemme Liberata*, says,—

“ Sorse a pari col sole, ed egli stesso
Seguir la pompa funeral poi volle;
A Dudon, d' odorifero cipresso,
Composto hanno un sepolcro a piè d' un colle.”

Canto iii.

The following lines are by De Lille, in *Les Jardins*:—

— “ Et toi, triste cyprès,
Fidèle ami des morts, protecteur de leurs cendres,
Ta tige, chère au cœur, mélancolique et tendre,
Laisse la joie au myrte, et la gloire au laurier.
Tu n'est point l'arbre heureux de l'amant, du guerrier,
Je le sais; mais ton deuil compatit à nos peines.”

Among the English poets, from the time of Spenser to the present day, the allusions to the cypress are very numerous. Lord Byron says, speaking of the simoon:—

“ Beneath whose widely wasting breath
The very cypress droops to death :
Dark tree ! still sad when others' grief is fled,
The only constant mourner of the dead.”

Sir Walter Scott's ballad in *Rokeby* is well known : —

“ Oh, lady ! twine no wreath for me,
Or twine it of the cypress tree.
Too lively glow the lilies light,
The varnish'd holly's all too bright ;
The mayflower and the eglantine
May shade a brow less sad than mine :
But, lady, weave no wreath for me,
Or weave it of the cypress tree.”

Properties and Uses. The wood of the cypress, as we have already seen, was much used by the ancients for all purposes which required durability ; and Horace says that whatever they thought worthy of being handed down to the most remote posterity was preserved in the wood of that tree, or of the cedar. It was occasionally used for building ; and the bridge thrown by Semiramis over the Euphrates is supposed to have been built of it. The Romans used the wood of the wild, or spreading, cypress, which they called citron wood, for beds and tables ; and it was highly esteemed for its numerous spots and figures, from which the tables made of it were called *mensæ tigrinæ et pantherinæ*. It was used in the funeral ceremonies ; and, when any one was dead, it was placed at the door, or in the vestibule of the house in which the body lay. Evelyn enumerates many purposes to which the wood of the cypress was applied : — “ What the uses of this timber are for chests and other utensils, harps, and divers other musical instruments (it being a sonorous wood, and therefore employed for organ-pipes, as heretofore for supporters of vines, poles, and planks, resisting the worm, moth, and all putrefaction, to eternity), the Venetians sufficiently understood, who did every twentieth year, and oftener (the Romans every thirteenth), make a considerable revenue of it out of Candy (Candia). . . . But there was in Candy a vast wood of these trees, belonging to the republic, by malice or accident, or, perhaps, by solar heat (as were many woods, 74 years after, here in England), set on fire ; which, beginning 1400, continued burning 7 years before it could be extinguished ; being fed by the unctuous nature of the timber, of which there were to be seen at Venice planks above 4 ft. broad.” Evelyn adds that the chips were used to flavour rich wines ; that the cones and chips burnt, will destroy and drive away moths, gnats, and flies ; and that it yields a gum not much inferior to mastic. The tree is not found of sufficient size, or in sufficient quantities, for the wood to be employed as timber at the present day ; but it is said to be still used for building in Candia and Malta ; and it is employed as the inner coffin, or shell, for burying the popes, there being also a coffin of lead, and an outer one of pine or fir. Du Hamel says that he had the fence of his melon-ground made with posts of cypress, which, at the time he wrote, had been 25 years in the ground, and were still quite fresh. He recommends trees of 7 in. or 8 in. in diameter for forming palisades for the defence of fortified towns during war, and for other services of a similar kind, where oak of the same dimensions does not last above 7 or 8 years. The young branches of the cypress make, he says, excellent props for vines ; and, doubtless, the young shoots in England would make very durable props for supporting plants. In Britain, however, the cypress is only to be regarded as an ornamental tree, and it is one of the most remarkable belonging to that class, the future growth and shape of which may be predicted with tolerable certainty. The planter of an oak, an ash, or an elm, can never tell, till the tree is full grown, whether it will have a widely spreading, or a tall erect, head ; but the planter of the spruce or silver fir, or of the Lombardy poplar or evergreen cypress, can predict with certainty that the form will be conical ; and he may estimate the size and shape of the cypress, in a given time, with more exactness than he can that of any of the others. Like other trees of narrow conical forms, such as the Lombardy poplar, or even the spruce fir and the larch, the cypress is not calculated to produce a grand effect when planted in masses ; but in rows, singly, under certain circum-

stances, in a group of trees of other shapes, or to break an outline formed by round-headed low trees or shrubs, the cypress is particularly suitable. It is also, from its narrow form and erect habit of growth, well adapted for small suburban gardens, and for planting near buildings, with which, by the contrast it affords to their horizontal roofs, it harmonises better than most other trees. It does not, however, thrive so well within the smoke of cities as the Lombardy poplar. In a picturesque point of view, it may be used in Britain for all those purposes to which we have shown, when treating of the Lombardy poplar (see p. 1662.), that that tree may be applied; but with this difference, that, as the cypress is of slower growth than the Lombardy poplar, and does not attain half its height, the description of round or irregular-headed trees, with which it is to be associated or contrasted, must be proportionately small; and thus, instead of elms, sycamores, and, perhaps, round-headed poplars and pines, must be used, thorns, crabs, sorbs, amelanchiers, cotoneasters, yews, hollies, Portugal laurels, ilexes, &c. Thus far as to the picturesque uses of the common cypress; but every one knows that there are certain associations connected with this tree, which are supposed to render it particularly suitable for places of burial. "If the name of the cypress," Bosc observes, "calls up gloomy ideas, it is not because its foliage has a sad hue, as is commonly alleged, but because its pyramidal shape, affording a striking contrast to the general forms of trees, and its head, occupying but a very limited space, and requiring no pruning, have occasioned it, from the earliest times, to be chosen as an object of decoration; and, as tombs and cemeteries were more decorated, in the earlier ages, than gardens, the cypress was frequently planted among them; till, at last, it has become, in the language of the poets, a symbol of the last residence of man. This is so true," he says, "that the appearance of the cypress produces no gloomy ideas in the minds of the inhabitants of the north of Europe, who only see it in the gardens of the living, or in conservatories; or on those who see the tree without knowing its name or having read anything respecting it. Hence," he continues, "it is only in the imaginations of those who are prepossessed with the supposed character of this tree, that it is considered an image of sadness: other persons regard it as a very beautiful object, fit for forming avenues and planting in pleasure-grounds. Singly, and of a large size," Bosc continues, "the cypress has a grand and very imposing appearance. In pots and tubs, it is highly prized both in France and Italy, and is used, along with orange trees, pomegranates, oleanders, &c., for decorating churches, and other public buildings, during great fêtes; for forming gardens of pots on balconies and on house tops, and even for ornamenting private apartments on holidays." In the *Nouveau Du Hamel*, the cypress is considered as recommending itself for being planted among tombs by filial piety, not only from the gloomy aspect of the tree, but on account of its long duration. "Depuis quelques années," the author says, "on reserve un endroit solitaire dans les parcs et les jardins, pour y placer des urnes et des monumens funéraires. Le cyprès doit y occuper la première place: il doit accompagner de son silence lugubre la retraite paisible des morts. Lorsque tous nos amis nous auront dit un éternel adieu, le cyprès fidèle nous prêtera son ombrage. Les urnes, les cercueils, périront: il se renouvellera, pour annoncer aux races futures qu'une main hospitalière l'a placé auprès de nous: il pourra quelquefois leur rappeler les bienfaiteurs de l'humanité."

"C'est ainsi, Du Hamel, qu'aux jours de l'avenir
Tes neveux fortunés, plein de ton souvenir,
Sans aller te pleurer au pied d'un mausolée,
S'imagineront voir ton ombre consolée
Errer dans les bosquets, sous les arbres chéris
Que tes mains ont plantés, que la terre a nourris."

*Épithaphe de Colardeau à Du Hamel de Denainvilliers,
le Frère de Du Hamel.*

Soil, Situation, Propagation, and Culture. Any common garden soil suits the cypress; but it attains its largest size in such soils as are rather dry and deep, and in situations sheltered rather than exposed. It may be propagated either by cuttings or seeds; the former being put in in autumn, and treated like

those of *Thuja*. (See p. 2460.) The cones, which appear to be ripe in autumn, are not perfectly so, but require to hang on the trees till the following March or April. They may then be gathered, and placed in a warm room, or in a box or basket, and set in a dry stove. In a few days, the scales will open, when the cones may be thrashed and the seeds collected: they may be immediately afterwards sown, and treated like those of the *Abiétina*. In England, it is common to sow the seeds in flat pans or in boxes; because, as they are somewhat tender when they first come up, they admit of being more readily protected by being carried to a pit. Unlike the seeds of the genus *Thuja*, which commonly lie in the ground a year, those of the cypress come up in three or four weeks. They grow to the height of 3 in. or 4 in. the first season, and may be transplanted into pots, and kept in a pit through the winter. At the end of the second autumn, they may be planted where they are finally to remain; but, if it be thought necessary, they may be kept three or four years in pots; shifting them frequently, or allowing them to remain in the pot unshifted, according as the object may be to produce large plants, or to concentrate the roots in a small ball, so as to occupy less space in sending the trees to a distance. When the cypress is planted where it is finally to remain, and the situation and soil are suitable, it may be said to require no farther attention during the whole of its existence. It always grows erect, so that no care is requisite to train up a leading shoot; and, as its branches occupy little space, it seldom or never requires pruning. The only culture which we have ever seen given to it in England is, replacing some of the side shoots when their points may have been blown out, by a violent storm of wind and rain, so as to protrude beyond the regular head: but this happens only in very old trees, and in exposed situations; as, for example at Croome.

Statistics. At Syon, it is 52 ft. high, diameter of the trunk 1 ft. 3 in., and of the head 8 ft.; at Fulham Palace, 50 years planted, it is 40 ft. high. In Devonshire, at Kenton, 38 years old, it is 60 ft. high, diameter of the trunk 2 ft. In Dorsetshire, at Melbury Park, 44 years planted, it is 44 ft. high. In Surrey, at St. Ann's Hill, it is 35 ft. high, diameter of the trunk 1 ft. In Northumberland, at Heartburn, 80 years planted, it is 35 ft. high. In Suffolk, at Stretton Rectory, it is 63 ft. high, with a trunk 2 ft. in diameter. In France, at Avranches, in the garden of M. Brunel, 26 years planted, it is 30 ft. high. In Italy, at Monza, 150 years old, it is 90 ft. high, the diameter of the trunk 2 ft. 6 in., and of the head 20 ft.

Commercial Statistics. Price of seeds, in London, of both varieties, 6s. per pound; and of plants in pots, 1s. 6d. each.

‡ 2. *C. THYÏDES* L. The Thuja-like Cypress, or White Cedar.

Identification. Willd. Sp. Pl., 4. p. 512.; Kalm It., 2. p. 175.; Mill. Diet., No. 5.; Du Roy Harbk., 2. p. 198.; Wagh. Amer., 8. t. 2.; Willd. Arb., 92.; N. Du Ham., 3. p. 6.; Bon Jard., ed. 1837.; Laws. Man., p. 391.

Synonymes. *C. nana mariàna*, &c., *Pluk. Mant.*, 61., t. 345. f. 1.; *Thuja spheroidalis* *Rich. Mém. sur les Conif.*, p. 45.; *Cypres faux Thuja*, *Fr.*

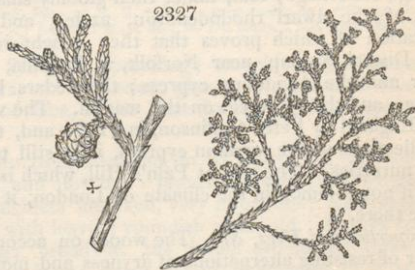
Engravings. Wagh. Amer., t. 2. f. 4.; *Pluk. Mant.*, t. 345. f. 4.; N. Du Ham. 3. t. 2.; N. Amer. Syl., 3. t. 152.; Wats. *Dend. Brit.*, t. 156.; and our fig. 2327.

Spec. Char., &c. Branchlets compressed. Leaves imbricated in 4 rows, ovate tuberculate at the base. (*Willd.*) An evergreen tree; a native of North America. Introduced in 1736; flowering in April and May.

Variety.

‡ *C. t. 2 foliis variegatis* has clusters

of the leaves variegated, or blotched, with white. The plant in the Horticultural Society's Garden, after being 6 years planted, is 5 ft. high. It was received from the Dunganstown Nursery in Ireland about 1831.



Description. The white cedar, according to Michaux, is a tree from 70 ft. to 80 ft. high, and rarely more than 3 ft. in diameter, unless, perhaps, in some of the great swamps, which have not been thoroughly explored. When the white cedars grow close together, the trunk is straight, perpendicular, and destitute of branches to the height of 50 ft. or 60 ft. The bark is very thin on young trees; but on older trees it becomes thick, of a reddish colour, and similar to that of an old vine. When cut, a yellow transparent resin exudes from it, of an agreeable odour, but in such small quantities, that only a few ounces could be collected in the course of a summer, from a tree 3 ft. in diameter. The wood is light, soft, fine-grained, and easily worked. When perfectly seasoned, and after it has been some time exposed to the light, it is of a rosy hue. It has a strong aromatic odour, which it preserves as long as it is guarded from humidity; and it resists the alternations of dryness and moisture longer than the wood of any other species of American tree. The concentric circles are always perfectly distinct, even in trunks of considerable size; but their number and compactness prove that many years must elapse before the tree arrives at its full growth. Michaux informs us that he has counted 275 annual layers in a trunk only 1 ft. 9 in. in diameter, and 47 in a plank only 8 in. thick. The tree, in the climate of London, is of slow growth, seldom exceeding the height of 4 ft. or 5 ft. in 10 or 12 years. There is an old shattered specimen at Mill Hill, probably one of the original plants which were raised by Collinson, which, in 1836, was 15 ft. high; and a magnificent tree at Pain's Hill, near the temple of Bacchus, which, in 1837, was 50 ft. high, with a trunk 2 ft. in diameter; the trunk is erect, and the branchlets are pendulous, somewhat in the manner of those of a spruce fir. There is a very handsome tree of about the same dimensions near the Duke of Devonshire's villa at Chiswick, on the property which in the 17th century belonged to Sir Stephen Fox, and which is now occupied by — Lance, Esq., a well known cultivator of *Orchidaceæ*. Plants, in the Horticultural Society's Garden, which have been 12 years planted, are only 5 ft. high; and there are some of the same age, but rather higher, in the Hackney arboretum.

Geography, History, &c. In America, the white cedar grows only in wet grounds in the maritime districts of New Jersey, Maryland, and Virginia, where it nearly fills the extensive marshes which lie adjacent to the salt meadows, and are exposed, at high tides, to be overflowed by the sea. In New Jersey, it covers, almost alone, the whole surface of the swamps, of which the tupelo and red maple occupy the skirts. Farther south, it is mingled with the deciduous cypress, by which it is at length entirely supplanted. In Lower Jersey and Maryland, the swamps are accessible only during the driest part of the summer, and when they are frozen during winter. The trees stand so thick in these swamps, that the light can hardly penetrate through the foliage; and, under their gloomy shade, at every step, are found tufts of the dwarf rhododendron, azalea, and andromeda, the luxuriant vegetation of which proves that they delight in dark and humid places. The Dismal Swamp, near Norfolk, in Virginia, is covered with the white cedar and the deciduous cypress; the cedars being in the centre of the swamp, and the cypresses on the margin. The white cedar was introduced into England by Peter Collinson, in 1736; and, though it is not so frequent in collections as the common cypress, it is still to be met with in the principal nurseries. The tree at Pain's Hill, which is in deep sandy loam, shows that, if not common in the climate of London, it is not because it will not thrive there.

Properties and Uses, &c. The wood, on account of its lightness, and its power of resisting alternations of dryness and moisture, is in common use, at Baltimore and Philadelphia, for shingles, which are cut transversely to the concentric circles, and not parallel to them like shingles of the deciduous cypress. They are from 2 ft. to 2 ft. 3 in. long, from 4 in. to 6 in. broad, and 3 lines thick at the larger end. At Baltimore, they are commonly called juniper shingles, and are there preferred to those of the deciduous cypress,

as they are larger, and free from the defect of splitting when nailed upon the rafters. The houses of Philadelphia, Baltimore, and New York are covered with them; and large quantities are exported to the West Indies. The shingles of the white cedar are much more durable and secure from worms than those of the white pine, generally lasting from 30 to 35 years. The wood is also considered well adapted for joinery and for household utensils. In Philadelphia, there is a distinct class of mechanics, called cedar coopers, who make pails, wash-tubs, churns, &c., of the wood of this tree, for both the domestic and the foreign markets. These utensils are held together with hoops made of young cedars stripped of their bark, and split down the middle. In some places, the sides of fishing-boats are covered with white cedar clap-boards, which are preferred to those of the deciduous cypress, as being lighter, more durable, and less liable to split. The wood makes excellent sounding-boards for pianofortes; and casks formed of it are found better than any others for preserving oils. The young wood makes an excellent charcoal for gunpowder; and the smoke of the seasoned wood affords a beautiful lampblack, which weighs less, and is more intensely coloured, than that obtained from any species of pine. When employed as fence-wood, the rails of young trees, either entire, or split down the middle, and deprived of their bark, last from 50 to 60 years. In England, the white cedar is only planted as an ornamental shrub or low tree; in Scotland, it is rather tender; and in the climate of Paris is rare, seldom rising above 5 ft. or 6 ft. high, and requiring protection during winter. In Germany, it is a green-house plant.

Propagation and Culture. Cones are sometimes imported, and the seeds may be sown early in spring, and treated in all respects like those of *Cupressus sempervirens*: it may also be propagated by cuttings; and, in the London nurseries, it is sometimes raised by layers. It would probably attain a much larger size than it generally does in England, if planted in a moist soil, more analogous to that in which it is found in its native habitats; at the same time, as our summers are far from being so warm as those of Maryland and Virginia, it is not likely that it would succeed in swamps in England so well as it does in those countries; because the average of cold and moisture and warmth must necessarily be materially different. In deep sandy soils, as is proved by the tree at Pain's Hill, it not only grows luxuriantly, but ripens its wood, which it would probably not do in Britain, if grown in a swamp. Price of plants, in the London nurseries, 5s. each; at Bollwyller, 1 franc 50 cents; and at New York, 25 cents.

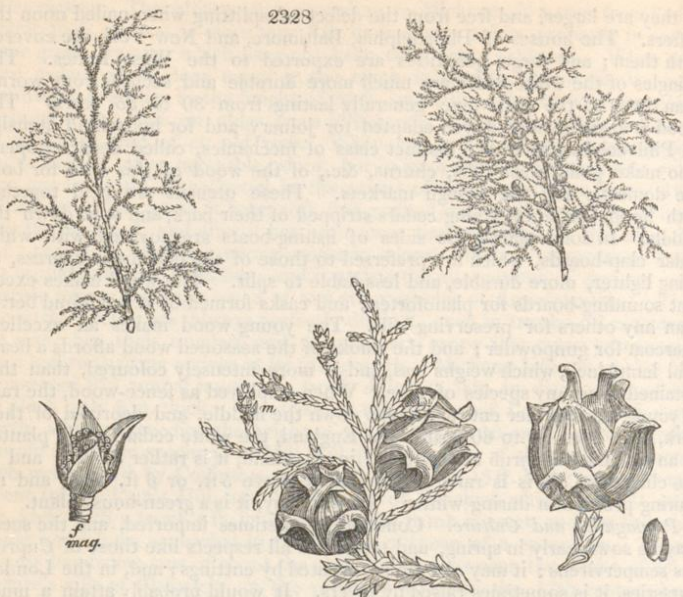
3. *C. LUSITANICA* Tourn. The Cedar of Goa, or Portuguese Cypress.

Identification. Tourn., 587; Willd. Sp. Pl., 4. p. 511; Mill. Dict., No. 3; Du Ham. Arb., 1. p. 198; Lamb. Pin., ed. 2., 1. t. 65; Laws. Man., p. 391; Lodd. Cat., ed. 1836.
Synonymes. *C. glauca* Brot. *Fl. Lus.*, 1. p. 216. *Lam. Encyc.*, 2. p. 243; *C. pëndula* L'Hérit. *Stirp. Nov.*, p. 15. *Hort. Kew.*, 3. p. 373. *N. Du Ham.*, 3. p. 7. *Bon Jard.*, ed. 1837, p. 970; Cedar of Bussaco. *C. pëndula* Thunb., *Lamb. Pin.*, ed. 2., 2. t. 66., is supposed to be a different plant.
Engravings. L'Hérit. *Stirp. Nov.*, t. 8; Lamb. Pin., t. 65; N. Du Ham., 3. t. 3.; our fig. 2328.; and the plate of this tree in our last Volume.

Spec. Char., &c. Branches flexuose, spreading; branchlets quadrangular. Leaves imbricated in 4 rows, acute, keeled, glaucous, adpressed. (*Lamb. Pin.*) A tree; a native of Goa, in the East Indies. Said to have been introduced in 1683.

Description, &c. A branchy tree, attaining, in its native country and in Portugal, the height of 50 ft. and upwards: branchlets scattered, irregular, flexuose, and spreading: branchlets incurved, very numerous; quadrangular when young, thickly covered with leaves; roundish when old. Leaves scale-like, somewhat stem-clasping; broad at the base, attenuated upwards, awl-shaped, remaining on very long; when young, imbricated in 4 rows, glaucous, marked on the back lengthwise with a concave resinous gland; when old, somewhat distant, scarcely imbricated, rigid afterwards, withered and brownish. Male catkins numerous, ovate, obtusely 8-angled, terminal, solitary, yellowish, 2 lines long; scales about 20, convexo-concave, yellow, greenish externally at the apex. Female catkins solitary, surrounded by the

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leaves; depressed, minute. Cones ovate-globose, roughish, muricate, about the size of a sloe, covered with a grey powder. Scales 8-angled; mucros elongated, reflexed. Seeds yellowish. (*Lamb.*) This species forms, in the climate of London, a remarkably handsome low tree, with spreading branches, somewhat pendulous, and covered with fine glaucous foliage. It is, however, rather scarce; and almost the only specimens that are to be met with in the neighbourhood of London are in the Horticultural Society's Garden, and at Purser's Cross; at both which places it is upwards of 12 ft. high, after being 12 years planted. The largest specimen which we have heard of is in Ireland, at Oriel Temple, the seat of Lord Viscount Ferrard, the history of which has been given at p. 109., and which was, in 1834, 32 ft. high, after being 24 years planted. There is another fine tree in the nursery of Mr. Hodgins, at Dunganstown, near Wicklow (see p. 116.), which, after being 54 years planted, was 20 ft. high. From Ray's *Letters*, as quoted in the *Hortus Kewensis*, the tree appears to have been introduced into England by Bishop Compton, in 1683; but it still continues rare. Mr. Lambert had a tree in his conservatory at Boyton, which produced "hundreds of cones, when not more than 12 ft. high." In Miller's time, there were specimens of it in different gardens; but most of them were killed by the severe frosts of 1740 and 1762. According to Brotero, it has been long in cultivation in Portugal, where it grows much faster than the common cypress. The tree is abundant at Bussaco, near Coimbra, in Portugal, whence cones might be imported, and thus so fine a tree rendered frequent in collections. Its seeds may be treated like those of the white cedar; or it may be propagated by cuttings, treated like those of *Thuja*. Judging from the two very handsome trees in the Horticultural Society's Garden, and that at Purser's Cross, it grows luxuriantly in a deep loamy soil. In the climate of Edinburgh, it requires protection during winter; and at Paris it is kept in the conservatory. Price of plants, in the London nurseries, 2s. 6d. each.

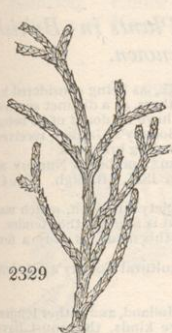
‡ 4. *C. TORULO'SA* *Lamb.* The *Bhotan*, or twisted, Cypress.

Identification. *Lamb. Pin.*, ed. 2., 2. No. 59.; *D. Don* in *Prodromus Nepalensis*, p. 55.; *W. S. Webb* in *Litt.*; *Royle* *Illust.*

Engravings. Our figs. 2329. to 2331. of the natural size, from specimens taken from the plant in the Hort. Soc. Garden, and showing the very different appearance that the shoots assume on the same plant, and that even a young one.

Spec. Char., &c. Leaves ovate-obtuse, imbricated in 4 rows. Galbulus globose, pedicellate. Scales bossed. Branchlets round, knotted, divaricate, crowded, spreading. (*Lamb. Pin.*, ii. No. 59.) A tree, a native of Nepal, on the Bhotan Alps. Introduced in 1824; flowering in April.

Description, &c. A beautiful, pyramidal, much-branched, evergreen tree covered with a brown bark. Branches crowded, ascending; branchlets much crowded, round, divaricate, spreading, knotted, 2 in. to 6 in. long, very closely imbricated with leaves. Leaves small, ovate-obtuse, convex, smooth, imbricated in 4 rows, adpressed, green; adult ones persistent, and falling off,



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with the bark. Only young male catkins seen: these numerous on the summit of the smaller branchlets, club-shaped, tetragonal, imbricated. Galbulus globose, on a very short scaly pedicel, pitch-black, of a glaucous hue; scales trapezoidal, bossed in the middle, thick, woody. (*Lamb.*) Found by Dr. Royle on the Himalayas, at 11,500 ft. above the level of the sea; also in Kunawar, on the borders of Chinese Tartary. Seeds were sent to England in 1824, and again in 1830, by Dr. Wallich; and there is a plant in the Horticultural Society's Garden, which, 6 years planted, is now 6 ft. high. There are also young plants in the Fulham and several other London nurseries; in the pinetum in the Chester Nursery, and in that at Elvaston Castle. As it appears tolerably hardy, and is very handsome, it well deserves a place in collections.

† 5. *C. PE'NDULA* Thunb. The weeping Cypress.

Identification. Thunb. Fl. Japon., p. 265.; Willd. Sp. Pl., 4. p. 512.; Staunt. Embass., 2. p. 525. *Lamb. Pin.*, ed. 2., t. 66.



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Synonymy. Fi-moro, *Kæmpf. Amœn.*, p. 883.

Engravings. Lamb. Pin., ed. 2., t. 66.; Staunt. Embass., t. 41.; our fig. 2322. to our usual scale; figs. 2333. of the natural size; and fig. 2334. showing parts of the shoots magnified

Spec. Char., &c. Branchlets 2-edged, leafy; the oldest very long, pendulous; the younger short, alternate, 2-rowed, spreading. (*Lamb.*) A tree, with a large expanded head. Branches dichotomous, loose, leafless, much divided; branchlets long, compressed, pendulous, closely covered with leaves; again divided, secondary branchlets short, spreading. Leaves imbricated in 4 rows, rather stem-clasping, and triquetrous; keeled, adpressed. Male catkins numerous, ovate, more than one line long, solitary on the apex of the branches, sessile; female depressed, surrounded by spreading leaves, terminating the very short inferior branchlets. Cone brownish, about the size of a sloe. Scales 8-angled; mucros obtuse. Seeds yellowish. (*Lamb.*) A tree, a native of China, said to have been introduced in 1808, but respecting which we know nothing with certainty. The pendulous cypress, or Thuja, at Chelsea, and in the Kew arboretum, may possibly be the same as Thunberg's plant.



App. i. *Kinds of Cuprëssus of which there are Plants in British Gardens, but of which very little is known.*

C. horizontalis Audibert. This plant has been already referred to, p. 2465., as being considered by some to be the same as the spreading variety of *C. sempervirens*; and by others, as a distinct species. As it has produced cones exactly resembling those of *C. sempervirens*, we have no doubt of its being only the spreading variety of that species. The tree in the Horticultural Society's Garden, received from Audibert in 1825, is now 6 ft. high, of vigorous growth, and with spreading branches.

C. expãnsa Audibert, ? *C. expãnsa* Hort. Par. The tree received from Audibert's Nursery at Tarascon in 1834, and now in the Horticultural Society's Garden, was, in 1837, 2 ft. high. The *C. expãnsa* of the Hort. Par. is *C. s. horizontalis*.

C. Fothergillii Lec. A plant under this name is in the Horticultural Society's Garden, which was received from the Hammersmith Nursery in 1834. It is now 2 ft. high, and is found rather tender.

C. thurifera. A plant in the Horticultural Society's Garden, bearing this name, is only a few inches high.

C. Tournefortii Audibert. The plant bearing this name in the Horticultural Society's Garden, received from Audibert in 1834, is 2 ft. high.

C. bacciformis Willd. A hardy tree, 20 ft. high. Introduced in 1818.

C. australis Pers. A shrub, with slender branches, a native of New Holland, and rather tender.

Before anything can be determined with certainty respecting the above kinds, they must have produced fruit; and, consequently, several years must elapse. Most of them are probably only synonyms to species of *Cuprëssus* above described, or of some of the kinds of *Juniperus* which will hereafter be given.

App. ii. *Kinds of Cuprëssus not yet introduced.*

C. nootkatënsis Lamb. Branchlets tetragonal. Leaves broad-ovate, acute, convex on the back, imbricated in 4 rows, adpressed. Galbulus globose, almost sessile. Scales bossed, smooth, (*Lamb. Pin.*, ii. No. 60.) A tree. Branches round, spreading, scaly from the withered leaves, covered with a brownish bark. Branches numerous, somewhat distant, tetragonal, short, spreading. Leaves broad-ovate, acute, very thick, glabrous, shining, closely adpressed, imbricated in 4 rows, convex on the back; adult ones shortly awl-shaped at the apex. Galbulus globose, lateral, the size of a wild cherry, covered with a glaucous hue, on a very short scaly footstalk, similar to a branchlet; scales trapezoidal, peltate, smooth, bossed in the centre. (*Lamb.*) Discovered by Mr. Menzies, in Nootka Sound, on the north-west coast of North America.

C. japonica Thunb. Jap., p. 265., Willd. Sp. Pl., 4. p. 513., Lin. Supp., p. 421. Leaves 4-rowed, compressed, furrowed, decurrent. (*Thunb.*)

GENUS XII.



TAXODIUM Rich. THE TAXODIUM, or DECIDUOUS CYPRESS. *Lin. Syst.* Monœ'cia Monadélphia.

Identification. Rich. Conif., p. 143.; Lamb. Pin., ed. 2., 2.

Synonymes. *Cuprëssus L.*, *Schubertia* Mirb., *Condylocarpus Satish.*

Derivation. From *taxus*, the yew, and *oidos*, like; the trees resembling the yew.

Description. Lofty, deciduous, and evergreen trees, natives of the southern part of North America; separated from the genus *Cuprëssus*, principally because the male catkins are disposed in loose spreading bunches, instead of being solitary and terminal; and because the female catkins are roundish and scaly, like the male, and each scale has only 2 perfect flowers. The genus is also distinguished by the embryo having from 5 to 9 cotyledons. The species are generally propagated by seeds, and the varieties by cuttings or layers.

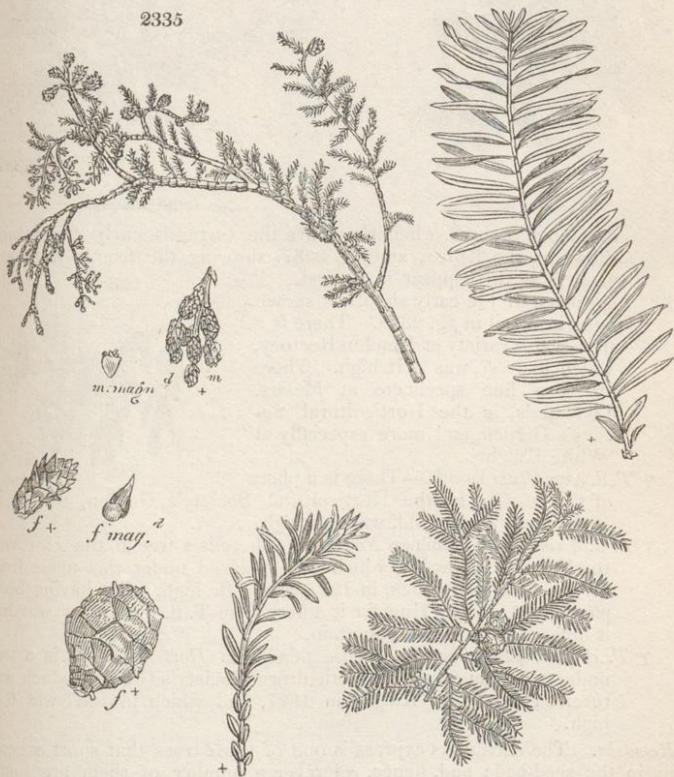
‡ 1. *T. DISTICHUM* Rich. The two-ranked-leaved Taxodium, or Deciduous Cypress.

Identification. Rich. in Ann. Mus., xvi. p. 298.; Mém. sur les Conif., p. 53. 143.; Lamb. Pin. ed. 2., 2. t. 63.

Synonymes. Cupressus disticha Lin. Sp. Pl., 1492., Hort. Cliff., p. 499., Gron. Virg., p. 153., Michx. Fl. Bor. Amer., 2. p. 208., Arb., 3. p. 4., N. Amer. Syl., 3. p. 197., Pursh Fl. Amer. Sept., 2. p. 645., Lodd. Cat., ed. 1836; C. americana Cat. Carol., 1. p. 11.; C. virginiana Comm. Hort., 1. p. 113., Pluk. Alm., p. 125.; Schubertia disticha Mirb., Laus. Man., p. 392.; bald Cypress, Cypress, Amer.; Cyprès de l'Amérique, Cyprès chauve, Fr.; zweyzeilige Cypresse Ger.

Engravings. Rich. Conif., t. 10.; Michx. Arb., 3. t. 1., North Amer. Syl., 3.; Catesb. Car., t. 11.; Comm. Hort., 1. t. 59.; Pluk. Alm., t. 85. f. 6.; Lamb. Pin., ed. 2., t. 63.; our fig. 2335.; and the plates of this tree in our last Volume.

Spec. Char., &c. Leaves 2-rowed, flat, deciduous. Male flowers leafless and panicked. Cones somewhat globose. (Willd.) A lofty deciduous tree; a native of North America. Introduced before 1640.



Varieties.

‡ *T. d. 1 patens* Ait. Hort. Kew., ed. 2., v. p. 323. — Leaves approximate, and strictly 2-rowed. This is the most common form.

‡ *T. d. 2 nutans*, l. c.; *T. d. pendula* Loud. Hort. Brit.; the long-leaved deciduous Cypress; has the leaves much longer and drooping, but more remote and thinner. There is a tree of this variety in Lodiges's arboretum, of which figs. 2336. and 2337. are portraits; fig. 2336. being taken when the fronds or deciduous shoots are first



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developed in June, when they have the tortuous curly appearance shown in the figure; and *fig.* 2337. showing the fronds fully expanded, as they appear in August. A specimen of the early shoots is shown more in detail in *fig.* 2338. There is a tree of this variety at Hendon Rectory, which, in 1837, was 15 ft. high. There are also fine specimens at Messrs. Loddiges's, in the Horticultural Society's Garden, and more especially at White Knights.

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- ‡ *T. d. 3 excelsum* Booth.—There is a plant of this variety in the Horticultural Society's Garden, which, in 1837, when 2 years old, was 2 ft. high.
- ‡ *T. d. 4 sinense*, *T. sinense Noisette*.—There is a tree in the Horticultural Society's Garden, which was received under this name from M. Noisette, and which, in 1837, was 6 ft. high, after having been planted 10 years. How far it differs from *T. d. nutans*, or whether it differs at all, we are uncertain.
- ‡ *T. d. 5 s. pendulum*, *T. sinense pendulum Hort.*—There is a tree under this name in the Horticultural Society's Garden, which was received from Mr. Knight in 1827, and which in 1837 was 6 ft. high.

Remarks. The deciduous cypress is one of those trees that sport exceedingly in the seed-bed; and, hence, wherever a number of them are found growing together, scarcely any two appear to have precisely the same habit. This is strikingly the case at White Knights, where there are several scores of trees, presenting a variety of forms and foliage almost as great as their number. They may all, however, as well as those enumerated in the above list, be reduced to the following four forms. 1. The species, having the branches horizontal or somewhat inclined upwards. 2. *T. d. pendulum*, with the branches pendulous. 3. *T. d. nutans*, with the branches horizontal, and the young shoots of the year pendulous; the leaves being twisted and compressed round them in the early part of the season, but fully expanded, like those of the species,

towards the autumn. Most of these shoots have their points killed every winter, and many of them are entirely destroyed. 4. *T. d. tortuosum pendulum*, with the leaves on the young shoots tortuous, and the branches pendulous. There is a very elegant specimen of this tree at White Knights. With respect to the *T. sinense* of cultivators, we have not been able to discover in what it differs from *T. nitans*.

Description. A tree, in North America, 120 ft. high. Trunk very thick, often from 25 ft. to 40 ft. in circumference at the base. Branchlets very slender, elegantly pinnate, bark brownish. Leaves pectinate and distichous; spreading horizontally, from being twisted at the base; linear, mucronulate, flat, 1-nerved (nerve somewhat depressed above); glabrous on both sides, light green; margins acute, exterior somewhat convex, $\frac{1}{2}$ in. or more in length, about 1 line broad. Male catkins roundish, in a racemose panicle; scales very short, obtuse, concave, keeled, membranaceous on the margin. Galbulus roundish or roundish-oval, of the size of a pigeon's egg. The tree, though pyramidal in form when it is young, yet, when full-grown, has a spreading broad head, somewhat in the manner of that of an old cedar of Lebanon. There are but few trees in Britain which have assumed this character; but, according to Michaux, it is common in the swamps of America; and it has also begun to show itself in some of the old trees at Whitton and Syon. The bark of trees which grow near the natural beds of the rivers, and are half the year surrounded with water to the height of 3 ft. or 4 ft., is lighter-coloured than that of trees which stand in places which the waters do not reach; the wood, also, is whiter, less resinous, and less heavy. These are called white cypresses. The others, of which the bark is browner, and the wood heavier, more resinous, and of a dusky hue, are called black cypresses; whence we have, in some catalogues, *T. d. nigrum*; but this name we have not given in our list of varieties, as it is obviously only that of a variation. The wood is fine-grained, and, after being for some time exposed to the light, becomes of a reddish colour: it possesses great strength and elasticity, and is lighter and less resinous than that of the pines. It has also a greater power of resisting heat and moisture. The foliage is open, light, and of a fresh agreeable tint; each frond, or young shoot, is 4 in. or 5 in. long, and consists of two parallel rows of leaves upon a common stem. The leaves are small, fine, and somewhat arched, with the convex side outwards. In the autumn, they change from a light green to a dull red, and soon after fall off. The deciduous cypress blossoms in Carolina about the 1st of February. The male catkins are produced in flexible pendulous aments, and the female in very small bunches. The cones are about as large as the point of the thumb, hard, roundish, and of an uneven surface. The seeds are small, ligneous, and of irregular shapes, with a cylindrical kernel: they are ripe in October, and retain their productive power two years. (*Lamb., Michx., and obs.*)

The deciduous cypress, in America, attains its largest size in the swamps of the southern states and the Floridas, on the deep miry soil of which a new layer is every year deposited by the floods. These trees, which are sometimes 40 ft. in circumference at the base, are, however, always at least three times as thick there as they are in any other part of the trunk. The base is usually hollow for three quarters of its bulk; and its surface is longitudinally furrowed with deep tortuous channels. In consequence of the hollowness and comparative worthlessness of the lower part of the trunk, the negroes raise themselves on scaffolds 5 ft. or 6 ft. from the ground, when the trees are to be felled, in order to cut off only the sound part of the tree. The roots of large trees, particularly in situations subject to inundation, are charged with conical protuberances, commonly from 1 ft. 6 in. to 2 ft. high, and sometimes from 4 ft. to 5 ft. in thickness: they are always hollow, smooth on the surface, and covered with a reddish bark, like the roots, which they resemble also in the softness of their wood. Michaux says that "no cause can be assigned for their existence: they are peculiar to the deciduous cypress, and begin to appear when it is only 20 ft. or 25 ft. high. They are made use of by the negroes for bee-hives." He adds that they exhibit

no signs of vegetation, and that he has never succeeded in obtaining shoots from them by wounding the surface, and covering them with earth. These facts are confirmed by Dupratz, the author of *Voyage à la Louisiane*, who says that he has seen protuberances which had grown up from the roots of deciduous cypresses after they had been cut down, in the form of a sugar-loaf, to the height of 10 ft., being a fourth part as broad as they were high, and without having ever produced either a root or a shoot. Bosc, who mentions this on Dupratz's authority, doubts the accuracy of his observation, and says that he never saw these protuberances of more than 1 ft. in height. Flint, in his *Geography and History of the Western States*, mentions these "curiously-shaped knobs," which, he says, are, in America, commonly called "cypress knees;" while the hollow base of the trunk is called "the tree's buttock." "The cypress," he says, "loves the deepest, most gloomy, inaccessible, and inundated swamps; and seems to flourish where water covers its roots more than half the year. When the water rises from 8 ft. to 10 ft. from the overflow of the rivers, the apex of the tree's buttock is just on a level with the surface of the water. It is then, in many places, that they cut it. The negroes surround the tree in periogues, and thus get at the tree above the large and broad buttock, and fell it with comparative ease. They cut off the straight shaft as suits their purpose, and float it to a raft, or the nearest high grounds." (*Geog. and Hist., &c.*, vol. i. p. 62.) The knees are produced abundantly by the large trees at Syon and Whitton, where they rise upwards of 1 ft. above the surface of the soil; and more than double that height from the roots under water, in the case of trees growing by the sides of lakes at these places. These protuberances are shown in the plate of the full-grown tree of this species in our last Volume. The tree is of comparatively slow growth in the climate of London; and the fronds, or points of the shoots, are frequently killed back by early frosts. Nevertheless, it attains the height, in moist soils, of 5 ft. or 6 ft. in 6 or 8 years, and of 15 ft. in 12 or 15 years; and, in 40 or 50 years, it is 40 ft. or 50 ft. in height. The largest tree in the environs of London is at Whitton, where, in 1834, it was 81 ft. high, with a trunk 5 ft. in diameter at 2 ft. from the ground. There are trees nearly 70 ft. high at Syon; and trees at Bagshot, St. Ann's Hill, and Purser's Cross which have borne male blossoms and cones. The first tree on record which bore cones in England was one at Wimbledon, before 1752. (See *History*.) The tree thrives well in Scotland, and also in the climate of Paris, and in central Germany.

Geography. The deciduous cypress is found on the banks of the Indian River, a small stream that waters part of Delaware, in lat. $38^{\circ} 50'$, and which may be considered as its northern boundary. Hence, proceeding southward, it becomes more abundant in the swamps; but, in Maryland and Virginia, it is confined to the view of the sea, where the winter is milder, and the summer more intense. Beyond Norfolk, its limits coincide exactly with those of the pine barrens; and, in the Carolinas and Georgia, it occupies a great part of the swamps, which border the rivers after they have left the mountains, and entered the low lands. In East Florida, the soil is, in general, more uniform; and here the long-leaved pine (*P. australis*) and deciduous cypress are very abundant; the one on the low grounds, and the other on the uplands. The Mississippi, from its mouth to the river of the Arkansas, a distance (following its windings) of more than 600 miles, is bordered with marshes, which, at the annual overflowing of this mighty stream, form a vast expanse of waters. In Louisiana, those parts of the marshes where the deciduous cypress grows almost alone are called *cyprières* or cypress swamps, as those in which it is mingled with the white cedar are called cedar swamps, and they sometimes occupy thousands of acres. In the Floridas, these swamps are contiguous to the immeasurable tracts covered with pines, and called pine barrens; or with tall rank grass, and called savannahs. In the midst of the pine forests and savannahs is seen, here and there, a bog, or a plash of water, filled with deciduous cypresses, the squalid appearance of

which, when they exceed 18 ft. or 20 ft. in height, proves how much they are affected by the barrenness of the soil. From these particulars an idea may be formed of the situations and soils in which the deciduous cypresses are found, over an extent of more than 1500 miles, from their first appearance in the north, to the Mississippi. Michaux adds that he has some reason to believe that the deciduous cypress is found as far south as the mouth of the Rio del Norte, lat. 36° ; which, if we measure the circuit of the Gulf of Mexico, makes a range for this tree of more than 3000 miles. (*Michx.*)

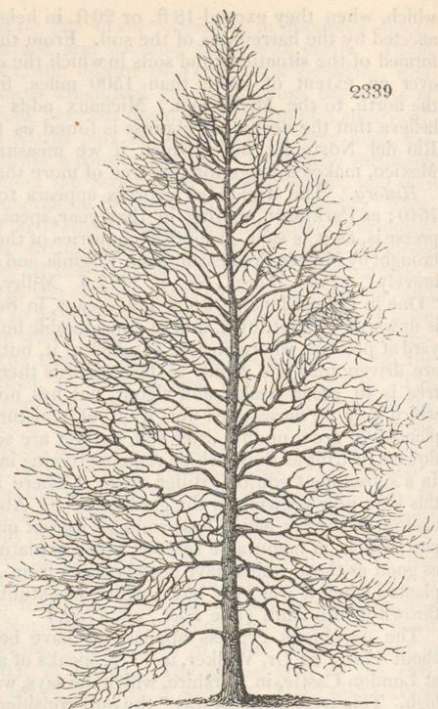
History. The deciduous cypress appears to have been introduced before 1640; as Parkinson, writing in that year, speaks of it. "The Americane cypresse is, as it is said, in sundrie countries of the North America; its seed was brought by Master Tradescant from Virginia, and sown here, and doe spring very bravely." (*Park. Theat.*, &c., p. 1477.) Miller, speaking of this tree, says: "One in the gardens of John Tradescant, in South Lambeth, near Vauxhall, is upwards of 30 ft. high, and of considerable bulk; and, though in a common yard at present, where no care is taken of it, but, on the contrary, many hooks are driven into the trunk to fasten cords thereto for drying clothes, yet the tree is in great health and vigour, but has not produced any fruit as yet, which may be occasioned for want of moisture; for we often see aquatic plants will grow upon a drier soil, but yet are seldom so productive of either flowers or fruit as those which remain growing in the water." (*Dict.*, ed. 1731.) In a subsequent edition, Miller says: "There is also a pretty large tree of this kind now growing in the gardens of Sir Abraham Jansen, Bart., at Wimbledon, in Surrey, which has produced a great quantity of cones for some years past, which, in favourable seasons, come to maturity; and the seeds have been as good as those which have been brought from America. This tree was transplanted when it was very large, which has stunted its growth," and may have thrown it into fruit. (See *Dict.*, ed. 1752.)

The deciduous cypress appears to have been introduced into Scotland about 1746; as Dr. Walker, in 1776, speaks of a fine tree of it in the grounds at Loudon Castle, in Ayrshire, which, he says, was then 30 years old, and 25 ft. high. This tree, he adds, was "the only considerable tree of the kind in North Britain. It was feathered down to the ground with branches; and is, without exception, the most elegant tree of the kind to be seen in our climate. It used formerly to be kept in the green-house, which, from this instance, appears quite unnecessary, as the tree has never suffered in winter. It stood well sheltered, and in a heavy clay soil." (*Essays*, &c., p. 80.) Humboldt mentions that there are some trees in Mexico, which were planted in the garden of the emperor there, before the Spanish invasion; and it is probably to these that Ward alludes in his *Mexico*. "The cypress of Montezuma," he says, "stands in the gardens of Chapultepec, near Mexico; and, as it had attained its full growth when that monarch was on the throne (1520), it must now be nearly 400 years old. The trunk is 41 ft. in circumference, and it is so high as to appear slender." At Santa Maria de Tula, in Oaxaca, is a cypress $93\frac{1}{2}$ ft. in circumference.

Botanical History. Parkinson, in 1640, expresses his doubts that this tree was not "a true cypresse," and suggests that it must have been called so from the fragrance of the wood. It was, however, classed by Linnæus, and all succeeding botanists, as a *Cupressus*, till M. Richard, in the *Annales du Musée*, tom. xvi. p. 269., constituted it a genus, under the name of *Taxodium*; which name was applied from the leaves being disposed in the same manner as those of the yew. Two years afterwards, M. Mirbel and M. Schubert described it as a separate genus, under the name of *Schubertia* (*Nouv. Bull. de la Soc. Phil.*, iii. p. 123.); but the name of *Taxodium* having been applied first, and accompanied by a scientific description, necessarily takes precedence.

Properties and Uses. The wood is universally employed, throughout the United States, for the best kind of shingles; and in Louisiana it is used for almost every other purpose to which timber is applied. Nearly all the

houses in New Orleans, in 1819, Michaux informs us, were of wood, and not only the frame, but the interior work and the outer covering, were, in most cases, of cypress. The shingles made of this wood are split off parallel to the concentric circles. At Norfolk, in Virginia, near the Dismal Swamp, immense quantities of shingles are made both of this wood and of that of the white cedar. Throughout the southern states, it is used for the interior fitting up of brick houses, for window sashes, and panels of doors exposed to the weather; and cabinet-makers use it for the drawers, &c., of mahogany furniture. It has been employed, in Louisiana, for the masts and sides of vessels; and is often used for canoes, which, when fashioned from a single trunk, and about 30 ft. long and 5 ft. wide, are light, solid, and more durable than those formed of any other tree. It makes excellent and very durable posts for fences, and



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pipes to convey water under ground; particularly the kind grown on dry land, and called the black cypress, the wood of which is more resinous and solid than that of the white. A resin, of an agreeable odour and red colour, exudes from the bark; but not in sufficient abundance to be used for the purposes of commerce, though more copious than that of the white cedar: the negroes prefer it to that of the pines for dressing wounds. The protuberances formed by the roots, as already observed, are used by the negroes as bee-hives. In England, the deciduous cypress is only valued as an ornamental tree; and the delicacy of its foliage, and the graceful pendent disposition of its lower branches, insure it a place in every collection where the soil is naturally moist, or where it can be planted in the vicinity of water. The noble trees at Syon and Whitton are admired by all who have seen them. The most graceful pendent-branched tree which we have seen is that at St. Ann's Hill, already mentioned; and, in the wood at White Knights, there are above a score of young trees, so different in their foliage, in the fastigate, spreading, or pendulous disposition of their branches, and also in the twisted or flattened 2-ranked arrangement of the leaves, that each might be considered as a distinct variety.

Soil, Propagation, &c. A rich moist soil is required to produce the deciduous cypress of any size, and it will not thrive in elevated situations. The species is increased by seeds, which are procured from imported cones: they may be treated in all respects like those of the common evergreen cypress, and, like them, come up the first year. The tree may also be propagated by cuttings, put in in autumn, in sand or heath soil, in the shade, and kept moist; a practice which, Bosc observes, is in use in the nurseries at Orleans, but not in those at Paris. Cuttings of the winter's wood, or of the summer's shoots with the leaves on, will root in a vessel of water in a very few

weeks; and, if an inch of soil be placed at the bottom of the vessel, the fibres will root into it, and the plants may be used as if they had been struck in the usual manner. Layers, put down in moist soil, root the first year.

Statistics. In the Neighbourhood of London. At Whitton, it is 81 ft. high, diameter of the trunk 5 ft. at 2 ft. from the ground; at Purser's Cross, it is between 70 ft. and 80 ft. high (this tree has borne cones and male blossoms); at Abercorn Priory, at Stanmore, it is 42 ft. high, diameter of the head 75 ft.; at Muswell Hill, it is 43 ft. high; at Kenwood, 50 years planted, it is 40 ft. high, diameter of the trunk 2 ft. 8 in., and of the head 24 ft.; at Gunnersbury Park it is 51 ft. high, diameter of the trunk 1 ft. 6 in.; at York House, Twickenham, it is 52 ft. high, diameter of the trunk 3 ft., and of the head 23 ft.; and at Syon there are several from 60 ft. to 70 ft. high, and, among others, the tree of which we have given a portrait in our last Volume. — South of London. In Cornwall, at Port Elliot, 80 years planted, it is 50 ft. high, diameter of the trunk 3 ft., and of the head 30 ft. In Hampshire, at Strathfieldsaye, it is 46 ft. high, with a trunk 3 ft. 4 in. in diameter. In Surrey, at St. Ann's Hill, 35 years planted, it is 45 ft. high, diameter of the trunk 2 ft., and of the head 30 ft., bearing cones abundantly. — North of London. In Berkshire, at Ditton Park, 90 years old, it is 80 ft. high, with a trunk 3 ft. 6 in. in diameter. In Cambridgeshire, at Wimpole, 45 years planted, it is only 27 ft. high. In Essex, at Hylands, 10 years planted, it is 13 ft. high. In Herefordshire, at Haffield, 11 years planted, it is 14 ft. high. In Leicestershire, at Elvaston Castle, 16 years planted, it is 15 ft. high. In Suffolk, at Great Livermore, 35 years planted, it is 37 ft. high, the diameter of the trunk 1 ft. 2 in., and of the head 18 ft. In Warwickshire, at Combe Abbey, it is 47 ft. high, the diameter of the trunk 2 ft. 3 in., and of the head 24 ft. In Worcestershire, at Croome, 60 years planted, it is 55 ft. high, the diameter of the trunk 2 ft., and of the head 40 ft. In Yorkshire, at Studley, the very handsome tree of which *fig. 2339*, is a portrait, 36 ft. high. — In Scotland, in Ayrshire, at Fullarton, 20 years planted, it is 20 ft. high. — In Ireland, in the county of Down, at Ballyleady, 22 years planted, it is 16 ft. high. — In France. In the Botanic Garden at Toulon, 38 years planted, it is 80 ft. high, the circumference of the trunk 10 ft. 4 in. On the Government Farm of Rambouillet are several from 65 ft. to 70 ft. high, with trunks about 10 ft. in circumference; and several others with trunks from 3 ft. to 8 ft. in circumference. At Avranches, in the Botanic Garden, 20 years old, it is from 30 ft. to 40 ft. high, the diameter of the trunk 1 ft. 2 in., and of the head 24 ft. In Austria, near Vienna, at Brück on the Leytha, 30 years planted, it is 36 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 13 ft. — In Prussia, at Berlin, at Sans Souci, from 45 to 50 years old, it is 20 ft. high, the diameter of the trunk 1 ft., and of the head 9 ft. — In Italy, in Lombardy, at Monza, 24 years planted, it is 62 ft. high, the circumference of the trunk 4 ft. 2 in., and the diameter of the head 45 ft. — In America, at Philadelphia, in Bartram's Botanic Garden, it is 120 ft. high, with a trunk 28½ ft in circumference, above the buttock.

Commercial Statistics. Price of cones, in London, 3s. per quart; plants 1s. each: at Bollwyller, plants are from 1 franc to 2 francs; and at New York, 50 cents.

♠ *T. sempervirens* Lamb. *Pin.*, ed. 2., 2 t. 64.; our *fig. 2340*. to our usual scale; and *fig. 2341*. of the natural size. The evergreen Taxodium. Leaves distichous, linear, acute, evergreen, coriaceous, glabrous, opaque. (*Lamb.*) An evergreen tree. Branchlets angled, leafy, glabrous. Leaves linear, acute, distichous, coriaceous, glabrous: opaque and shining on both sides, keeled beneath, flat on the margin; ½ in. to 1 in. long, ¼ line broad, decurrent. Galbulus terminal, solitary, roundish, with short imbricated scales at the base; scales trapezoidal, peltate, thick, fungous and woody; rough above, and radiately striated; depressed in the centre, terminating at the base in a thick angular pedicel. Seeds many to a single scale, angular, yellowish. (*Lamb. Pin.*) This species was discovered by Mr. Menzies, on the north-west coast of America, in 1796; and immense trees of it were seen by Dr. Coulter in 1836; but it has not yet been introduced. It will probably prove hardy; and, in that case its introduction would be exceedingly desirable.

♀ *T. capense*; *Cupressus juniperoides* *Lin. Sp. Pl.*, 4.; the African, or Cape, Cypress; has the branches loose and spreading; leaves nearly 1 in. long, of a light green colour, and continuing the same all the year. Galbulus black when ripe. A native of the Cape of Good Hope; cultivated before 1756 by Miller; and flowering in April and May. It requires the protection of the greenhouse.



GENUS XIII.



JUNIPERUS L. THE JUNIPER. *Lin. Syst. Dic'cia* Monadelphica.

Identification. *Lin. Gen.*, No. 1134.; *Reich.*, 1240.; *Schreb.*, 1552.; *Gærtn.*, t. 91.; *Tourn.*, t. 361. *Juss.*, 413.; *Lamb. Pin.*, 2.

Synonymes. *Sabina Bauh.*; *Cedrus Tourn.*; *Genévrier, Fr.*; *Wachholder, Ger.*

Derivation. From *junepirus*, rough or rude, *Coll.*, the plants of this genus being stiff shrubs; or from *juniores pariens*, from the young and old leaves being on the tree at the same time, or with reference to the young fruit being produced before the old fruit drops off.

Description, Geography, &c. Evergreen shrubs and trees; natives of Europe, Asia, Africa, and America; mostly hardy in British gardens. The wood of all the species is more or less aromatic, and very durable. The berries are employed in medicine as a diuretic, and are used in flavouring gin; but in some species the aromatic is united with an acrid principle, as in the savin. According to Royle, the berries of the common juniper secrete sugar, as well as an essential oil. The genus has a very extensive geographical range. The common juniper is found in most parts of Europe and North America; and it was also seen by Capt. Webb on the Neetee Pass, in the Himalayas, where it is called Bilhara, also Pudma, and Pumaroa; and by Mr. Inglis, in Kunawar. Here there is also another species, *J. religiosa* Royle (? *J. recurva* Ham.), called Gogul by the natives, and employed for burning as incense in their religious ceremonies. The most common species, however, in India, is *J. squamòsa* Royle (*J. squamàta* D. Don), occurring on such mountains as Choor and Kedarkauta, as high as 11,000 ft.; as well as near Neetee, &c.; and on Peer Punjal, as well as Gossainthan. In the last-mentioned place, *J. recurva* is also found. As there is some difficulty in distinguishing the species, it is not easy to ascertain what species is called bastard, or creeping cedar, in contradistinction to the Himalaya cedar wood (*Juniperus excelsa*), found in Gossainthan, in Kamaon, and on the confines of Tartary. This, in its foliage, resembles *Cupressus torulòsa*, specimens of which, indeed, are mixed with those of *J. excelsa* in the East Indian herbarium. The former appears to be the plant called Theloo by the natives, and seen by Huree Sing between Simla and Phagoo, near a small piece of water; and by Murdan Aly, a very intelligent plant collector, near Saughee Ke Ghat, a high hill to the southward of Rol. It is also found in Kamaon, near Neetee, Simla, and in Kunawar. (Royle Ill.) The species, with the exception of three or four, which have grown to some size, and ripened fruit in England, are very imperfectly known to British cultivators; and, probably, some of those kinds which we have given as distinct species may prove not to be so. We could not, however, avoid this, from the impossibility of seeing any plants of many of the kinds, but those which were quite young. All the species are readily propagated by seeds, which retain their vitality, when kept in the berry, for several years; and, when sown, lie one year, and often two years, before they come up. They may also be increased by cuttings, planted in sandy soil, in a shady situation, in the autumn, and covered with a hand-glass during winter; or by layers.

Insects. The juniper is not much frequented by insects. Two species of British lepidopterous insects, however, derive their names from feeding upon this tree; namely, *Thera juniperata*, a very rare species of *Geometridæ* (*Steph. Illust.*, pl. 31. f. 2.); and *Anacamptis Juniperella* (one of the *Tinèidæ*). Three species of Linnæan *Hemiptera*, also, are named from their inhabiting this plant; namely, *Pentátoma junipérina* (one of the field bugs), *Aphis juniperi* (a species of plant louse), and *Thrips juniperi*; as well as a saw-fly (*Tenthredo juniperi*).—*J. O. W.*

The *Fungi* are not very numerous. On the leaves of *Juniperus communis* are found *Hystèrium Pinástri* var. *Juniperi* Fr., *Hystèrium Juniperi* Grev., t. 26., and our fig. 2342.; and *Podisòma foliòscolum* Berk. On the living branches are found *Gymnosporangium Juniperi* Lk., and *Podisòma Juniperi communis* Fr., which are a kind of perennial mildew, resembling in structure *Puccíniæ*, with the addition of copious gelatine. On *Juniperus Sabina* occurs *Podisòma Juniperi Sabinae*.—*M. J. B.*



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§ i. *Oxycedri*.—Leaves spreading in the adult plants. D. Don.

■ 1. *J. COMMUNIS L.* The common Juniper.

Identification. Lin. Sp. Pl., 1470.; Willd., 4. p. 853.; Fl. Br., 1085.; Eng. Bot., t. 1100.; Hook. Scot., 290.; Woodv., t. 95.; Mill. Illustr., t. 95.; Ehr. Pl. Off., 449.; Engl. Flor., 4. p. 251.; N. Du Ham., 6. p. 46.; Hook. Brit. Fl., p. 434.; Lindl. Syn., p. 241.; Lodd. Cat., ed. 1836.; Bon Jard., ed. 1837.

Synonymes. *J.* No. 1661a., *Hall. Hist.*, 2. p. 319.; *J. vulgàris*, &c., *Raii Syn.*, 444., *Bauh. Hist.*, 1. pt. 2. p. 293., *Bauh. Pin.*, 488., *Ger. Em.*, 1372., *Matth. Vaigr.*, 1. p. 109., *Cam. Epit.*, p. 53., *Lob. Ic.*, 2. p. 222.; *J. minor Fuchs Hist.*, p. 78., *Ic.*, t. 44., *Dalech. Hist.*, p. 67.; *J. communis saxatilis Pall. Ross.*, 2. p. 12.; *J. alpina Clus. Hist.*, 38., *J. Bauh.*, 1. lib. 9. p. 309.; *J. minor montana C. Bauh. Pin.*; *Genévrier commun, Fr.*; gemeiner Wachholder, *Ger.*

Engravings. Engl. Bot., t. 1100.; Woodv., t. 95.; Mill. Illustr., t. 95.; N. Du Ham., t. 15. f. 1.; Hayne Abbild., t. 206.; our fig. 2349. to our usual scale; and fig. 2348. of the natural size.

Spec. Char., &c. Leaves in threes, spreading, mucronate. Berries longish. (Willd.) An evergreen shrub; a native of Europe, North America, and Asia; flowering in May.

Varieties.

■ *J. c.* 1 *vulgàris* Park. Theat., 1029., Mart. Mill., No. 7.; *J. v. fruticosa Bauh. Pin.*, p. 488.; *J. c. erectis Pursh Fl. Amer. Sept.*, ii. p. 646.—Leaves, according to Hayne, $\frac{1}{2}$ in. in length. A bushy shrub, from 3 ft. to 5 ft. high; but, in favourable situations, growing much higher. (Willd.)

■ *J. c.* 2 *suécica* Mart. Mill., Ait. Hort. Kew., éd. 2., v. p. 414.; *J. suécica Mill. Dict.*, No. 2.; *J. vulgàris arbor Bauh.*; the Swedish, or true, Juniper; (fig. 2343.) has the leaves spreading and acute, and according to Hayne, 1 in. in length; and the branches erect, with oblong fruit. This kind was supposed by Miller to be a species, because he found it always come true from seed. It generally attains the height of 10 ft. or 12 ft., and sometimes of 16 ft. or 18 ft. The branches are more erect than those of the common juniper; the leaves are narrower, they end in more acute points, and are placed farther asunder on the branches; the berries are also larger and longer. It is a native of Sweden, Denmark, and Norway, and is in common cultivation in British nurseries. The leaves of the plants in the Horticultural Society's Garden, which are marked *J. suécica*, and also those of the plants that are sold for that variety, or species in the British nurseries, are rather shorter than those of the common juniper; or, at all events, not longer. Perhaps the variety *J. c. oblonga*, mentioned below, which has leaves an inch long, and the fruit oblong, may be the true Swedish Juniper.

■ *J. c.* 3 *nàna* Willd. Sp. Pl., iv. p. 854.; *J. communis* β *Fl. Br.*, 1086., *Lightf.*, p. 624., *Lin. Sp. Pl.*, 1470.; *J. c. saxatilis Pall. Ross.*, ii. t. 54.; *J. No. 1661. Hall. Hist.*, ii. p. 320.; *J. alpina Ray Syn.*, 444., *Bauh. Hist.*, i. pt. 2. p. 301. f. 302., *Clus. Hist.*, p. 38., *Pann.*, p. 26. f. 25., *Lodd. Cat.*, ed. 1836.; *J. alpina minor Ger. Emac.*, 1372.; *J. minor montana*, &c., *Bauh. Pin.*, 489., *N. Du Ham.*, vi. p. 46.; *J. nàna Smith Engl. Fl.*, iv. p. 252.; *J. sibírica Hort.*; *J. dàurica, Hort.*; *J. c. montana Ait. Hort. Kew.*, v. p. 415.; and our fig. 2344.; has the leaves broader and thicker, and the fruit longer, than the species.

■ *J. c.* 4 *oblonga, J. oblonga Hort.*, (fig. 2346.) has longer leaves than any other variety, and small oblong fruit. There is a large bush of this variety in the Horticultural Society's



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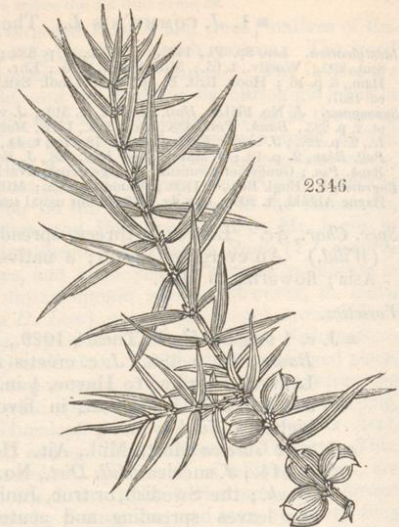


2344

Garden, which is only 4 ft. high, after having been planted 12 years, and which was received from M. Godefroy, Ville d'Avray, near Paris.



2345



2346

♣ *J. c. 5 o. pëndula*. (fig. 2345.)—We apply this name to a plant at Kew, which resembles that in the Horticultural Society's Garden, in every respect, except that the habit of the main branches is fastigiate; and the points of the shoots pendulous. It forms a very graceful plant, about 5 ft. high.

♣ *J. c. 6 canadensis*, *J. canadensis* Lodd. *Cat.*, ed. 1836, (fig. 2347.) is a handsome vigorous-growing variety, coming near in foliage to *J. c. nana*; but, as we have only seen a small plant of it in the collection of Messrs. Loddiges, we are unable to depict the particular feature in which it differs from the species. In Lawson's *Manual*, a variety of this name is referred to *J. virginiana*.

♣ *J. c. 8 depressa* Pursh *Fl. Amer. Sept.*, ii. 646, is a native of North America, and does not grow above 1 ft. or 2 ft. high; though its root will sometimes cover a space of from 15 ft. to 20 ft. in diameter. It does not appear to have been introduced. Possibly this may be the *J. canadensis* of Lodd. *Cat.*, No. 6. above.

Other Varieties. In Loddiges's *Catalogue*, there are *J. cracòvia* and *J. hibèrnica*, very small plants, but obviously belonging to *J. communis*. There can be no doubt of this, though as in the case of *J. c. canadensis* in the same collection, we cannot point out in what the difference consists. There are other names current in the nurseries, in some of which they are applied to *J. communis*, in others to *J. Sabina*, and in others to *J. virginiana*.

Description, &c. The common juniper, in its native habitats, is a low shrub, seldom rising more than 3 ft. high, and sending out many spreading tough branches, which incline on every side, and are covered with a smooth brown or reddish bark, with a tinge of purple. The bark of the young branches is green; but that of the trunk and old wood is of a greyish brown, cracked and scaly. Leaves narrow, awl-shaped, ending in acute points, placed by threes round the branches, pointing outwards; bright green on one side, and grey on the other; continuing throughout the year. The male



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flowers are sometimes on the same plant with the females, though at a distance from them; but they are commonly on distinct plants. The female flowers are succeeded by roundish berries, which are first green, but, when ripe, are of a dark purple or blackish blue colour, covered with a bloom. They continue on the bush two years, and are sessile in the axils of the leaves. They are juiceless, spongy-fleshed, and each contains 3 stones. Each berry is marked at top with 3 raised dots and a 3-forked groove, received at bottom into a very small starred involucre. When planted in a deep sandy loam, the common juniper will grow 15 ft. or 16 ft. high, and will form a handsome bushy shrub. In Birch Wood, near Farningham, is the juniper of which *fig.* 2350. is a portrait to a scale of 1 in. to 12 ft., for the drawing of which we are indebted to J. F. Christy, Esq. This remarkable tree is 20 ft. high, with a trunk 5 ft. 8 in. in circumference at the base, and 4 ft. 1 in. at 2 ft. from the ground. In the grounds at Pain's Hill is a bush 15 ft. high, and 36 ft. in diameter. At White Knights, there are several hundreds of plants, varying in height from 2 ft. to 12 ft.; but the largest of the species in England is probably that at Wardour Castle, which is 30 ft. high. Of the variety *J. c. 2 suécica*, there is a specimen at Farnham Castle, 40 ft. high. The rate of growth of the taller-growing varieties, in the climate of London, is from 6 in. to 9 in. a year, till the plants are 6 ft. or 8 ft. high, after which they grow more slowly; and their duration is more than a century.

Geography. The juniper is common in all the northern parts of Europe, both in fertile and barren soils, on hills and in valleys, in open sandy plains or in moist and close woods. On the sides of the hills, its trunk grows tall; but on the tops of rocky mountains, and in bogs, it is only a shrub. In England, it is found chiefly on open downs, in a chalky or sandy soil. In the southern countries of Europe, it is less common, except in very elevated situations. According to Pursh, it is found in North America, about rocks, near the falls of rivers, in Canada, and the western part of New York; and the variety *J. c. depréssa* in the state of New York, and particularly in the province of Maine, in rocky or gravelly situations. The common juniper, he adds, "may probably have been originally brought from Europe; but the variety, or, probably, distinct species, *J. c. depréssa*, seems to be really a native." (*Pursh Fl. Amer. Sept.*, ii. p. 646.) In Asia, the common juniper was found by Capt. Webb in Nepal, and on the Bhotan Alps. In all these countries it generally grows in dry soil, and never attains a large size but in soils which are dry and deep.

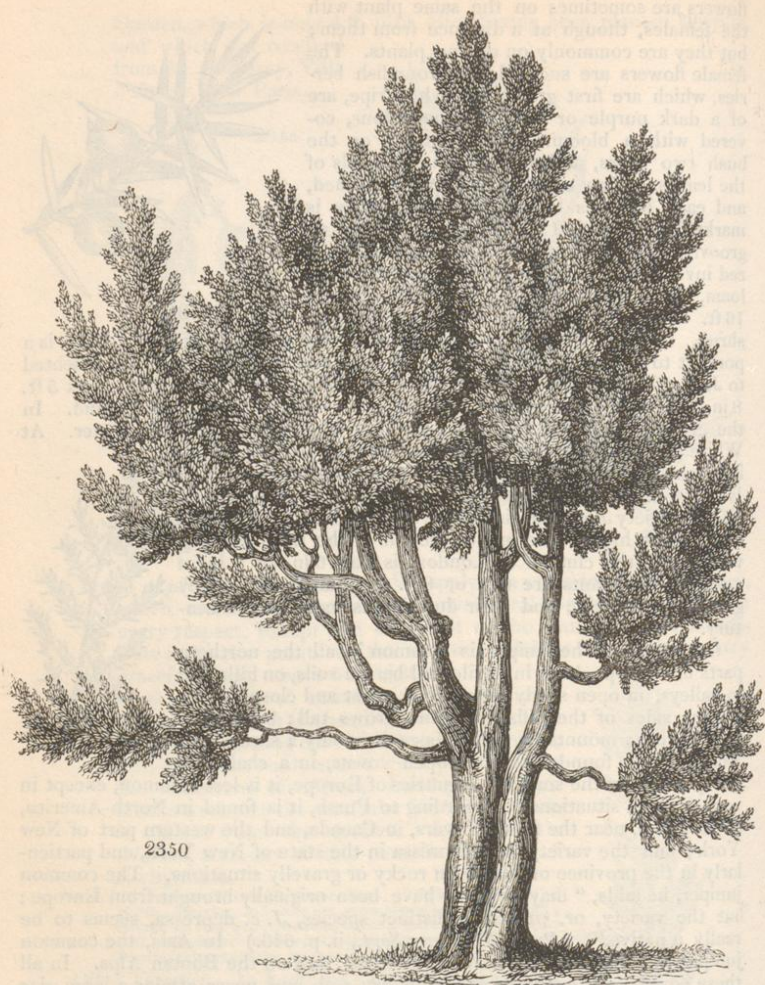
History. The juniper is mentioned in the *Bible*, in the First Book of Kings, as the tree under which the prophet Elijah took refuge in the wilderness of Beersheba, to avoid the persecution of King Ahab. It was known to the Greeks, who used its berries medicinally, though they thought its shade unwholesome. Pliny says the juniper has the same properties as the cedar; adding that, in his time, it grew in Spain to a great size; but that wherever it grows its heart is always sound. He also says that a piece of juniper wood, when ignited, will, if covered with ashes of the same wood, keep on fire a whole year. It is mentioned by Virgil, who says that its shade is hurtful both to men and corn. The species referred to by the classical writers is, in all probability, not the common juniper, but the Phœnician, or some other species of the south of Europe. The botanists of the middle ages appear to have had a high opinion of the virtues of the common juniper. Tragus asserts



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that its berries will cure all diseases; and Mathiolus, that its virtues are too numerous to mention. Turner says that, in England, the juniper "groweth most plenteouslie in Kent: it groweth, also, in the bisshopryche of Durram, and in Northumberlande. It groweth in Germany in greate plentye, but in no place in greater than a lyttle from Bon; where, at the time of year the feldefares fede only of junipers berries, the people eate the feldefares undrawen, with guttes and all, because they are full of the berries of juniper." (*Names of Herbes, &c.*, fol. 25.) The juniper is treated of at length in both Gerard and Parkinson, who enumerate a great many virtues belonging to it. In the Highlands, it is the badge of the clan Murray.

Poetical Allusions, &c. The ancients consecrated this shrub to the Furies, and threw its berries on the funeral pile, to protect the departing spirit from evil influences. They also offered it in sacrifice to the Infernal Gods, to

whom they believed its perfume was acceptable, and burnt it in their dwellings to keep away demons. A similar custom still prevails, to a certain extent, in various parts of the Continent; where the peasants believe that burning juniper branches before their doors will prevent the incantations of witches, and keep away evil spirits. It is probably in allusion to this belief that Sir Walter Scott says, in the *Lady of the Lake*, —

“ A heap of wither'd boughs was piled
Of juniper and rowan wild,
Mingled with shivers from the oak,
Rent by the lightning's recent stroke.”

Properties and Uses. The wood is finely veined, of a yellowish brown, and very aromatic. It weighs, when dry, above 42 lb. per cubic foot. It makes excellent vine-props, but is generally considered too valuable to be applied to such a use, as, from its beauty, and the high polish it will take, it is employed for walkingsticks, cups, and various articles of turnery. It makes excellent fuel, and is used in Scotland and Sweden for smoking hams. The bark is made by the Laplanders into ropes. The berries are, however, the most useful product of the juniper. Many kinds of birds feed on them; and, when burnt, they were formerly thought to possess the power of preventing infection. They are, however, now principally used in making gin, which is simply a spirit distilled from corn, and flavoured by an infusion of these berries. When crushed and distilled, the berries yield an essential oil. They are used by the peasants, in some parts of France, to make a kind of beer, which is called *genévrette*. For this purpose, they take equal parts of barley and juniper berries, and, after boiling the barley about a quarter of an hour, they throw in the juniper berries. They then pour the whole into a barrel half full of water, and bung it closely for two or three days; after which they give it air to promote fermentation. Some persons add molasses or coarse sugar, to make the liquor stronger. This beer is ready to drink in about a week, and it is bright and sparkling, and powerfully diuretic. Apples or pears, slightly crushed, are sometimes substituted for the barley; but the liquor thus made is apt to turn sour, or become vapid, in a short time. It was formerly supposed that this shrub, when grown in hot countries, produced the substance called gum sandarach, which, when powdered, is called pounce; but it is now discovered that this gum is the produce of *Cállitris quadrivalvis* (see p. 2463.). The entire juniper bush was formerly much employed in topiary work; and Evelyn mentions that his brother had an arbour, which three persons could sit in, cut out of a single plant. This arbour was 7 ft. wide, and 11 ft. high. The juniper is occasionally still seen in modern gardens, trained and clipped into the form of an open bowl or goblet. There is a fine specimen, a bowl, in the gardens of Mrs. Maryatt, at Wimbledon House, and another in the nursery of Mr. Waterer, at Knaphill. In France, being one of the few evergreen shrubs that will stand the open air in the climate of Paris, it is often planted as a screen to objects which it is desired to conceal, and trained and clipped into the form of evergreen walls, called there *rideaux de verdure*. The low trailing varieties are well adapted for covering rockwork.

Statistics. In Devonshire, at Endsleigh Cottage, 12 years planted, it is 16 ft. high, diameter of the head 10 ft. In Surrey, at Bagshot Park, 12 years planted, it is 15 ft. high. In Wiltshire, at Wardour Castle, 40 years planted, it is 30 ft. high, the diameter of the trunk 6 in., and of the head 12 ft. In Bedfordshire, at Amptill, 22 years planted, it is 10 ft. high. In Suffolk, at Finborough Hall, 40 years planted, it is 16 ft. high. In Yorkshire, at Hackress, 40 years planted, it is 12 ft. high. In Ireland, in King's County, at Charleville Forest, 25 years planted, it is 20 ft. high. In France, in Brittany, at Barres, 50 years old, it is 9 ft. high, and the diameter of the trunk 1 ft.; at Avranches, in the garden of M. Angot, 29 years planted, it is 24 ft. high. In Germany, in Bavaria, in the Botanic Garden, Munich, 24 years planted, it is 6 ft. high. In Italy, at Monza, 29 years planted, it is 20 ft. high.

J. c. 2 suécica. In Hampshire, at Farnham Castle, 50 years planted, it is 40 ft. high, the diameter of the trunk 2 ft., and that of the space covered by the branches 20 ft. In Surrey, at Bagshot Park, 12 years planted, it is 20 ft. high. In Sussex, at Westdean, 14 years planted, it is 17 ft. high. In Berkshire, at White Knights, 24 years planted, it is 32 ft. high. In Ireland, in Louth, at Oriel Temple, 18 years planted, it is 12 ft. high.

Commercial Statistics. Plants, in the London nurseries, are 9d. each, and of

the varieties 1s. 6d. each; at Bollwyller, the varieties, 2 francs each. At New York, plants of the Swedish juniper, which requires protection there during winter, are 50 cents each.

■ 2. *J. OXYCEDRUS* L. The Sharp Cedar, or brown-berried, Juniper.

Identification. Lin. Sp. Pl., 1470.; Willd. Sp., 4. p. 854.; Lam. Dict., 2. p. 625.; Desf. Fl. Atl., 2. p. 270.; Lois. Fl. Gall., p. 634.; N. Du Ham., 6. p. 47.

Synonymes. *J. major* Cam. Epit., 54.; *J. m. monspeliensium* Lob. Ic., 2. p. 223.; *J. phœnicea*, &c., *J. Bauh. Hist.*, 1. p. 277.; *J. major*, &c., *C. Bauh.*, p. 489., *Tourn. Inst.*, 589., *Du Ham. Arb.*, p. 322. t. 128., *Raui Hist.*, 1413.; *Cedrus phœnicea* Matth. Valgr., 127.; *Oxycedrus* Clus. Hist., p. 39.; *O. phœnicea* Dod. Pempt., p. 853.; the prickly Cedar; le Cade, Fr.; Spanische Wachholder, Ger.

Engravings. Du Ham. Arb., 2. t. 128.; N. Du Ham., 6. t. 15. f. 2.; our fig. 2352. to our usual scale; and fig. 2351. of the natural size.

Spec. Char., &c. Leaves in threes, spreading, mucronate, shorter than the berries. (Willd.) An evergreen shrub, native of Spain, Portugal, and the south of France. Introduced before 1739; flowering in May and June.

Description, &c. A shrub, closely allied to *J. communis*, from 10 ft. to 12 ft. high, and feathered from the ground. The branches are small and taper, with-



out angles. Berries very large, of a brownish red, and marked with two white lines. This species is said to form a handsome shrub when allowed sufficient space; and to be rather more tender than *J. communis*. In France, an essential oil is distilled from its wood, called *huile de cade*, which is used in veterinary medicine.



There are small plants in the Horticultural Society's Garden, at Kew, and at a few other places; but we have never been able to see any above 1 ft. in height.

■ 3. *J. MACROCARPA* Smith. The large-fruited Juniper.

Identification. Smith in Fl. Græc. Prod., 2. p. 263.; ? Tenore Syll. Fl. Neapol.

Synonymes. *J. major*, *baccâ ceruleâ*, *Tourn. Inst.*, 589.

Engravings. Lob. Icon., 2. p. 223. f. 1.; Tourn. Inst., 589. f.; and our fig. 2353. of the natural size, copied from the figure of L'Obel.

Spec. Char., &c. Leaves ternate, spreading, mucronate, sharply keeled, one-nerved. Berries elliptical, longer than the leaf. (Smith Fl. Gr., 2. p. 267.) A shrub, a native of Greece, with leaves like those of *J. Oxycedrus*, but the berries are twice as large, elliptic or obovate, and black covered with a violet bloom. There is a specimen in Sibthorp's herbarium, in the Linnæan Society. (Du Ham.) Berries have been sent to us by the Honourable W. Fox Strangways, under the name of *J. macrocarpa*, (but which were of a brownish red, and only differing from those of *J. Oxycedrus* in size,) accompanied by the following remarks:—"Juniperus macrocarpa is described in Tenore's *Sylog. Fl. Neapol.*, 1832, 8vo. It is common along the sea-shore, particularly near Baia, Cuma, and Licola; and is a low thick bush, having neither the cedar-like spread of the common juniper, nor the upright stature or *J. Oxycedrus*. *J. Oxycedrus* appears to be intermediate between *J. communis* and *J. macrocarpa*; having the small fruit of the former, and the spreading prickly leaves, wide apart, of the latter. It is not common in Italy, but is abundant in Istria and Dalmatia, where it bears the *Viscum Oxycedri*.—W. Fox Strangways January 20. 1838." Professor Don doubts much whether Tenore's *J. macrocarpa* be any thing more than a variety of *J. Oxycedrus*. As Mr. Strangways has given seeds of Tenore's plant to the Horticultural Society, and to other collections, it will be known in a few years what it is.



■ 4. *J. DRUPACEA* Lab., N. Du Ham. The drupaceous, or large-fruited, Juniper.

Identification. Labillard. Icon. Plant. Syr. Dec., 2. p. 14.; Mart. Mill., No. 11.; Desfont. Hist. des Arbres et Arbriss., 2. p. 558.



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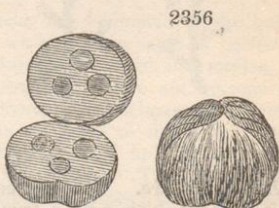
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Synonymes. *Håbbel fructus* Clus. *Hist. Ic.*, 37.; *J. major Bellon Obs.*, 2. p. 162.

Engravings. Clus. *Icon.*; Labillard. *Icon.*; our fig. 2354. reduced to our usual scale from the figure of La Billardière; and figs. 2355. and 2356. of the natural size, also from the same authority. Fig. 2355. shows the scales of the fruit much open than is usual in *Juniperus*; it is, however, a correct copy of the original.

Spec. Char. Leaves in threes, spreading, acute, three times shorter than the fruit. Nut 3-celled. (*Labillard.*) A shrub, a native of Syria. Introduced in 1820; but we have not seen the plant.

Description, &c. Stem erect, branched. Branches spreading; branchlets 3-sided. Leaves lanceolate, sessile, somewhat glaucous, with a double line above. Fruit testaceous, often three times as long as the leaves; large, roundish, angular, dark blue, with a glaucous bloom, and marked with six or nine retuse tubercles. Nut subovate, large, with three small cells; very hard, hollowed above with three lines; kernel solitary, oblong, fixed by a pellicle to the bottom of the cell. A native of Mount Casius, and probably the same with the greater junipers observed by Bellonius on Mount Taurus, which he describes as rising to the height of a cypress, and bearing a sweet fruit, the size and shape of an olive, which is eaten by the inhabitants of the mountains. (*Mart. Mill.*) This species was seen by Desfontaines in Paris, in the nursery of M. Cels. Clusius received it from the East, under the name of *Håbbel*.



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‡ 5. *J. VIRGINIANA* L. The Virginian Juniper, or Red Cedar.

Identification. Lin. *Sp. Pl.*, 1471.; Willd. *Sp. Pl.*, 4. p. 853.; Michx. *Arb. For.*, 3. p. 42.; North Amer. *Syl.*, 3. p. 222.; Mart. *Mill.*, No. 6.; Ait. *Hort. Kew.*, ed. 2., 5. p. 415.

Synonymes. *J. major americana Raii Hist.*, 1413.; *J. maxima*, &c., Sloan, *Lodd. Cat.*, ed. 1836, *Bon Jard.*, ed. 1837, *Laws. Man.*, p. 399.

Engravings. Michx. *Arb. For.*, 3. t. 5.; North Amer. *Syl.*, 3. t. 155.; our fig. 2357.; and the plates of this tree in our last Volume.

Spec. Char. Leaves in threes, the three growing together at the base; young ones imbricated, old ones spreading. (*Willd.*) An evergreen tree; a native of North America. Introduced before 1664; flowering in May, and ripening its fruit in October.

Varieties.

‡ *J. v. 2 humilis* Lodd. *Cat.*, ed. 1836.—The only plant that we have seen is at Messrs. Loddiges's, and it is there so very small and sickly, that it is difficult to form any opinion respecting it.

‡ *J. v. 3 caroliniana*; *J. caroliniana Du Roi, Mill. Dict.*, No. 2.—Miller says that the lower leaves of this kind are like those of the Swedish juniper; but that the upper leaves are like those of the cypress; while in the Virginian cedar all the leaves are like those of the juniper. The name is in Messrs. Loddiges's catalogue for 1837; but, as the plant in their collection is dead, we can say nothing as to the difference between it and the species.

Other Varieties. The red cedar varies exceedingly from seed. At White Knights, where there are some hundreds of trees, some are low and spread-

ing, and others tall and fastigate; some bear only male blossoms, and others only female ones. The foliage, in some, is of a very light hue; in others, it is glaucous; and in some a very dark green. The fruit, also, varies considerably in size; but, perhaps, the most striking variety is one in which the branches are decidedly pendent. Miller mentions a variety which has leaves like a cypress.



Description, &c. The red cedar, in its native country, is a tree from 40 ft. to 45 ft. high, with a trunk from 1 ft. to 1 ft. 6 in. in diameter. Its branches, which are numerous and close, spring near the earth, and spread horizontally; and the lower limbs are, during many years, as long as the body of the tree. The trunk decreases so rapidly, in diameter as it ascends, that the largest specimens rarely afford timber for ship-building more than 11 ft. in length. The diameter of the wood is also very much diminished by deep oblong furrows in every part of the trunk, occasioned by the large branches persisting after they are dead. (*Michx.*) The wood is fragrant, compact, fine-grained, and light; though heavier and stronger than that of either the white cedar or the deciduous cypress. The bark is thin and scaling off. The leaves are fastened at the base by their inner side, in the new shoots, imbricated in four rows, giving them the appearance of being quadrangular; the year following these spread from the branch at an acute angle, and appear to be disposed in six rows, or longitudinal phalanxes. The male and female flowers are small, not conspicuous, and borne separately on the same or on different trees. The berry is dark blue, and covered with a whitish resinous meal. The rate of growth, in the climate of London, is 10 ft. or 12 ft. in ten years; and the duration of the tree is upwards of a century. The largest specimens that we have seen are at Whitton, where there is one 60 ft. high, with a trunk 2 ft. in diameter; at Pain's Hill, where there is one 40 ft. high, with a trunk 2 ft. in diameter, and the diameter of the head 40 ft.; and at Syon, where there is the tree figured in our last Volume.

Geography and History. According to the elder Michaux, Cedar Island, in Lake Champlain, nearly opposite to Burlington, in lat. $44^{\circ} 25'$, is the most northern boundary of the red cedar. Eastward, it is found near Wiscasset, a

small town of the district of Maine, at the mouth of the Kennebeck; where it spreads, without interruption, to Cape Florida, and thence round the Gulf of Mexico, to beyond St. Bernard's Bay, a distance of more than 3000 miles. As it retires from shore, it becomes gradually less common and less vigorous; "and, in Virginia and the more southern states, it is rare at the point where the tide ceases to flow in the rivers: farther inland, it is seen only in the form of a shrub, in open dry sandy places. In the western states, it is confined to spots where the calcareous rock shows itself naked, or is so thinly covered with mould, as to forbid the vegetation of other trees. Though the red cedar grows naturally in the district of Maine, and in the islands of Lake Champlain, it is repressed by a winter as intense as that of the north of Germany; and develops itself less vigorously than in Virginia and farther south, where the soil and climate are favourable to the growth of the tree, and the perfection of its wood. Upon the downs, it is often buried in the sand cast up by the waves, except the summit of the branches, which appear like young trees above the surface. When unencumbered with sand, as in the middle of the islands, and on the borders of the narrow sounds which flow between them and the main, it attains the height of 40 ft. or 45 ft.; but it would be difficult to meet with trees of this size northward of the river St. Mary, within the ancient limits of the United States." (*Michx.*) According to Pursh, it is found in dry and rocky woods and fields, from the province of Maine to Georgia. It is mentioned by Parkinson; but he says that he has only seen the wood. It is said, in the *Hortus Kewensis*, to have been introduced before 1664, by Evelyn; and it has long been one of the commonest evergreens in British shrubberies. It endures the open air in Paris, and in Central Germany.

Properties and Uses. The name of red cedar has reference to the heart wood of this tree, which is of a beautiful red, while the sap wood is perfectly white. It is so strong and durable, that it would be preferred, in America, to every other kind of wood for many rural purposes, if it were not become so scarce in that country as to be very dear. According to Michaux, the barriers of the side walks in the streets of Philadelphia are made of this wood: they are 10 ft. or 11 ft. long, and 8 in. wide; and they are sold at 80 cents each; while those made of white cedar cost only 16 or 17 cents. The wood of the red cedar is admirably fitted for subterranean water-pipes; but it is rarely used for that purpose, from the difficulty of procuring trunks of sufficient size. The wood of the red cedar grown in the southern maritime states is reckoned the best; and it is used, combined with live oak, for the upper part of the frames of vessels; it is also generally used, in the southern states, for coffins. In Philadelphia the turners make their large stop-cocks of it; they also make very elegant little tubs, neatly wrought, and hooped with brass, resembling the Scotch bickers, of alternate staves of the heart and sap wood. It makes admirable fuel; and, when used for this purpose on board the steam-boats, the volumes of smoke which issue from the boiler furnaces are said to perfume the air for several miles in the track of the boat, or in the direction of the wind. The timber is imported into England for the manufacture of black-lead pencils; though the Bermuda juniper is preferred for that purpose. In Britain, the red cedar it is not planted as a timber tree; though, from the size which it attains in deep dry sandy soils, it might be worth while to plant it in masses for this purpose. As an ornamental tree, or large shrub, it is highly valued, either for planting singly on lawns, or in groups along with other trees and shrubs. It is more especially adapted for grouping with other *Cupressinæ*, the pine and fir tribe, and the yew.

Soil, Propagation, Culture, &c., as in the common juniper.

Statistics. In the Environs of London. At Ham House, Essex, it is 38 ft. high, with a trunk 1 ft. 9 in. in diameter; in the Fulham Nursery, 12 years planted, it is 15 ft. high. — South of London. In Devonshire, at Bicton, 10 years planted, it is 12 ft. high. In Hampshire, at Strathfieldsaye, it is 47 ft. high, with a trunk 2 ft. in diameter. In Somersetshire, at Nettlecombe, 60 years planted, it is 36 ft. high, diameter of the trunk 2 ft., and of the head 25 ft. In Surrey, at Bagshot Park, 20 years planted, it is 22 ft. high. In Sussex, at Westdean, 14 years planted, it is 29 ft. high. — North of

London. In Bedfordshire, at Southill, it is 38 ft. high, diameter of the trunk 2 ft. 3 in., and of the head 27 ft. In Berkshire, at White Knights, 34 years planted, it is 30 ft. high. In Cambridgeshire, at Wimpole, 100 years old, it is 32 ft. high, diameter of the trunk 3 ft. In Essex, at Braybrooke, 51 years planted, it is 32 ft. high; at Hylands, 10 years planted, it is 16 ft. high. In Gloucestershire, at Doddington Park, 27 years planted, it is 18 ft. high. In Hertfordshire, at Cashiobury, 30 years planted, it is 34 ft. high. In Leicestershire, at Elvaston Castle, 55 years planted, it is 31 ft. high, diameter of the trunk 1 ft. 8 in.; at Whatton House, 20 years planted, it is 24 ft. high. In Nottinghamshire, at Clumber Park, it is 36 ft. high. In Staffordshire, at Rolleston Hall, 50 years planted, it is 32 ft. high. In Suffolk, at Finborough Hall, 70 years planted, it is 60 ft. high; at Stretton Rectory, 90 years old, it has three stems, the total circumference of which is 11 ft. In Warwickshire, at Combe Abbey, 60 years planted, it is 44 ft. high, diameter of the trunk 1 ft. 9 in., and of the head 20 ft. In Worcestershire, at Croome, 50 years planted, it is 65 ft. high, the diameter of the trunk 1 ft. 8 in., and of the head 30 ft. In Yorkshire, at Hackress, 40 years planted, it is 14 ft. high. — In Scotland. In the environs of Edinburgh, at Gosford House, 30 years planted, it is 15 ft. high; at Dalhousie Castle, 20 years planted, it is 16 ft. high. In Berwickshire, at the Hrsel, 30 years planted, it is 21 ft. high. In Haddingtonshire, at Tynningham, 23 years planted, it is 17 ft. high. In Roxburghshire, at Minto, 65 years planted, it is 35 ft. high. In Aberdeenshire, at Thainston, it grows about 11 in. a year. In Perthshire, at Taymouth, 50 years planted, it is 36 ft. high. In Ross-shire, at Brahan Castle, 50 years planted, it is 54 ft. high. In Strlingshire, at Blair Drummond, it is 40 ft. high. — In Ireland. In the environs of Dublin, in the Glasnevin Botanic Garden, 30 years planted, it is 16 ft. high. In Fermanagh, at Florence Court, 50 years planted, it is 40 ft. high. In Louth, at Oriel Temple, 35 years planted, it is 32 ft. high, the diameter of the trunk 1 ft., and of the head 25 ft.; in the Botanic Garden at Foulon, 36 years planted, it is 29 ft. high. At Avranches, in the garden of M. Brunel, 29 years planted, it is 24 ft. high, the diameter of the trunk 1 ft. 6 in., and of the head 20 ft. — In Hanover, in the Göttingen Botanic Garden, 50 years planted, it is 40 ft. high. — In Bavaria, in the Botanic Garden, Munich, 20 years planted, it is 12 ft. high. — In Austria, at Vienna, in the University Botanic Garden, 30 years planted, it is 25 ft. high; at Laxenburg, 30 years planted, it is 20 ft. high; at Brück on the Leytha, 45 years planted, it is 30 ft. high. — In Prussia, at Berlin, at Sans Souci, 90 years planted, it is 40 ft. high; in the Pfauen Insel, 40 years planted, it is 26 ft. high. — In Sweden, in the Botanic Garden at Lund, it is 22 ft. high. — In Italy, at Monza, 29 years planted, it is 20 ft. high.

Commercial Statistics. Price of berries, in London, 1s. 3d. per quart; of seedling plants, 5s. a hundred; plants from 12 in. to 18 in. high, 75s. a hundred. At Bollwyller, plants in pots are 1 franc each; or seedlings, one year transplanted, per hundred, 30 francs. At New York, plants are 25 cents each.

† 6. *J. BERMUDIA'NA* L. The Bermudas Cedar.

Identification. Lin. Sp. Pl., 1471.; Reich., 4. p. 276.; Herm. Lugdb., t. 347.; Raii Hist., 1414. *Synonymy.* *Cedrus Bermudæ* Ray's Letters, p. 171.

Engravings. Herm. Lugdb., t. 347.; and our fig. 2358. of the natural size, from a young plant at Messrs. Loddiges's.

Spec. Char. Leaves in threes; upper in pairs, decurrent, awl-shaped, spreading, acute. (*Willd.*) A tall tree, a native of the Island of Bermudas. Introduced before 1683, and flowering in May and June.

Description, &c. A lofty tree, with loose, thin, reddish bark, and very fragrant wood. When young, it has acutely pointed leaves, which spread open, and are placed by threes round the branches; but, as the trees advance in age, their leaves alter, and become very short; lying over each other by fours round the branches, so as to make the branchlets appear 4-cornered. The berries are produced towards the end of the branches, and are of a dark red colour, inclining to purple. According to Ray's Letters, p. 171., it was introduced in 1683; but, in Martyn's Miller, it is said that it was first cultivated by the Earl of Clarendon, in 1700. The wood is much used, in the West Indies, for wainscoting, and different articles of furniture, as it is never attacked by cockroaches or other insects. It is imported into England for the purpose of making black-lead pencils; and shavings of it, under the name of cedar shavings, are used to put in drawers, &c., to keep away moths. The tree, being rather tender in the climate of London, is not frequent in collections; but plants may be obtained in the principal nurseries. The largest specimen which we have seen is at Hendon Rectory, where it is about 2 ft. high. There are plants in the Fulham Nursery, and in the Horticultural Society's Garden. Price of plants, in the London nurseries, 2s. 6d. each. At Bollwyller and New York, it is a green-house plant.



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J. nepalensis Hort., *Cupressus nepalensis* Hort. Seeds of this species were sent to the Horticultural Society's Garden, by Mr. Ward of the Isle of Wight, in 1834, and many plants raised from them. They are of vigorous growth, and have the general appearance of the common red cedar. The largest plant in the Horticultural Society's Garden is 2 ft. high.

§ ii. *Sabina*. — *Leaves of the adult plant imbricated.* D. Don.

■ 7. *J. SABI'NA.* The common Savin.

Identification. Lin. Sp., 1472.; Hort. Cliff.; Woodv. Med. Bot., p. 256. t. 94.; Gouan Hort. Monsp., 510.; Hall. Helv. No. 1662.; Scop. Carn., No. 1228.; Gmel. Sib., 1. 183. No. 34.; Pall. Itin., 3. 368.; Fl. Ross., 1. 2. 15. t. 56. f. 2.; Mart. Mill., No. 5.; Willd. Sp. Pl., 4. 852.; Ait. Hort. Kew., 5. p. 414.; Du Ham. Arb., 2. t. 62.; Desf. Hist. des Arb., &c., 2. p. 559.
Engravings. Woodv. Med. Bot., t. 94.; Pall. Fl. Ross., t. 56. f. 2.; Du Ham. Arb., 2. t. 62. 63.; Bull. Herb., t. 139.; and our fig. 2364.

Spec. Char., &c. Leaves oval, opposite, imbricated, somewhat acute, convex on the back; the male catkins pedunculate. Berries of a blackish blue, generally monospermous. (*N. Du Ham.*) A low shrub, introduced before 1548, and flowering in March and April.

Varieties.

■ *J. S. 1 cupressifolia* Ait. Hort. Kew., v. p. 414.; *J. lusitânica* Mill. Dict., No. 11.; *Sabina* Dod. *Pempt.*, 854.; *S. folio Cupressi* Bauh. *Pin.*, 487., *Du Ham. Arb.*, ii. t. 62., *Rau Hist.*, 1415.; la Sabine mâle, *Fr.*; the Cypress-leaved Savin; (*fig. 2359.*) has the leaves like those of a cypress.

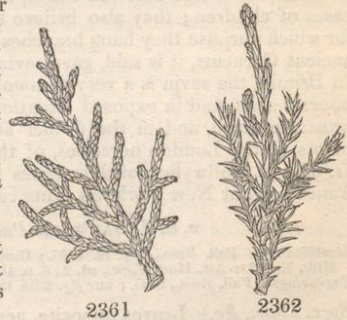
■ *J. S. 2 tamariscifolia* Ait., l. c.; *Sabina folio Tamarisci Dioscoridis* Bauh., l. c.; *J. Sabina* Mill. Dict., No. 10.; la Sabine femelle; the Tamarisk-leaved, or berry-bearing, Savin. (*fig. 2360.*)

■ *J. S. 3 foliis variegatis* Mart. Mill. has the leaves variegated.

There are plants of all the above varieties in the Horticultural Society's Garden.

■ *J. S. 4 prostrata*, *J. prostrata* Michx., *J. repens* Nutt., *J. hudsónica* Lodd. *Cat.*, 1836, and our *fig. 2361.*, is a low trailing plant, seldom rising above 6 in. or 8 in. in height, but rooting into the soil, and extending its branches to a great distance.

■ *J. S. 5 alpina*, *J. alpina* Lodd. *Cat.*, 1836, (*fig. 2362.*) is a procumbent plant, more slender in its habit, but, in other respects, only slightly different from *J. prostrata*. The plant in the Horticultural Society's Garden is about 18 in. high.



Description. &c. The savin, though generally seen, in British gardens, as a low spreading shrub, has sometimes an upright trunk, clothed in a reddish brown bark, and rising to the height of 10 ft. or 12 ft., or even higher. Its branches are nearly straight, very much ramified, and form, with the trunk, a regular pyramid. Its young branches are entirely covered with imbricated leaves, which have a very strong and disagreeable odour, and a

very bitter taste. The male flowers are disposed in small catkins, on peduncles covered with little imbricated leaves, and are dispersed laterally along the youngest branches. The female flowers are generally produced on separate trees, and are disposed in the same manner: they are succeeded by oval berries, of a blue so deep as to be almost black, and are about the size of a currant: they generally contain only one seed, which is long, oval, and somewhat compressed. The variety *J. S. tamariscifolia* is a much lower shrub, with spreading branches, and longer leaves, which are only half-opened. (*N. Du Ham.*) Miller says that the cypress-leaved savin is by many supposed to be only an accidental variety; but the branches grow more erect, the leaves are shorter, and end in acute points, which spread outwards. It rises to the height of 7 ft. or 8 ft., and produces great quantities of berries; whereas the tamarisk-leaved savin very rarely produces either flowers or seeds in British gardens. (*Mart. Mill.*) This last-mentioned variety sends out its branches horizontally, and seldom rises more than 3 ft. or 4 ft. high, but spreads to a considerable distance every way. The leaves are very short, acutely pointed, and running over each other along the branches, with the ends pointing upwards. The berries are smaller than those of the common juniper, but of the same colour, and a little compressed. The savin is a native of Spain, Italy, part of France, and the Levant. Professor Pallas says that it is also found in the Taurian Chersonese, where it often has a trunk 1 ft. in diameter, and an upright habit of growth, like a cypress; whereas in the Tanais it is procumbent, the branches extending on the sand several fathoms. The wood very much resembles that of *J. lycia*, but has a more unpleasant smell. (*Mart. Mill.*) Both the two first-mentioned varieties, or, rather forms of the species, were in cultivation in British gardens before 1548, as they are mentioned in Turner's *Names of Herbes, &c.*, published in that year. The leaves of the savin are used in medicine, as a diuretic; but, if taken in large quantities during pregnancy, as well in the human species as in domestic animals, will produce abortion. When dried and pulverised, they are used for cleansing foul ulcers. The upright savin was formerly much used in England, and still is in some parts of France, in topiary work, as it bears the sheers very well. In France, it is employed in the same manner as the common juniper, to form screens (*rideaux de verdure*), and to cover walls which it is wished to conceal. The Baschkirs, a people of Russia, between the Volga and the Oural, use fumigations of savin to cure the diseases of children; they also believe it to have a great effect against witches, for which purpose they hang branches of it at the doors of their houses. The ancient Germans, it is said, gave savin to their chargers to give them ardour. In Britain, the savin is a very common ornamental evergreen, thriving in the poorest soils, and in exposed situations; in the latter remaining an humble prostrate shrub, and in the former attaining a considerable size. Price of plants, in the London nurseries, of the species 6*d.* each, and of the varieties 1*s.* 6*d.*; at Bollwyller, of the species 1 franc 50 cents, and of the varieties 2 francs; and at New York, 50 cents each.

2363. *J. DAURICA* Pall. The Daurian Juniper.

Identification. Pall. Ross., 2. p. 13. t. 55.; Gmel. Sib., 1. p. 185. No. 35.; And. Rep., 534.; Mart. Mill., No. 12.; Ait. Hort. Kew., ed. 2., 5. p. 414.; Lodd. Cat., ed. 1836.

Engravings. Pall. Ross., t. 55.; our fig. 2365. to our usual scale; and fig. 2366. of the natural size.

Spec. Char., &c. Leaves opposite, acute, imbricate-decurrent, spreading, and awl-shaped. (*Willd.*) A prostrate shrub, a native of Dauria. Introduced in 1791, by John Bell, Esq., and flowering from June to August.

Description, &c. The limbs of this juniper are large and very thick, and are usually found lying prostrate on the rocks. The branches are dichotomous, and covered with imbricated young leaves, and the remains of old leaves, which change into acuminate scales before they fall off. The leaves differ in



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the different sexes : in the male, they are decurrent, with a short awl-shaped

2364



point, and closely imbricated, with here and there a longer needle-shaped leaf on the branches. This kind, though principally bearing male catkins, has sometimes on the tips of the branchlets a few female flowers. The female tree is covered with berries all over the branches, except the outer and younger shoots; and the leaves, like those of *J. Oxycedrus*, are sharp and needle-shaped, spreading



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outwards from the base, and are almost as long as the berries. The berries are globular, more bitter than those of the common juniper, blackish when ripe, but appearing blue from the white meal that covers them; peduncled, as it were, by standing on a leafless thickened branchlet, and containing one or two stones. It is a native of Siberia, but is totally different from *J. lycia*. (*Pall. Ross.*, ii. p. 13.) There are plants at Messrs. Loddiges's.

‡ 9. *J. PHŒNICIA* L. The Phœnician Juniper.

Identification. *Lin. Sp. Pl.*, 1471.; *Willd. Sp.*, 4. p. 855.; *Mart. Mill.*, No. 9.; *Lam. Dict. Encyc.*, 2. p. 628.; *Desf. Fl. Atlan.*, 2. p. 371.; *Pall. Ross.*, 2. p. 14. 57.; *Ait. Hort. Kew.*, 5. p. 415.; *N. Du Ham.*, 6. p. 47.; *Lodd. Cat.*, ed. 1836.; *Bon Jard.*, ed. 1837.

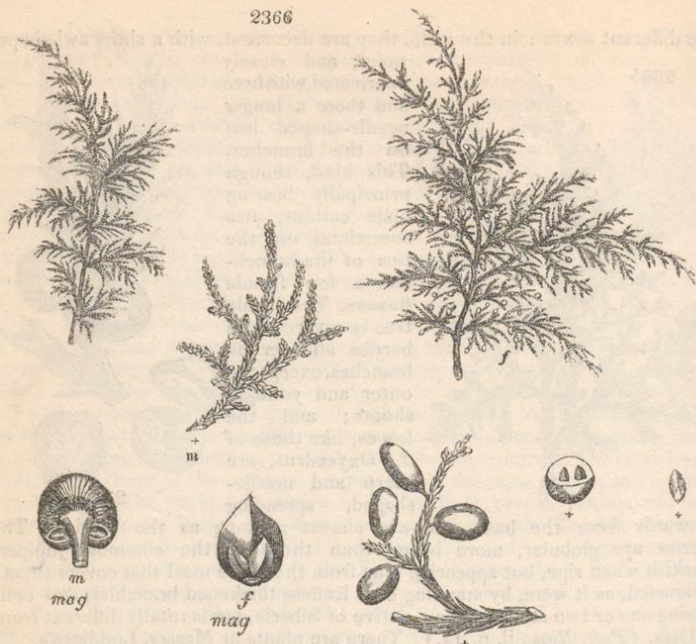
Synonymes. *J. major Dioscoridis* *Clus. Hist.*, 38.; *Cedrus phœnicia media* *Lob. Icon.*, 2. p. 221.; *C. lycia retusa* *J. Bauh. Hist.*, 1. lib. 9. p. 300.; *C. folio Cupressi major*, &c., *C. Bauh. Pin.*, 487.; *Tourn. Inst.*, 588., *Du Ham. Arb.*, 1. p. 140.; *Oxycedrus lycia* *Dod. Pempt.*, 853.; *Genévrier de Phénicie*, *Fr.*; *dichtnadliger Wachholder*, *Ger.*

Engravings. *Du Ham. Arb.*, 1. t. 52.; *Pall. Ross.*, t. 56.; *N. Du Ham.*, 6. pl. 17.; and our fig. 2367.

Spec. Char., &c. Leaves in threes, obliterated, imbricated, obtuse. (*Willd.*) A native of the south of Europe, Russia, and the Levant; cultivated in Britain in 1683, and flowering in May and June.

Description, &c. The Phœnician juniper is a shrub, the trunk of which is loaded with numerous branches, disposed so as to form a pyramid, and both trunk and branches are covered with a reddish brown bark. The young branches are slight, entirely covered with very small leaves, which are disposed in threes opposite to each other, closely covering the surface of the branches, and laid one upon another like scales. These leaves are oval, obtuse, somewhat channeled, and convex on the back, perfectly smooth. On some of the branches, a few sharp linear leaves are found, which are about 3 lines long, and quite open. The male and female flowers are sometimes found on the same tree, but they are generally on different trees. The form and disposition of the male and female flowers closely resemble those of *J. Sabina*. The berries are about the size of a pea, and of a pale yellow when ripe, which is not till the end of two entire years. They generally contain 9 bony seeds in each, of an irregular oval, slightly compressed and angular; the pulp is dry and fibrous, in the middle of which are 3 or 4 bladders, filled with a sort of resinous fluid. The Phœnician juniper was first cultivated in Britain by Mr. James Sutherland, of the Botanic Garden, Edinburgh, in 1683. It is now occasionally to be met with in collections; but is

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much less common than so fine a shrub deserves to be. The plant in the Horticultural Society's Garden, after being 10 years planted, is 10 ft. high. In the Botanic Garden at Toulon, 48 years planted, it is 19 ft. high, and the diameter of the trunk 1 ft. 2 in. Plants, in the London nurseries, are 2s. 6d. each; and at Bollwyller, 3 francs.

■ 2. 10. *J. (P.) LYCIA L.* The Lycian Juniper.

Identification. Lin. Sp., 1471; Willd. Sp. Pl., iv. p. 855; Pall. Ross., ii. p. 14. t. 56.; Ait. Hort. Kew., v. p. 415.; Lodd. Cat., ed. 1836.

Synonymes. *J. p. β lycia N. Du Ham.*, vi. p. 47.; *Cedrus phœnicea áltera Plinii et Theophrásti Lob. Ic.*, ii. p. 221.; *C. folio Cupressi, &c. C. Bauh. Pin.*, p. 487.

Engravings. Pall. Ross., t. 56.; N. Du Ham., 6. t. 17.; and our fig. 2367., and fig. 2368. from Pallas.

Spec. Char., &c. Leaves in threes, imbricate on all sides, ovate, obtuse.

(Willd.) Miller describes the Lycian cedar as having its branches "growing

erect, and covered with a reddish brown bark.

Leaves small, obtuse. Male flowers at the ends of

the branches, in a conical ament; and the fruit single

from the axils below them, on the same branch.

Berries large, oval, and, when ripe, brown." According to Pallas, *J. lycia* is an entirely prostrate

shrub, with the trunk branching from the very

bottom, and often thicker than the human arm.

This, and the branches, are often variously deformed,

with scarcely any outer bark. The wood smells very

strong, like that of the Bermudas cedar. Branches

and branchlets wand-like, and covered with a testa-

ceous bark. Shoots dark green, dichotomous, and

imbricate with scale-formed sharp leaves. Berries

terminal, globular, middle-sized, nearly black when

ripe, and covered with a glaucous bloom; con-

taining 3 or 4 stones. Pallas adds that it greatly resembles the dwarf

savin, and that it differs principally in the greater thickness of the shoots,



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and in the leaves being acute and less clustered. Native of the south of Europe, the Levant, and Siberia. It was cultivated in 1759, by Miller, who received it from Spain and Italy. In its native climate it produces the resinous gum called olibanum, which has a strong smell, and a bitterish and somewhat pungent taste. When burned, it diffuses a fragrant smell, and is supposed to be the incense which was used by the ancients in their religious ceremonies (though not the same as the substance known by that name in the shops.) It is much employed by the Roman Catholics, in their churches, for similar purposes. It is used in medicine, as an astringent. The only plants that we have seen of it were quite young; that in the Horticultural Society's Garden being, in 1837, only 2 ft. high; the upper part of the plant so closely resembling *J. phœnicea* as scarcely to be distinguished from it, but the lower part with the leaves glaucous on both sides, and 4-rowed. There is a large plant at Boyton, of which we have received specimens from Mr. Lambert, and the shoots of which were covered with a white resinous matter, like minute scales. Mr. Lambert describes his plant as hardy, very much branched, and 6 ft. or 8 ft. high. It is the only plant, he says, which he has seen of the species.



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‡ 11. *J. THURIFERA* L. The incense-bearing, or Spanish, Juniper.

Identification. Lin. Sp., 1471.; Willd. Sp. Pl., 4 p. 851.; Ait. Hort. Kew., ed. 2., 5. p. 413.; Mart. Mill., 1.; Lodd. Cat., ed. 1836.

Synonymes. *J. hispánica* Mill. Dict., No. 13., *Lam. Encyc. Dict.*, 2. p. 626., *N. Du Ham.*, 6. p. 50.; *Cedrus hispánica*, &c., *Tourn. Inst.*, p. 588.

Engraving. Fig. 2369., from a specimen received from Mr. Lambert.

Spec. Char., &c. Leaves imbricate in 4 rows, acute. (Willd.) A tree, a native of Spain and Portugal; cultivated in 1752, by Miller; and flowering in May and June.

Description, &c. An evergreen low tree, growing to the height of from 25 ft. to 30 ft., and sending out many branches, so as to form a pyramidal head. The leaves are acute, and lie over each other in four rows, so as to make the branches appear four-cornered. Berries very large, and black when ripe. There is a tree at Mr. Lambert's seat at Boyton, which, in 1837, was 28 ft. high, with a trunk 9 in. in diameter; one at Bagshot Park, 12 years old, which is 12 ft. high; and one at Croome, 40 years planted, which is 30 ft. high: there are also plants in the Horticultural Society's Garden, and in the Fulham Nursery, in both places 3 ft. high. Price of plants, in London, 3s. 6d. each; at Bollwyler, 3 francs.



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‡ 12. *J. EXCE'LSA* Willd. The tall Juniper.

Identification. Willd. Sp. Pl., 4. p. 852.; Ait. Hort. Kew., ed. 2., 5. p. 413.; Laws. Man., p. 399.; Pursh Fl. Amer. Sept., 2. p. 647.; Royle Illust.; Lodd. Cat., ed. 1836.; Bon Jard., ed. 1837.

Synonymes. *J. Sabina* var. *Pall. Ross.*, 2. p. 15.; Himalaya Cedar-wood.

Engraving. Fig. 2370., from a plant about 2 ft. high.

Spec. Char., &c. Leaves opposite, somewhat obtuse, with a central gland; 4-ranked and imbricate; slender, acute, disposed in threes, and spreading. Stem arboreous. (Willd.) A tall evergreen tree. Introduced in 1806.

Description, &c. A very handsome and elegant tree, with an upright trunk, and slightly pendulous branches. Leaves opposite, imbricated in 4 rows, and having a raised line on the back. This species has a very extensive geographical range. It was first discovered in Siberia, by Pallas; and it was introduced in 1806, by Sir Joseph Banks. Some years afterwards, it was discovered

in North America, on the banks of the waters of the Rocky Mountains, by Mr. Lewis (see *Pursh Fl. Amer. Sept.*, ii. p. 647.); and, since, it has been found on the Himalayas, by Captain Webb, in Gossainthan, Kamaon, and on the confines of Tartary. It is a very free grower; and there are plants at Messrs. Loddiges's, in the Horticultural Society's Garden, and in the Fulham Nursery. There is a large tree of this species in the Jardin des Plantes, 32 ft. high, diameter of the trunk 1 ft. 3 in., and of the head 25 ft.

♣ 13. *J. SQUAMATA* D. Don. The scaled Juniper, or creeping Cedar.

Identification. Lamb. Pin., 2. No. 66.; D. Don Fl. Nepalensis, p. 55.; Royle Illust.

Spec. Char., &c. Leaves in threes, closely imbricated, ovate-oblong, more or less pointed; remaining on after they are withered; young ones inflexed at the apex, as if obtuse. Berries ovate, umbilicate on the top. Branches and branchlets crowded round. Stem prostrate. (*Lamb. Pin.*) A large, decumbent, much-branched shrub. Branches large, 3 ft. to 6 ft., reclinate; apices ascending. Bark brownish purple, scaling off. Branchlets crowded round, closely imbricated with leaves. Leaves in threes, oblong, closely imbricated, of an intense green, very smooth, externally convex; young ones generally obtuse, with an inflexed point; adult ones more or less pointed; when withered, always having a very long point, persistent, and adhering to the branches like scales; whence the name. Berries numerous, roundish-ovate, solitary, red, on a short scaly footstalk, umbilicate at the summit, a little larger than in the common juniper. (*Lamb. Pin.*) Found in Narainhetty, in Nepal, by Dr. Hamilton; and on the Bhotan Alps, by Captain Webb; flowering in August. It was introduced in 1824; but we have not seen the plant.



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♣ 14. *J. RECURVA* Ham. The recurved Nepal Juniper.

Identification. Ham. MSS., as quoted in Don's Flora Nepalensis, p. 55.

Engraving. Our fig. 2371.

Spec. Char., &c. Leaves linear-lanceolate, mucronate loosely imbricated, smooth, convex beneath. Berries roundish oval, tubercled. Branches and branchlets recurved. (*D. Don.*) A shrub, found by Dr. Hamilton in Narainhetty, in Nepal, and flowering there in February. There is a plant in the Horticultural Society's Garden, which, in 1837, after having been four years planted, was 3 ft. high; and one at Messrs. Loddiges's, 4 ft. high, which ripened fruit, and from which our figure was taken. It forms a graceful bush, or low tree, from its pendulous habit; and it is readily distinguished from all the other species, not only by this circumstance, but by the mixture of its brown, half-decayed chaffy leaves of the past year, with its greenish grey leaves of the present year. The bark is rough, brown, and soon begins to curl up; when it has a rough appearance, and ultimately scales off.

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♣ 15. *J. UVI'FERA* D. Don. The grape-bearing, or large-fruited, Juniper.

Identification. Lamb. Pin., 2. No. 67.

Spec. Char., &c. Leaves ovate, obtuse, adpressed, imbricated in 4 rows. Branchlets short, erect, crowded, knotted. Drupes terminal, roundish. (*Lamb. Pin.*) A decumbent, much branched shrub. Branches ascending, round, covered with a greyish brown scaly bark. Branchlets short, erect, crowded, closely imbricated with leaves, knotted, twiggy. Leaves ovate, obtuse, adpressed, imbricated in 4 rows, quite entire, coriaceous, glabrous, smooth. Drupes roundish, purple, about the size and shape of a small grape, solitary on the apex of the branchlets, sessile, smooth. Abundant about Cape Horn, and the only species in the southern hemisphere. It was introduced from Cape Horn by Mr. Middleton, probably about the beginning of the present century, but we have not seen a plant. (See *Lambert.*)

‡ 16. *J. BARBADE'NSIS* L. The Barbadoes Juniper.

Identification. Lin. Sp. Pl., 1471.; Willd. Sp. Pl., 4. p. 851.; Reich., 4. p. 276.; Pluk. Phyt., t. 197. f. 4.; Mart. Mill., No. 2.; Pursh Fl. Amer. Sept., 2. p. 647.

Synonymes. *J. bermudiãna Hort. Ang.*, t. 1. f. 1., *Brown Jam.*, 362.; Jamaica Berry-bearing Cedar.

Engraving. Pluk. Phyt., t. 197. f. 4.

Spec. Char., &c. All the leaves imbricate in 4 rows; the younger ovate, the older acute. (*Willd.*) A large timber tree, with very widely spreading branches. The bark is rugged, of a very dark

brown, and splits off in strings. The leaves are extremely small, and always imbricate. The berries are smaller than those of the Bermudas cedar, and are of a light brown colour when ripe. It is a native of the West Indies, and also, Pursh says, on the authority of Michaux, of the coast of Florida. It was cultivated in England in 1759, by Miller, but we have not seen the plant.

■ 17. *J. CHINE'NSIS* L. The Chinese Juniper.

Identification. Lin. Syst., 894.; Reich., 4. 277.; Mant., 127.; Lour. Coch., 636.
Engravings. Our figs. 2372. and 2373.

Spec. Char. Leaves decurrent, imbricate-spreading, clustered; stem leaves in threes, branch leaves in fours. (*Willd.*)

Description, &c. According to Martyn's *Miller*, Loureiro describes the Chinese juniper as a shrub of 3 ft. in height, with twisted and very spreading branches. Leaves awl-shaped, hardish, dark green:



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according to Linnæus, spreading, green on both sides, more clustered than in the other sorts, fastened at the base, scarcely pungent, and extremely distinct by the density of the leaves. (*Mant.*) There are two plants in the Horticultural Society's Garden bearing the name of *J. sinensis*, male



2373

and female, 12 ft. and 10 ft. high. The leaves are green, short, and imbricated; the fruit rough, angular, and dry; and the plants do not accord, in some respects, with the species described by Loureiro. Specimens of the plant in the Horticultural Society's Garden were, however, compared by Professor Don with the Linnæan specimens, and he is of opinion that it is correctly named.

J. c. 2 Smithii. A species of *Juniperus* in the Horticultural Society's Garden (*fig.* 2374.), without a name, and said to have been received from Smith of Ayr, about 1825 or before, bears a close resemblance to *J. chinensis*, but the fruit is rather more angular. The plant in the garden is of vigorous growth, 8 ft. or 10 ft. high; it produces both male and female blossoms, and ripens fruit. There can be no doubt that it is not a European plant; nor are there any species at all resembling it from North America. We have been informed that there is a species in some of the Scotch nurseries raised from Nepal seeds, and commonly called *Juniperus nepalensis*, which bears so close a resemblance to Mr. Smith's plant, as to leave little doubt of their identity. Mr. Smith, to whom we have written on the subject, can give us no satisfactory information; and it even appears to us doubtful if the plant in the Horticultural Society's Garden was received from him. We have ventured to give it a name, merely to prevent it from being lost sight of; and because we should wish to see such a vigorous-growing healthy species propagated, and introduced into collections.



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App. i. *Kinds of Juniperus mentioned in Books, but of which very little is known.*

J. fectitissima Willd. Sp. Pl. approaches *J. excelsa*, but has not been yet introduced.
J. capensis Lam. Dict., p. 626., Desf. Hist. des Arb., &c., Dum. Bot. Cult., 6 p. 444., has an upright trunk, and numerous branches, which are short and close together. The leaves, at the extremity of the branches, are in threes, linear, sharply pointed, and glaucous; the others are smaller and imbricated. Lamarck mentions having sent this species to Kew; but it is not included in the *Hortus Kewensis*. Desfontaines says that the species is rare and little known, and that it requires protection during winter.