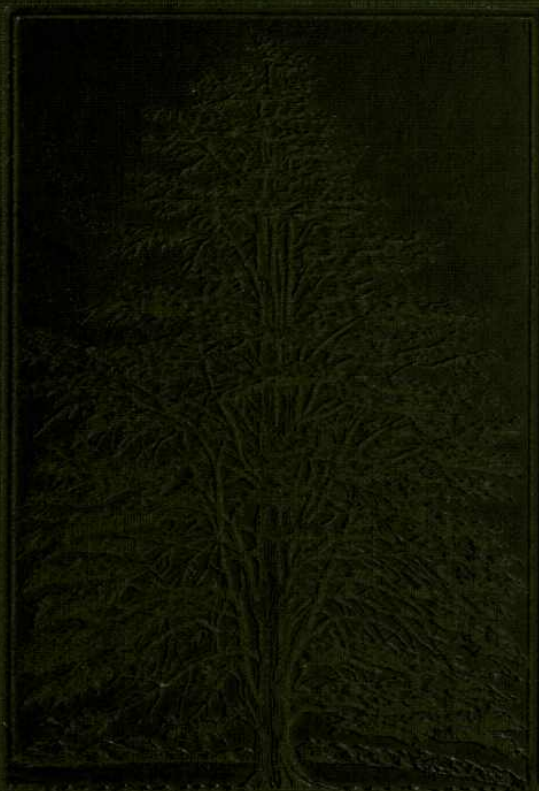


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TREES AND SHRUBS
HARDY IN THE BRITISH ISLES

FIRST EDITION	.	.	.	.	.	<i>October 1914</i>
SECOND EDITION	.	.	.	.	.	<i>June 1916</i>
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TREES AND SHRUBS HARDY IN THE BRITISH ISLES

BY W. ^{William} J. BEAN

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WITH ILLUSTRATIONS

VOL. I.

SECOND EDITION

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JOHN MURRAY, ALBEMARLE STREET, W.

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PREFACE

SINCE Loudon published his great work, about seventy-five years ago, no book in English dealing comprehensively with the trees and shrubs hardy and cultivated in Britain has been published. During that period an enormous number of new species have become available for cultivation through the labours of collectors like William Lobb in Chile and California, Hartweg and Jeffrey in Western N. America, J. G. Veitch and Maries in Japan, Fortune and Wilson in China. The present work is an attempt to bring together brief descriptions of all the species and more important varieties of hardy woody plants established in cultivation, with notes on their distinctive characters, garden value, and culture. It is hoped that it may prove of use to the numerous amateurs, country gentlemen, and landowners who are interested in shrubs and trees, also to nurserymen, park superintendents, and to professional gardeners.

The great accession of Chinese plants during the last fourteen years has made the task a much more difficult one. Many of the plants introduced by Wilson are as yet unidentified, and the hardiness and garden value also of a great number have not yet been definitely ascertained. Still, most of the earlier introduced ones have been dealt with, also those of later introduction that have flowered and been identified.

The question of nomenclature is always a vexed one. The only thing certain is, that it is impossible to please everyone. With regard to generic names, I have endeavoured to be as conservative as possible. When botany was largely under the influence of the Hookers and Bentham in England, and of Asa Gray in America, the tendency was towards the reduction of genera and species. There is no doubt the process was carried too far. The merging, for instance, of *Mespilus* with *Pyrus*, *Pterostyrax* with *Halesia*, *Maackia* with *Cladrastis* was not

justifiable. In these and a few similar cases the older generic names have been revived. But there has lately risen a school of workers, with a strong following on the Continent and in the United States, whose aim is to subdivide species, genera, and Natural Orders to the fullest extent. Whilst much of this is, no doubt, the result of a closer study and a more critical insight than the older men practised, some of it seems to represent a desire of change for change's sake. At any rate, if adopted in its entirety, it would involve such confusion and readjustment of nomenclature as to render its acceptance by cultivators in the last degree unlikely in this country.

In the case of nomenclature of species, I have with few exceptions clung to what is known as the Kew rule of giving a plant the specific name first published in conjunction with the proper genus.

In the preparation of this work I have had the enormous advantage of being able to make full use, not only of the magnificent collections of living plants at Kew, but also of the herbarium of trees and shrubs which has been in course of formation there for thirty years, at first by the late Mr Geo. Nicholson, and during the last thirteen years by myself. There are very few of the descriptions that have not been made from authentic material—living or dried.

Some explanation of the term "hardy" as used in the following pages is perhaps needed. There is a great variety of climate in the British Isles, and the word "hardy" has a very different significance, say, in eastern Northumberland to what it has at Falmouth or Cork. Although we are apt, almost instinctively, to regard the softness of the climate as progressing from north to south, it is, in Great Britain, rather from east to west. Thus, plants can be grown on the west coast of Scotland as far to the north as Ross-shire, such as *Desfontainea*, *Tricuspidaria* and Himalayan rhododendrons, which are absolutely hopeless in the open air at Kew. To have included a consideration of all the shrubs and trees that can be grown outside in the mildest corners of Great Britain and Ireland would have inconveniently and unduly extended the limits of this work. A considerable proportion of them can only be regarded as greenhouse plants in most parts of Great Britain. The word "hardy" may be taken generally as applicable to Kew. This district is fairly average in regard to temperature, although, being flat and low-lying, plants are particularly liable there to injury by spring frosts.

With comparatively few exceptions, the trees and shrubs dealt with here may be grown at Kew, either fully in the open or against walls.

I have to express my thanks to Sir David Prain, the director of Kew, for permission to borrow books belonging to the Kew library; also to Messrs Elwes and Henry for the privilege of seeing proof-sheets of the *Trees of Great Britain and Ireland*, and to the editors of the *Gardeners' Chronicle* for permission to adapt some articles of mine which appeared in that journal a few years ago on transplanting, pruning, and one or two other subjects. To my colleague, Mr W. Dallimore of Kew, I owe a debt of gratitude for assistance in reading the proofs.

The illustrations in the text have been drawn by Miss E. Goldring from photographs made by Mr E. J. Wallis. For some of the subjects illustrated I am indebted to Sir Frederick W. Moore, of the Royal Botanic Gardens, Glasnevin, Dublin.

W. J. B.

KEW, *April* 1914.

PREFACE TO SECOND EDITION

THIS edition is little more than a reprint of the first. The opportunity has been taken to correct such errors as have been discovered, but most of these are of a minor character. The time which has elapsed since the publication of the first edition—about fifteen months—has been too short to have made many changes or additions necessary. The note on *Colletia* has been largely re-written and the name *Cratægus stipulosa* has been altered to *C. stipulacea*. Also, *Olearia Gunniana* has been substituted for *O. stellulata* and *Stewartia sinensis* for *S. monadelphæ*.

W. J. B.

KEW, *Feb.* 1916

A SELECT BIBLIOGRAPHY OF TREES AND SHRUBS

THE following is a list of the chief botanical and horticultural works of which use has been made in preparing the present work. It has been thought worth while to print it here as a guide to the most important literature dealing, in particular, with hardy trees and shrubs. It might, of course, be indefinitely amplified, but will, nevertheless, serve to direct the attention of those who desire to make up a collection of works on this fascinating branch of natural history to the best and most useful of them.

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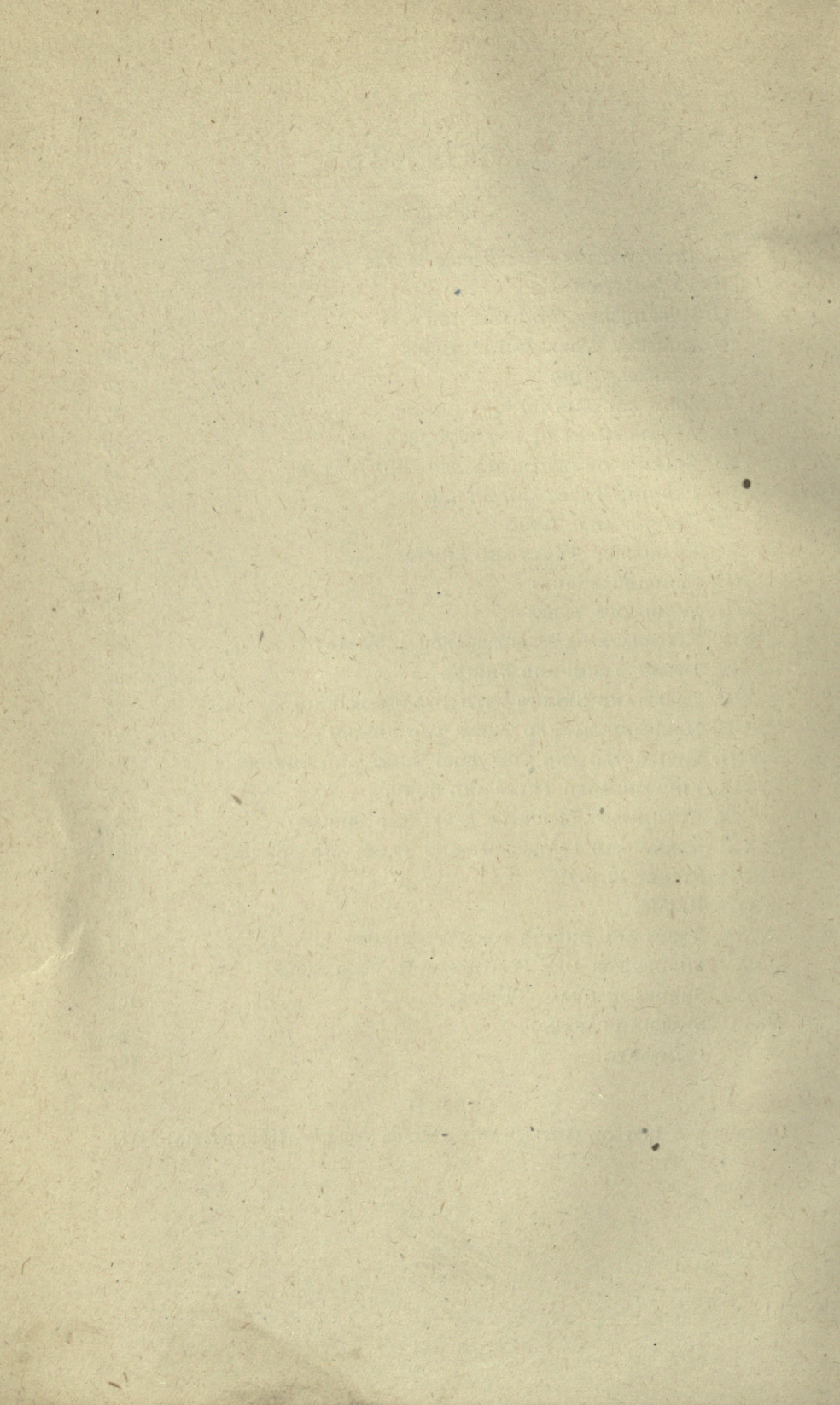
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PART I

CHAPTER I

INTRODUCTION. HISTORICAL NOTES.

It has long been the custom to attribute to the Romans the introduction to Britain of certain common trees and shrubs. From the fact that remains of the seeds of *Pinus Pinea*, the stone pine of Italy, have lately been found in the refuse heaps of Roman encampments in Britain, it is evident that edible seeds and possibly fruits were imported from Italy for the soldiers' use, and in that way the sweet chestnut, the walnut, the mulberry, and other trees with edible fruits or seeds may, as has often been stated, have been first brought to this country. Probably, also, some of the most popular ornamental exotic trees and shrubs, like the common lime, were brought over by them too. As for the common elm and box, often attributed to the Romans, there appears no reason for disputing their genuineness as natives of Southern England.

After the withdrawal of the Roman legions in the fourth and fifth centuries, the country relapsed into comparative barbarism, but subsequent to the establishment of Christianity, the introduction of plants from the Continent was, no doubt, carried on by religious houses, especially after the Norman Conquest. Most attention was given to the scented and medicinal plants, like rosemary and thyme, and to fruit-trees. It is also likely that a number of ornamental as well as useful trees, shrubs, and herbs were first introduced during the Dark Ages by mariners and others touching at continental and Mediterranean ports, or by travellers inland. But the fact is, what they, the Romans, or the monks accomplished, must to us remain largely mere guesswork.

We only touch certain ground in this matter in the year 1548, when **Wm. Turner** published his *Names of Herbes*. Turner, sometimes called the "Father of English Botany," was born at Morpeth early in the sixteenth century and, after becoming Dean of Wells, died in 1568. At one time he lived and had a garden at Kew, and his *Names of Herbes* was dated from the neighbouring Syon House, then the residence of the Duke of Somerset, Lord Protector, to whom Turner was physician. In

this and his other works, the number of foreign trees and shrubs enumerated barely amount to thirty. But it is quite probable, with the lack of intercommunication then prevailing, that others were in cultivation in the country unknown to him.

In 1597, nearly fifty years after the appearance of Turner's first work, a famous *Herbal* was published by **John Gerard**. Gerard was born at Nantwich in 1545, and was trained as a surgeon, which profession, as well as that of apothecary, he practised in London. For the purpose probably of supplying his own simples, he established a physic, or botanic garden at Holborn. From his *Herbal* and other sources of information, it appears that by the end of the sixteenth century about one hundred foreign trees and shrubs were in cultivation in England. Of big trees, there were the Oriental plane, holm oak, common spruce, *Pinus Pinaster*, *Cupressus sempervirens*, as well as the walnut, stone pine, and sweet chestnut previously mentioned. It is interesting to note also, as recorded by Gerard, the cultivation in 1596 of two woody plants of American origin, *Yucca gloriosa* and *Thuya occidentalis*, the first apparently of their country.

Gerard died about 1607, and after him the next great herbalist was **John Parkinson** (1567-1650), a London apothecary in the service of James I., and the author of a herbal and other works. He was one of the most noteworthy cultivators in the early seventeenth century who interested themselves in the introduction of new plants. By Aiton he is credited with introducing, or it is perhaps more correct to say, being the first to cultivate, about forty trees and shrubs, all from N. America or Europe. The influx of new trees and shrubs from N. America proceeded slowly during the seventeenth century, but about fifty species appear to have become established in Britain.

Two names which frequently occur in connection with the introduction of new woody plants about the middle of the seventeenth century are those of the two Tradescants, who, between 1640 and 1656, have attributed to them about twenty species. The elder **John Tradescant** appears to have been a Dutchman who came to England about the end of the sixteenth century. He is said to have been a considerable traveller in Europe, N. Africa, and the Orient. About 1629 he was appointed gardener to Charles I. He had a garden and museum at Lambeth, and died about 1652. His son, **John Tradescant the younger**, was a man of similar tastes and carried on the museum and garden at Lambeth. In 1656 he published a catalogue of the plants grown in the latter. He travelled in N. America, especially Virginia, whence he introduced the locust tree (*Robinia Pseudacacia*), *Juglans cinerea*, *Acer rubrum*, *Celtis occidentalis*, and the American plane. These and others he propagated for sale. He died in 1662.



ADAM'S NEEDLE, *Yucca gloriosa*.

In the latter part of the seventeenth century and the early years of the following one, the most notable name in connection with hardy trees and shrubs is that of **Henry Compton**, Bishop of London from 1675 to 1713. In his garden at Fulham he got together the most extensive collection that had hitherto been seen in the British Isles. By 1713, when Compton died, probably 400 species of foreign trees and shrubs were in cultivation in England. Of especial interest at that time were the American introductions, such as the spruces, red oaks, hickories, walnuts, magnolias, thorns, maples, and the tulip tree. Many of these had been sent home to Bishop Compton by **John Banister**, a missionary in Virginia, who was the author of the first catalogue of American plants. He was killed in 1692 by falling from a rock whilst collecting.

Another person interested largely in this branch of horticulture, and contemporary with Compton, was the **Duchess of Beaufort**, who planted extensively in the gardens at Badminton.

The foundation of the Oxford Botanic Garden in 1621, of Chelsea Physic Garden about 1674, and that of the Edinburgh Botanic Garden in 1680, must have had a stimulating effect on the cultivation of exotic trees and shrubs, as well as of other plants. At this period the site now covered by the Botanic Gardens of Kew was owned by **Sir Henry** (afterwards Lord) **Capel**, in whose hands it became one of the finest private gardens in the kingdom.

Among trees introduced in the seventeenth century, the one destined to play the most important part in the sylva of Great Britain and Ireland was the common larch (*Larix europæa*), said to have been first brought to Britain, under the auspices of Parkinson, in 1629. It was not, however, until a century later, namely, in 1738, that it first began to be planted as a forest tree. The pioneer in this work was the 2nd **Duke of Atholl**, and it was his son, the 3rd Duke, whose planting (it is said) of 27 millions of larch trees gained him the soubriquet of "the planter."

Next in importance to the larch, and introduced the same year, was the horse chestnut. It reached W. Europe by way of Constantinople through the agency of the botanist Clusius, but its true native home, which is Northern Greece, long remained a mystery. The common silver fir was introduced by **Sarjeant Newdigate** from Central Europe in 1603. The well-known tulip tree first reached this country in 1663; whilst the cedar of Lebanon, than which no tree ever introduced has made a finer or more conspicuous feature in our gardens and parks, came a few years later.

The eighteenth century witnessed a remarkable increase in the interest taken in hardy trees and shrubs by planters in the British Isles, both amateur and professional, and in the number of exotic species cultivated. One of the most notable amateurs was the **Duke of Argyll** (1680-1761),

who planted largely at Whitton, near Hounslow. He has been described indeed as the most assiduous collector and planter of his time in England, and was by Pope nicknamed "the tree-monger." Although the Whitton property has latterly been cut up into lots for building, there were, when I visited it in 1903, many fine trees planted by the Duke still thriving, notably the grove of cedars of Lebanon said to have been raised from seed in 1725, a group of magnificent deciduous cypresses, red maple, etc. After his death, in 1761, many of the smaller trees were removed to the then newly formed arboretum at Kew, where a few of them still stand in the vicinity of the Temple of the Sun.

A name which will be found to occur frequently in the body of this work is that of **Peter Collinson** (1694-1768), an amateur who certainly stands out as one of the chief patrons of arboriculture in the eighteenth century. Collinson was a linen-draper in London, in which business he appears to have amassed a considerable fortune. In his later years he planted largely in his garden at Mill Hill, near Hendon. The site is now occupied by the Mill Hill School and its grounds. Collinson was instrumental in introducing many new plants, more especially N. American ones.

Among botanical cultivators of the eighteenth century two names are conspicuous: **Phillip Miller** (1691-1771) and **William Aiton**. Miller, so well known by his *Dictionary*, which passed into eight editions in his lifetime, was curator of the Physic Garden at Chelsea, an institution he is said to have raised to the first position among all botanic gardens of the time. Aiton (1731-93) was his pupil, and by him was recommended to the Dowager Princess of Wales, in 1759, to take charge of the botanic garden at Kew, founded that year, an event destined to have so important an influence on horticulture and botany in the British Empire. Aiton died in 1793, and his memory lives chiefly as the author of the *Hortus Kewensis*, a work which enumerates and gives a brief description of 5500 species of plants with their date of introduction. This work is, in fact, the chief source of information in regard to the introduction of exotic plants up to the time of its publication.

A cultivator of whom Collinson and others wrote in eulogistic terms was **Lord Petre** (1713-42), who planted extensively at Thorndon Hall, in Essex. Writing in lament of his early death, Collinson calls him the "worthiest of men," and his loss the "greatest that botany or gardening ever felt in this island."

The introduction of trees and shrubs from N. America in the latter half of the eighteenth century owes much to the two Bartrams—John (1699-1777) and his son William (1729-1823). **John Bartram** is famous as the first American-born botanist, and the founder of the first American botanic garden. This garden, situated in Philadelphia, is still

in existence. He and his son collected chiefly on the mountains of the S.E. United States.

Contemporary with the Bartrams was **André Michaux** (1746-1803), a Frenchman who resided in America from 1785 to 1796. He travelled much in eastern N. America, and was the first to introduce many of the trees and shrubs of that region to Europe. They were sent to France, and some of the trees raised from his seed may still be seen in the gardens of the Petit Trianon.

The foundation of the *Botanical Magazine* by **William Curtis** (1746-99) in 1787 is an event that merits a passing notice. It has appeared once a month from that date up to the present time, each number giving five or six coloured plates of plants, accompanied by descriptions in Latin and English. Up to the present over 8500 plates have appeared, a considerable proportion of which depict hardy trees and shrubs, as may be judged from the frequent quotation of plates I have made.

Among nurserymen of the eighteenth century, those whose fame persists in connection with our present subject are: **James Gordon**, who was one time gardener to the Lord Petre aforementioned. About 1750 he established a nursery at Mile End. He introduced *Ulmus americana*, *Sophora japonica* (one of his original trees, introduced in 1753, is still healthy at Kew), and the maidenhair tree. **James Lee** (1715-95), in partnership with one Kennedy, founded a nursery at Hammersmith (Olympia now partly covers the site), which ultimately became the finest in the kingdom. The firm did not finally disappear until about the beginning of the twentieth century. A German named **Conrad Loddiges** started as a nurseryman at Hackney in 1771 and established a business which, so far as hardy trees and shrubs are concerned, became by far the most important in the British Isles. It was on the collections maintained by this firm more than any other that **J. C. Loudon** relied for living material in the preparation of his great work in 1835-37. This firm, equally famous as cultivators and introducers of orchids and greenhouse plants, continued to exist until the middle of the nineteenth century.

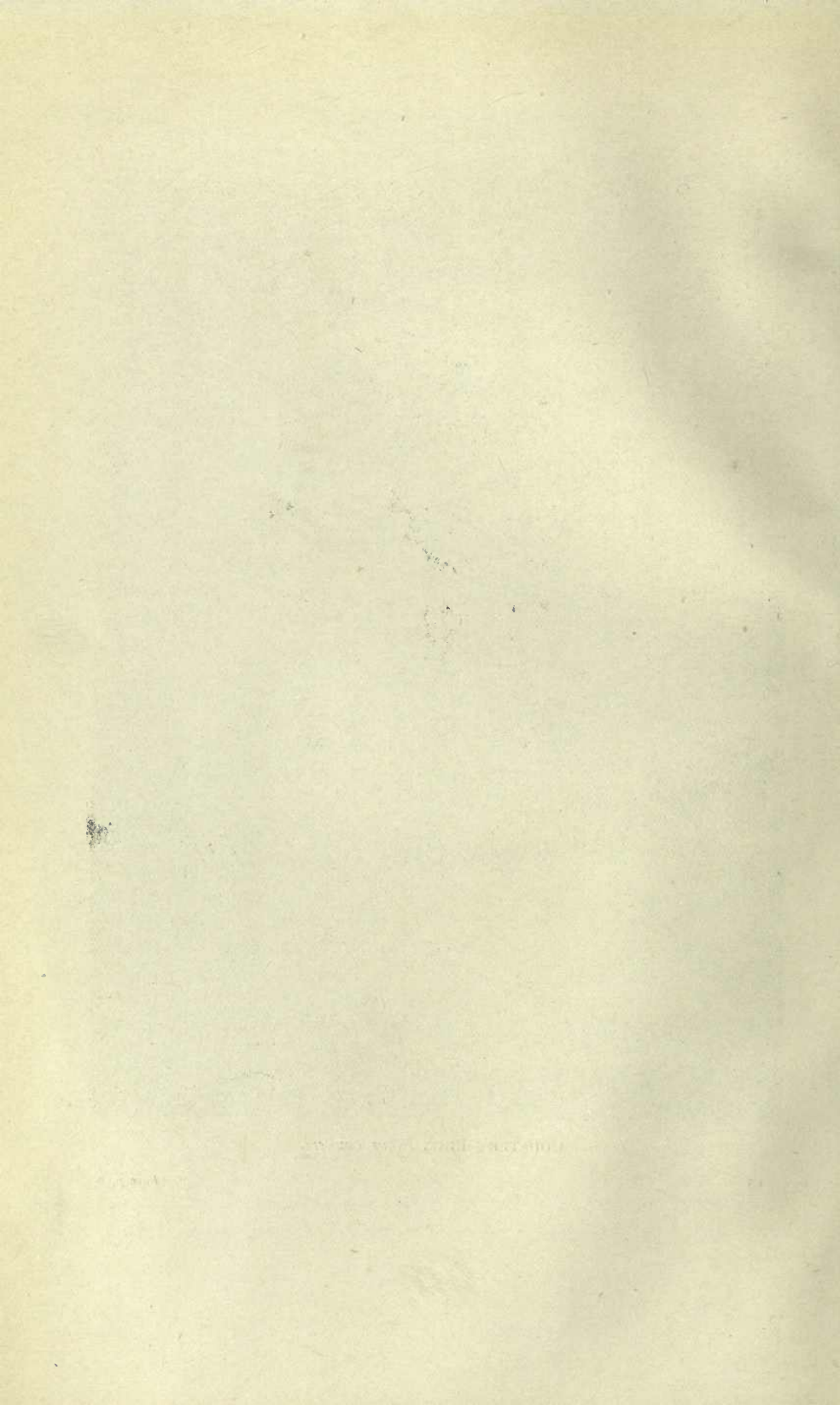
In 1772 the first of professional plant collectors, **Francis Masson**, was sent out from Kew to the Cape of Good Hope. From that time until 1862 a succession, sometimes interrupted, of plant collectors went out from Kew to many parts of the world. But it must be admitted that their work, largely guided and fostered in those early years by **Sir Joseph Banks** (1743-1820), went on more in tropical and subtropical countries than in those whence plants hardy in this country come. Altogether about 500 new hardy trees and shrubs were introduced in the eighteenth century, three-fifths of them from N. America.

In the early years of the nineteenth century the most important collector of woody plants was **John Fraser** (1752-1811). Born in the county of Inverness, he came to London as a young man and ultimately started in business at Chelsea as a hosier and linen-draper. Living near the famous Chelsea Physic Garden, he appears to have acquired a love for plants that soon set him longing for travel in search of new ones. With the assistance of **Sir James Smith**, then a leading botanist and authority on willows, and that of Aiton of Kew, he went to N. America about 1780. During the next twenty years he crossed the Atlantic ten or twelve times (latterly in company with his son of the same name), and introduced many of the trees and shrubs now most cherished in our gardens, amongst them such as the magnolias—*M. Fraseri* was named after him,—azaleas, *Pieris floribunda*, and *Rhododendron catawbiense*, the chief parent of the garden race of rhododendrons. His most successful work was done in the S.E. United States. His later years were clouded by ill-health and financial embarrassment, and he died at Sloane Square in 1811, when only sixty years of age. Loudon describes him as one of the most enterprising, indefatigable, and persevering men who ever devoted themselves to botany and plant discovery.

No single event up to the time of its occurrence can be said to have exerted so stimulating an influence on the cultivation of hardy trees and shrubs in our islands as the foundation of the **Horticultural Society** in 1804. In 1824 they initiated one of the most famous of plant-collecting expeditions; they sent **David Douglas** to western N. America, a region which hitherto had only been touched at, thirty years before, by Archibald Menzies, when he accompanied Vancouver on his voyage of discovery. Douglas (1798-1834), like nearly all these early collectors, was of Scottish descent. Born at Scone, near Perth, he went as a youth to the Botanic Garden at Glasgow, where his botanical tastes gained for him the patronage of Sir Wm. Hooker, by whom he was recommended to the Horticultural Society as a plant collector. He reached British Columbia in April 1825, and sent home the seeds of many species during that and the two following years. In 1829 he again left England and reached the mouth of the Columbia River in June 1830. In this region and in California he worked during the succeeding two or three years. Among the most notable additions Douglas made to cultivated trees were the Douglas fir, *Pinus insignis*, *P. Lambertiana*, *P. monticola*, *P. Sabiniana*, *P. ponderosa*, and *P. Coulteri*; *Abies amabilis*, *A. grandis*, and *A. nobilis*; *Picea sitchensis*, *Acer macrophyllum* and *A. circinatum*, *Arbutus Menziesii*. Among shrubs whose first sending we owe to him are *Garrya elliptica*, *Ribes aureum*, *R. sanguineum* and *R. speciosum*, *Rubus nutkanus* and *R. spectabilis*, *Gaultheria Shallon*. Douglas came to a horribly tragic end on 12th July 1834. He was collecting plants alone in



COULTER'S PINE, *Pinus Coulteri*.



the Sandwich Islands when he fell into one of the pit-traps constructed by the natives to catch wild bulls, in which an animal was already entrapped. He was found terribly gored and mangled and quite dead a few hours later.

Hitherto the foreign hardy trees and shrubs introduced had been almost wholly obtained from Europe and N. America. We have now briefly to notice a man who devoted much of his life to the introduction of plants from Japan. **Philipp F. von Siebold** (1796-1866) was born at Wurzburg in Bavaria and went to Japan in 1823. In 1830 he returned to Europe, and in collaboration with Zuccarini published his fine illustrated work, the *Flora Japonica* (1835-42). In 1850 he founded a nursery at Leyden to which he successfully introduced many trees and shrubs from Japan and China. After his death many of his original trees were secured by the firm of Simon-Louis of Metz, in whose arboretum they may still be seen.

As regards Chinese plants, not much had yet been done. Some plants had been introduced during the famous embassy of **Lord Macartney** to the Chinese court in 1792-3, and a young man named **William Kerr** had been sent out from Kew to China in 1803. He introduced the double-flowered *Kerria japonica* and the Chinese juniper, but appears to have done little among hardy trees and shrubs. Soon, however, the vast increase of shipping, and the greatly augmented intercourse between various parts of the world, began to render the introduction of plants easy by means of seeds sent by amateurs resident in foreign ports. Especially was this the case when the disturbing and retrogressive influences of the Napoleonic wars ceased with Waterloo.

In N. America the work of the Frasers was carried on by **John Lyon**, commemorated by the genus *Lyonia*, who filled in the period between the Frasers and Douglas. Like the former, he worked chiefly on the wonderful flora of the S.E. United States. He introduced many trees and shrubs in large quantities (although not for the first time) between 1806 and 1818, and thus did much to add to the beauty and interest of gardens. Many of the fine old N. American trees still adorning our gardens were brought over by Lyon. He was of Scottish parentage, but the place and date of his birth are not known, nor very certainly that of his death. According to Nuttall, the botanist, he "fell a victim to a dangerous epidemic amidst those savage and romantic mountains which had so often been the scene of his labours."

During the second and third decades of the nineteenth century a few Himalayan trees and shrubs had been sent to England, chiefly by **Buchanan-Hamilton** and **Wallich**, successive directors of the Botanic Garden at Calcutta; but the first genuine revelation of the riches of that region was reserved for **Joseph Dalton Hooker** (1817-1911). This

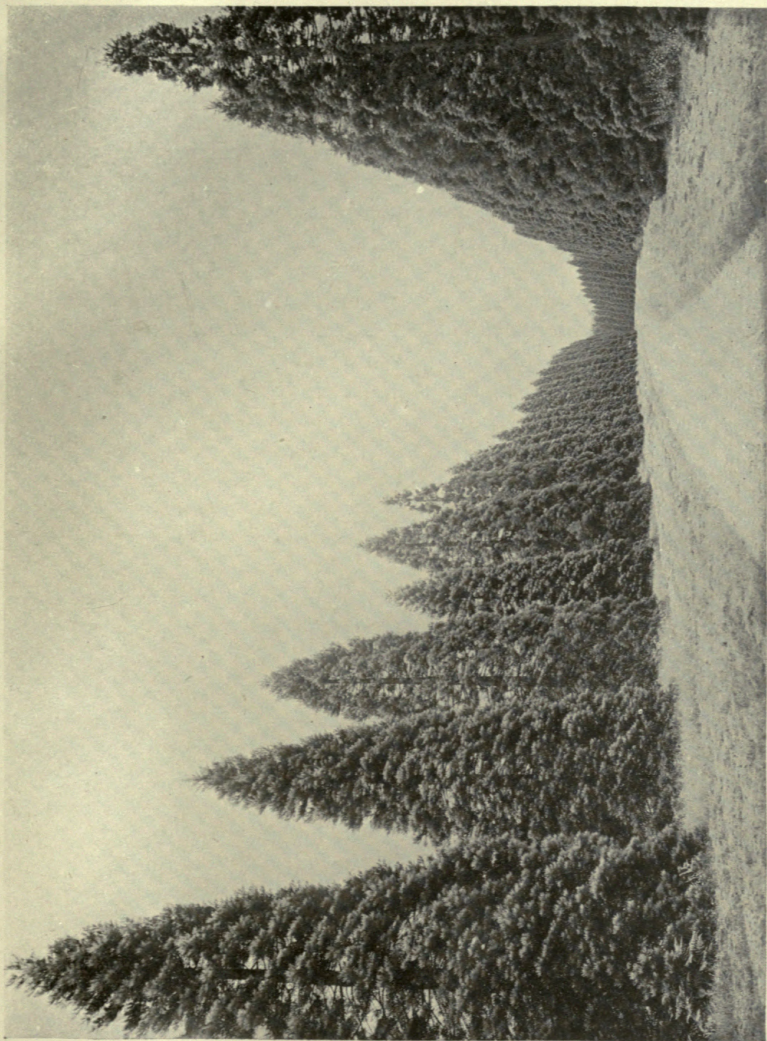
famous botanist and traveller was sent from Kew to collect in India between 1847 and 1851, and, among other things, introduced the splendid Sikkim rhododendrons, which are now the glory of many gardens in the milder parts of the kingdom.

No name in the annals of horticulture holds a more honoured place than that of **Veitch**. The enterprise of this well-known firm (which was founded near Exeter in 1808 and removed to Chelsea in 1853) has been the means of introducing more ornamental exotic plants to this country than any other single agency up to the present time. They were the first to exploit systematically the riches of Chile in the interests of English gardens and parks. To that country in 1840 they sent one of the most famous of collectors, **William Lobb** (1809-63), a Cornishman. During that journey he introduced (for the first time in quantity) *Araucaria imbricata*. He returned to England in 1844, but left for S. America again the following year, and during the next two or three years introduced many valuable shrubs, such as *Berberis Darwinii*, the *Lapageria*, *Embothrium*, *Desfontainea*, and many of the Chilean conifers. In 1849 he was sent by the Messrs Veitch to California and Oregon, and, as the pages of this work will show, introduced a wealth of fine trees and shrubs from that region, the most wonderful for its sylvia of all the regions of the globe. One of Lobb's greatest achievements was the introduction of the Wellingtonia (*Sequoia gigantea*), then but newly discovered, in quantity to Britain in 1853. He also introduced in quantity many of the trees discovered by Douglas. After his engagement with Messrs Veitch terminated, he returned to California, where he died of paralysis in 1863.

The collections in the noted tree and shrub nursery of Messrs Veitch at Coombe Wood, near Kingston, owing to the expiration of the lease, are being dispersed as these pages go through the press.

In 1836 the Horticultural Society sent **K. T. Hartweg** (1812-71), a native of Carlsruhe in Germany, to Mexico. He remained there seven years and introduced many plants, but mostly tender ones. The trees are only suitable for the warmer parts of Britain. Among them were several curious oaks, still to be found in old gardens, several of the remarkable Mexican pines and *Abies religiosa*. He went to California in 1846-7 and worked at Monterey and in the Upper Valley of the Sacramento River.

One of the greatest of all plant collectors was **Robert Fortune** (1812-80), a native of Berwickshire. After spending some time in the Botanic Garden at Edinburgh, he went, in 1841, to the Horticultural Society's gardens at Chiswick. Two years later the Society selected him to collect for them in China. In 1844 he visited the tea-growing district of Ningpo, and after introducing many beautiful plants, both hardy and



1.] AVENUE OF WELLINGTONIA (*Sequoia gigantea*) at Strathfieldsaye.

[Face p. 10.]

tender—a goodly proportion of which were subjects that had long been cultivated by the Chinese—he returned to England in 1846. He was appointed curator of the Chelsea Physic Garden, but in 1848 resigned this post and went again to China for the purpose of transmitting the tea plant to the hill countries of India. By means of seeds and plants he succeeded in doing this, and thus laid the foundation of the great tea industry of India. In 1852, and again in 1858, he went to China, collecting and studying Chinese horticulture—on the latter occasion in the interests of the United States Government. In 1860 he worked in Japan. Fortune's name will be found frequently to occur in the following pages in connection with the introduction of N. Asiatic plants.

An association of mostly Scottish gentlemen was formed about the middle of the nineteenth century in Edinburgh to exploit the natural products of western N. America. It was called the **Oregon Association**. In 1850 the Association engaged **John Jeffrey** to collect for them in western N. America. Jeffrey was a native of Fifeshire, and as a young man entered the Edinburgh Botanic Garden. He adopted what was then the most convenient method of crossing the N. American continent, which was by way of the Hudson Bay Company's posts, and reached his collecting ground in 1851. In 1852 he worked in California. Jeffrey explored and collected with great zeal during these two years, but the third year his engagement appears to have become irksome to him, the roving passion seized him, and he joined an expedition to explore the Colorado and Gila Rivers in Arizona, and was never heard of again. He introduced, among other things, *Abies magnifica*, *Tsuga Albertiana* and *Pinus Jeffreyi*.

After W. Lobb, the next Chilean collector was **Richard Pearse**, who worked for Messrs Veitch from 1859 to 1866. He reintroduced many of the plants sent home by his predecessor, and British gardens owed to his labours new stocks of *Eucryphia pinnatifolia*, the *Embothrium* and *Desfontainea*. Among conifers, *Araucaria imbricata* was again introduced, *Podocarpus nubigena*, and for the first time, *Prumnopitys elegans*. Pearse died in Panama in July 1867.

Since the labours of Siebold in Japan, earlier in the century, the beautiful flora of that country had yielded little for the gardens of Europe. The opening of the ports to foreigners afforded an opportunity for renewed discovery, and, in 1860, **John Gould Veitch** (1839-70) reached Japan, and initiated in the interests of his firm one of the most successful of all plant-collecting enterprises. He was especially fortunate in the number of new conifers he introduced, amongst which were *Abies Veitchii*, *A. firma*, *Picea hondoensis*, *P. polita*, several pines, and, for the first time in quantity, the umbrella pine (*Sciadopitys verticillata*).

The foundation, in 1872, of the Arnold Arboretum at Jamaica Plain,

in the environs of Boston, Mass., under the auspices of Harvard University and **Charles Sprague Sargent**, must be accounted one of the most pregnant events in regard to the discovery, introduction, and cultivation of hardy trees and shrubs during the last forty years. This institution, conducted with admirable skill and energy, has, through the generous and unselfish policy of its director, exerted an influence on the gardens of Europe scarcely less beneficent than on those of its own country. The exploitation of the N. American sylvia, more especially on the eastern side, had been comparatively neglected since the departure of the earlier collectors like Fraser and Lyon. Some of the interesting plants they found had disappeared from cultivation. The work has been revived by Professor Sargent and a renewed interest has sprung up, especially in the United States, in that most beautiful flora of the Alleghenies and other parts of the south-east. Sargent has travelled not only all over N. America but also in Japan, whence he introduced to cultivation a large number of beautiful trees and shrubs. His magnificent printed works are noticed on a previous page.

Charles Maries, a native of Stratford-on-Avon, collected in Japan and China for the Messrs Veitch between 1877 and 1879. His name will be found frequently mentioned in the body of this work as the introducer of plants from those countries, but more especially Japan. He first brought *Hamamelis mollis*, *Styrax Obassia*, and *Abies Mariesii* under cultivation, also numerous forms of Japanese maples. In 1882 Maries entered the service of one of the native princes of India, and died at Gwalior in 1902.

A great impetus to the interest taken in hardy trees and shrubs during the last decade has been given by the discovery and introduction of new species from Central and Western China. The work was initiated in the first place by the Jesuit missionaries of France, among whom **David, Delavay**, and **Farges** were most prominent. These men, stationed in districts new to Europeans, spent their leisure time in botanising and collecting seeds, which were first sent to the Jardin des Plantes at Paris and to **Maurice L. de Vilmorin**, in whose grounds at Les Barres a vast collection has been got together.

So far as Great Britain is concerned, the introduction of the plants of Central and Western China had its beginning in the work of **Augustine Henry**. This famous traveller and collector was born in Co. Derry, Ireland, in 1857, and was educated at Queen's Colleges, Galway and Belfast. After studying medicine, he, in June 1881, entered the Chinese Imperial Maritime Customs Service at Shanghai. The following year he was transferred to Ichang, a port on the Yangtze Kiang, 1000 miles from the sea. A few miles above the town the great river finds its exit from the mountains into the great plain by way of wonderful

gorges. It was in these mountains that Henry commenced to collect plants in 1885. The flora proved to be of extraordinary richness, and during the next four years he sent an enormous number of dried plants to Kew. Henry remained in various posts in China until 1900, spending most of his leave in exploration and botanical collecting, travelling much over the provinces of Hupeh, Szechuen, and Yunnan. After his return home he studied forestry in France, and soon after, in association with **Henry John Elwes**, commenced the great work, the *Trees of Great Britain and Ireland*, recently completed. At present he is Professor of Forestry in the Royal College of Science, Dublin.

The amazing richness of the vegetation of the far provinces of China, as revealed by Henry's dried plants, and the wonderful beauty many of the trees and shrubs were seen to possess, induced Messrs Veitch to send out a collector to obtain in a living state such as were likely to be of horticultural value. On the recommendation of Sir Wm. Thiselton-Dyer, then director of Kew, **Ernest Henry Wilson** was dispatched to China in 1899. Wilson is a native of Chipping Campden, Gloucestershire, where he was born in 1876; after working as a young man in the Botanic Gardens, Birmingham, he went, in 1897, to Kew. He possesses a combination of mental and physical qualities which have made him one of the greatest of plant collectors. Of athletic build, and endowed with an indomitable courage and perseverance—attributes of the highest necessity to the plant collector in untrodden wilds—he has also that deep love of science, especially of botany, without which the man who adopts this work is but poorly equipped. To these qualities Wilson joins a business aptitude and an adaptability to new circumstances which has led to his dealings with the Chinaman being invariably successful. In all, he has visited China four times, twice in the interests of Messrs Veitch (1899-1902 and 1903-5), and twice under the auspices of Harvard University and a number of subscribers (1907-9 and 1910-11). It is too early yet to compute the full value of his services to botany and to horticulture, but, to the two combined, they are such as have not probably been equalled by those of any one collector.

To give some idea of the magnitude of his labours, it may be mentioned that he has introduced some 1200 species of trees and shrubs, amongst which have been found about 400 new species and 4 new genera; and he has collected about 65,000 sheets of herbarium specimens.

At the present time, the botanical exploration of China is being carried on by **George Forrest**, a native of Falkirk, born in 1873. He is now engaged in his third plant-collecting expedition to China, whence he is expected to return in 1915. The previous journeys were made in 1904-7, and in 1910-11.

CHAPTER II

PROPAGATION.

THE raising of new stocks of trees and shrubs in private gardens is a much neglected branch of horticulture. In many places it is never attempted unless it be in the case of shrubs that can be increased by division, or the pulling to pieces of old stock. Yet there is no more interesting work.

There are really three methods by which trees and shrubs may be increased: 1, by seeds, which is Nature's way; 2, by taking away part of a plant and enabling it to exist separately, *i.e.*, by division, layers, and cuttings of either stem or root; 3, by taking part of one plant and joining it to another already possessing a root system of its own, *i.e.*, by grafting or budding.

The raising of new healthy trees is undoubtedly best accomplished with but few exceptions by means of seeds, and especially is this the case for conifers, timber trees, and long-lived trees generally. For shrubs that have a low-branching system and renew themselves continually by new basal growth, cuttings and layers in most instances are quite as good. Seeds cannot be relied on to perpetuate varieties that have originated from branch sports, such as those with coloured or abnormally shaped leaves; and only partially can they be relied on to reproduce aberrant forms of seedling origin like fastigate or weeping trees, dwarfs, and such like. Seeds from such trees usually reproduce few or perhaps none of the abnormal form that bore them, the majority reverting wholly or in part to the normal type. Thus very few weeping or fastigate varieties of trees are found in Nature. Excepting those like Lombardy poplars and willows, which may increase by pieces of branch broken off by wind, etc., and take root on the ground, they exist only as individuals. Civilised man propagates them artificially for his use and pleasure, otherwise they would disappear. On the whole, if fine, clean-grown, healthy, long-lived trees are desired they should be raised from seed. Still, there are other factors to be considered. Many foreign trees do not bear seed in this country until they are old, often not then, so other means must be

employed. Plants raised from seed do not as a rule flower so soon as those which originate from cuttings or grafts. Occasionally, too, as with desert shrubs like *Calophaca wolgarica*, the root system is ill-adapted for our climate, and they are much longer-lived when grafted on plants with more adaptable roots; in the case of *Calophaca*, use is made of *Caragana* or *Laburnum* as a stock.

SEEDS.

Except where large quantities of plants are required, as is usual with forest trees, quick, holly and such-like, it is not advisable to sow seeds of trees and shrubs in the open ground. They are much more under control, germination is quicker and more certain, if they are sown in boxes or pots in a cold frame or slightly heated house. If the quantity justify it, they may be sown on prepared soil on the floor of a frame. Where no convenience of this sort exists the protection afforded by a cloche, or handlight, in the open ground is a considerable advantage.

Soil and Drainage.—The soil in which seeds are sown should be fine where it is in contact with the seed, and it should be thoroughly well drained. If a pot is used, at least one-third of its depth should be filled with potsherds. For fine seeds like rhododendron, the pot may be at least half filled. Above the potsherds leaves or loam fibre is placed to prevent the fine particles of earth running amongst them. Finally, the pot is nearly filled with a light compost of loam, finely sifted leaf-soil, and sand. In the case of peat-loving plants like the heath family, finely broken-up peat is to be employed in place of loam. For shallow pans or boxes less drainage is of course required, but except for large seeds a depth of 2 to 3 ins. of soil will suffice.

A common mistake is that of sowing seed too thickly. It is a matter about which no fixed rule can be laid down, and it must be left to individual judgment. But young seedlings standing too closely together are apt to become drawn up and weakly, and, if the weather be dull, to decay through damp. Another frequent mistake is that of sowing seeds too deeply. A good old gardeners' rule is that a seed should *not be buried more than its own depth*. Thus a walnut should be buried an inch deep, whilst the seeds of some Ericaceæ, like rhododendrons, which are minute, must not be covered at all, but simply sprinkled on the top.

Moisture.—A most important requisite for the perfect germination of seeds is the provision of a uniform and proper degree of moisture in the soil and in the atmosphere. There is nothing more harmful to minute seedlings than rapid fluctuations between dryness and saturation. Large robust seeds like acorns or most of the pea family are not so susceptible as the more minute and delicate ones. The ingenuity of the cultivator may be exercised to secure as uniform a condition of moisture as possible.

Thus newly sown seeds may be heavily shaded to prevent rapid drying under the influence of hot sun. Fresh supplies of water must be given, but for minute seeds it should be applied almost in the form of spray. The slight disturbance of the minute plant by careless watering, repeatedly done, before the radicle (or primary root) has had time to fix itself firmly, causes many to perish. In the case of minute seeds it is best to water the soil thoroughly before sowing. If they are placed in a close atmosphere and shaded, germination may take place before watering becomes again necessary. It need scarcely be said that as soon as germination takes place light becomes essential.

Whilst the majority of seeds do not, perhaps, require the amount of care indicated above, I have thought it worth while to mention the conditions most favourable to germination. For new and valuable plants any amount of attention will be repaid, and it will not be thrown away on commoner subjects.

It should be mentioned that a gentle moist heat will often stimulate seeds of even very hardy plants into germination that might otherwise fail. This has repeatedly been seen in the case of seeds that have been sent long distances, and become enfeebled by exposure to various influences *en route*. Old seeds, too, are benefited in the same way.

The length of time it takes a seed to germinate is dependent on many circumstances. Newly gathered seed germinates more quickly than old, and, as has just been intimated, heat accelerates that process. Seeds with a hard, bony covering, like those of holly, many of the Rosaceæ, such as thorns, plums, apples, etc., lie dormant twelve to eighteen months. To save space and trouble such seeds are frequently mixed with earth or sand and left thus for a year. Bony seeds of foreign hardy trees and shrubs sown in pots or boxes, if they do not germinate the first season after they are sown, should be stood out-of-doors the succeeding winter and subjected to all the frost and snow that may occur. This often softens the outer covering of the seeds, and they germinate when warm weather returns. Minute seeds almost invariably germinate soon or not at all.

All soft, fleshy seeds, like acorns and chestnuts, need to be sown as soon as they fall, or at any rate kept moist until they are sown. If stored in a dry atmosphere their vitality rapidly decreases. But as a general rule it is best to sow seeds of trees and shrubs about mid-February. By the time they have germinated the sun has acquired considerable power, and they are not likely to suffer from damp and darkness like autumn-sown ones. This applies particularly to seeds obtained from abroad in autumn; still, where doubts exist as to their vitality, a proportion may be sown as soon as received and the remainder in February. Ordinary dry seeds are best kept in a cool dry place.

DIVISION.

This is the simplest mode of propagation, for it consists merely in separating an old plant into a number of pieces, each with more or less root attached. It is best done just as growth is recommencing in spring, and if the pieces can be separated with plenty of root attached they may be planted straight away in permanent quarters. Such shrubs as the dwarf spiræas, *Kerria*, *Berberis Aquifolium*, *Euonymus radicans*, and all with a similar method of renewing themselves by fresh growths from the ground may be treated in this way. Bamboos are increased by division, but in their case it is best deferred until mid-May; even then they are liable to suffer and become unsightly, especially those of a close-growing habit that form hard, matted masses of root which can only be divided by chopping. In the case of valuable plants, or pieces with poor roots, a gentle bottom heat is a very useful aid. The pieces should be potted and the pots plunged in a mildly heated medium, or they may be planted under glass in a shallow layer of soil. Where a large quantity of young plants is desired an old-fashioned hot-bed of manure and leaves covered with a frame is useful.

LAYERING.

Shrubs and trees with branches near the ground can almost always be increased by this method. Nature herself frequently adopts it. It consists in burying a portion of a shoot or branchlet without severing it wholly from the tree. The process is as follows: a shoot is brought to the ground and is pegged down to it at a point 6 to 18 ins. from the end. The pegged part should be notched or slit lengthwise so as to partially sever it, and then be covered with sufficient earth to keep it moist. The free end of the shoot can be staked partially upright to keep it fixed. Brittle wood sometimes cannot be cut at the buried part without breaking, but some method of interrupting the flow of sap should be adopted, such as twisting wire tightly round the stem, as it stimulates the production of roots at the point of interruption. The two other most essential things to secure in layering are, a state of permanent moistness at the buried part, and its perfect fixity. Whilst the time at which layering is best done is spring, it may be performed at almost any time, but the incision of the buried part needs more care, or perhaps omitting altogether, if the plants are in full leafage. One summer is usually required for the new root-system to have become sufficiently developed for the layer to be removed. It may require two for some plants, as, for instance, rhododendrons.

In establishments where little convenience for striking cuttings in heat is available, layering is a very useful and very certain means of increase.

Provided the earth and the branchlet can be brought together, very few plants indeed refuse to take root. But, of course, this is often difficult or impossible. A plan is sometimes adopted of splitting a flower-pot in two, tying the two parts together again round a branchlet that has been previously notched or ringed, and filling the pot with earth, or earth and moss mixed. On the Continent, specially designed vessels made of two pieces of tin attached by a hinge are used for this purpose. The trouble of keeping the soil moist is against its general use, but where it is adopted the shady side of the tree or shrub should be operated on, and ingenious people may devise various ways of keeping the soil moist, such as placing a slightly leaking vessel of water above it.

In nurseries, where large stocks are required for sale, plants known as stools are devoted entirely to the production of shoots for layering. Dwarf shrubs, like heaths and daphnes, are often layered by merely weighting a branch to the ground by placing a stone on it.

CUTTINGS.

Next to seeds, cuttings afford the best and most important means of propagation. Although trees are, no doubt, on the whole best raised from seeds, shrubs raised from cuttings are in most cases apparently quite as healthy and long-lived as seedlings. As compared with grafting, the method has the advantage of putting them on their own roots, which obviates the sucker nuisance.

Many more trees and shrubs can be increased by cuttings than is generally supposed, for instance, elms, birches, hornbeams, apples, and cherries are amongst those that can be so raised. The process is with them not always a certain one, but it is still a possible one. It would, indeed, be rash to say of any exogenous tree that its increase by means of cuttings is absolutely impossible. The best, or perhaps the only possible way, must be found by experience, although old and professional propagators seem to know by intuition when is the best time, and what are the best methods of rooting cuttings of plants they have not even seen before.

A cutting differs from a layer chiefly in the fact that it is completely severed from the mother plant from the first. Theoretically the propagator's work is to keep the piece of shoot alive and fresh until it is able, by the production of its own roots, to live independently. His chief aim is to prevent undue transpiration, *i.e.*, the loss of more moisture from its tissues than it can reabsorb. It follows, therefore, that cuttings of succulent leafy young growth, which transpire freely and are subject to early decay, must take root soon, if at all. A close atmosphere for all, and a brisk bottom heat for many, is needed. But for cuttings in a leaf-

less state, made of late autumn wood, where transpiration has practically ceased, no heat at all is needed; cuttings of such trees as willows, tamarisk, poplars, and currants, as well as very many more, take root in the open ground. As a general principle it may be stated that the younger and softer cuttings of hardy trees and shrubs are, the more essential a close atmosphere and bottom heat become. As the growths from which cuttings are made harden and become more woody with the advancing season, the emission of roots becomes, in general, slower. Things must not be hurried, and less bottom heat is needed. Whether it is best to take cuttings young, medium, or old, in the case of any given plant, depends on its nature. It is a matter on which experience is the only sure guide, and is dealt with in the descriptive part of this work, usually under the notice of the genus.

For the vast majority of the plants dealt with in the present work that are habitually increased by cuttings, it will be found that the most suitable time to make them is from mid-July to the end of August. That is the busy time of the hardy tree and shrub propagator who relies on cuttings. The growths of the year have by then become moderately firm and woody; they are old enough and solid enough to retain their vitality sufficiently, and yet not so old as to have become hard and hide-bound. The character of the wood at a given date varies of course with the season; in hot summers it is ready sooner.

For the majority of new shrubs I should first try their propagation by cuttings at this intermediate state of the current season's growth in gentle bottom heat. If they fail then, harder wood should be tried, and if that fails too, more succulent growth the following early summer.

Making the cutting.—The expert propagator is very careful in selecting the growths from which he proposes to make his cuttings, especially leaf-bearing ones. He avoids very strong, vigorous, leading or "sappy" shoots, but usually prefers the short side twigs, a few inches long, which he can break off with a slight "heel" of the previous year's wood attached at the base. This "heel" of older wood is often a valuable factor, and cuttings possessing it will root when those without it fail. I suppose its firmer tissues prevent decay at the base. In its absence the base of a cutting should be just below a joint. The average leafy cutting is from 2 to 4 ins. long, about one-third of which is inserted in the soil. Cuttings of heaths and such like shrubs with very fine branchlets are made 1 to 1½ ins. long. If the cutting be too long, the succulent top rather than the heel should be cut away. With cuttings that have inconveniently large leaves, it is a good plan to clip off half each leaf, and of course the whole of the leaves at the base of the cutting must be cut cleanly away. A sharp knife is an absolute necessity for making

cuttings, it should be of almost razor-like keenness, so that all the material can be cut cleanly away and not bruised.

Soil.—In preparing a compost for cuttings it is as necessary as it is with seeds to secure good drainage; therefore, if pots, pans or boxes are used, they should be drained as advised for seeds. All the soil as far as the cuttings descend (and if pots are used it need not go very much deeper) should be finely sifted. For most shrubs two parts clean silver sand to one of sifted loam will be suitable. If the plants are peat-lovers, the sand may be increased to a proportion of three parts to one of peat. When placing the cutting in the soil the base of the cutting should settle firmly on the bottom of the hole made for it. It should not be suspended so that a hollow exists beneath its base. When the cuttings are firmly inserted they should be well watered and then, if in pots, put in the propagating case.

Bell-glasses, cloches, and handlights are extremely useful for placing over cuttings, either under glass or in the open air. The first can be obtained to fit any but the smallest sizes of circular pots. By their aid much valuable propagating may be done in the open air. For this work a sheltered shady spot should be selected; the soil should be prepared in the proportions advised, rather deeper than the cuttings descend, and when inserted the cuttings should be covered by the glass, the chief use of which is to keep a permanently moist, still air and prevent undue loss of moisture. Where no other convenience exists this method may be tried for any hardy shrub. For many, no doubt, it may fail, but for the brooms, double-flowered gorse, rosemary, lavender, and numerous others, it is the best method available. Cuttings made in September and October usually form a callus during the winter, and take root the following spring.

Most of the species of *Vitis*, including the common grape-vine, can be propagated in spring by single buds, or "eyes," as they are usually termed. Healthy buds from the most vigorous part of the previous year's shoot are selected, and are cut with about half an inch of wood each side the bud. The pieces are usually made boat-shaped, *i.e.*, with a sloping cut at each side, the cuts approaching each other on the under side. They are pressed into soil and left with only the tip of the bud exposed. Bottom heat is needed.

Root-cuttings.—A considerable number of hardy trees and shrubs can be increased by cutting up the root into pieces and planting them in soil. They usually produce leafy shoots more quickly and surely when given bottom heat. The sumachs (*Rhus*), *Xanthoceras sorbifolia*, mulberry, and all those that naturally produce root-suckers like elms, *Robinia*, etc., may be propagated in this way. When other means fail, it is worth trying for any plant that produces fairly thick fleshy roots. The pieces are usually made about 3 ins. long and should be inserted with that

part of the root uppermost which was nearest the stem. They ought not to be less than $\frac{1}{8}$ in. thick.

The Paris Frame.—A system of propagation without heat has latterly come into use which has proved very useful in gardens too small to justify the erection of the ordinary outfit of the propagator (bottom heat, etc.). This is known as the "Paris frame," the method having come to us from France. An ordinary one- or two-light frame is placed in an open spot and filled to within 9 or 12 ins. of the glass with drainage and a mixture of very sandy soil. In this the cuttings are inserted on the ordinary plan after being made in the usual way. But their after-treatment is radically different. The frame is never shaded, no matter how hot the sun may be, and it is never ventilated except when watered, which it must be once every hour during hot sunshine or even oftener during the fiercest heat. These are the three essentials: no shade, no ventilation, continual watering during bright sunshine. The last, of course, implies the need of drainage. Some striking successes have been achieved by this system, especially among those plants ordinarily needing fire-heat to increase by cuttings. Although the watering demands constant attention in hot sunny weather, the plan on the whole is very cheap, convenient and useful. Some practitioners use pure sand for a rooting medium.

GRAFTING.

The practice of grafting is acquiring an evil reputation. In mediæval times it was the most venerated of all the operations common to horticulture and the most cherished of the mysteries of the craft. The late Mr F. W. Burbidge made the famous observation that it is "always a makeshift, very often a fraud." A certain latitude must be accorded to coiners of epigrams, but there is no doubt grafting has been much too commonly practised by nurserymen. The latter part of Mr Burbidge's statement no one can dispute: The grafting of cotoneasters on common hawthorn, of phillyreas on privet, and of choice willows on common sallow, can only fittingly be described as a "fraud." It is unnecessary, because in each case the plants are easily obtained from cuttings; it weakens rather than improves their vigour, and suckers from the stock are an endless bother and worry. Numerous other instances might be given.

Not always, however, is grafting a "makeshift." I have already instanced *Calophaca wolgarica* as a shrub difficult to keep alive on its own roots; to it may be added *Caragana jubata* and *Halimodendron argenteum*. These shrubs inhabit dry regions with great winter cold, and their roots appear unable to thrive under the wet, comparatively warm conditions of our winters, at least in ordinary positions. Consequently they are grafted on laburnum or *Caragana arborescens*, which

labour under no such disability. *Cytisus scoparius* var. *Andreanus* again, and other varieties of common broom that do not come true from seed, are often short-lived when raised from cuttings, due to the formation of an imperfect callus at the base, which leaves the centre of the stem not entirely sealed over and subject to decay. In their case, grafting low down on young seedling laburnums has no disadvantages that I am aware of. In the case of trees and shrubs which do not produce seed in this country and cannot readily be increased by cuttings or layers, grafting has to be resorted to. In very many instances grafted trees thrive well and are long-lived, although not so much so as seedlings. I know grafted oaks, for instance, that must be 100 years old, in perfect health and vigour. There is nothing to be said against the grafting of such trees as weeping beech, weeping ash, fastigate oaks, or, indeed, any garden form that does not reproduce itself by seed, if it be done on their respective types. The identical nature of stock and scion makes a perfect union possible. On the whole, it may be said that grafting, with the allied processes of inarching and budding, is often a valuable, sometimes an indispensable, resource, but that nurserymen resort to it much too readily, thereby bringing it into disrepute. Attempts should always be made to get a tree or shrub on its own roots first; it is when those fail that grafting should be resorted to.

There are various modes of grafting, but they all have one principle in common. This is that the inner bark (or cambium) of stock and that of scion should be placed in contact. Roughly speaking, the stem of an exogenous plant consists of four parts: in the centre is the pith, then comes the wood, then the cambium, lastly the true bark. So far as grafting (also the formation of roots in cuttings) is concerned, the whole matter centres in the cambium, which is composed of active growing or formative cells. The most perfect grafting is where the cut surfaces of stock and scion are so arranged that the greatest amount of each set of cambium is brought in contact with the other, and kept there until a union is formed. The other parts do not matter.

It is not appropriate here to discuss the various methods of grafting. When once the underlying principle is understood the success of the operation is dependent as much on practice and deftness of hand as anything. Professional propagators in nurseries have a very small percentage of failures compared with the fumbling beginner. The operation is really delicate joinery. What is termed "whip-grafting" is the simplest and commonest method; in this a long slanting cut is made on the stock, a similar one is then made of the scion; the two cut surfaces are then placed together, taking care that the inner barks, on both sides if possible, but certainly on one, are coincident. In this position the two are firmly tied together with bast and the whole is

covered with grafting clay or grafting wax to keep the uniting parts air-tight. Scions are normally 2 to 6 ins. long, and the chances of success are naturally greatest when they and the stock are of the same diameter.

The propagating case, mildly heated, is of great assistance in grafting. The most convenient method and the surest with rare or delicate trees and shrubs is to have the stocks brought into a moist house and grafted there. Such shrubs as *Hamamelis*, rhododendrons and brooms are always treated that way. The stocks may be potted, or their roots laid in earth. Robust common trees like oaks, maples, and the ordinary fruit-trees can be done out-of-doors. For deciduous trees and shrubs, and, indeed, for most things, spring is the best time, usually April out-of-doors, earlier under glass. But many evergreens and some deciduous things are successfully grafted under glass in late summer and early autumn. As a general rule, for spring grafting, propagators like to have the stock slightly more forward in growth than the scions; the latter are often cut some time beforehand and laid in the ground to keep them back, and for indoor grafting the stocks are usually taken under glass some time before the operation.

On the whole, in private establishments, propagation by grafting is of much less importance and general practicability than that by cuttings or layers. There is, however, one mode of grafting that might be more generally practised and has no objections to be urged against it. This is grafting the twigs of a plant on pieces of its own root. When all other attempts at propagation have failed this has been known to succeed. Pieces of root about the thickness of the proposed scion should be selected. After the two are fitted and tied together in the ordinary way the root should be potted, leaving only that part of the scion which is above the cut exposed, then placed in gentle bottom heat. Wistarias are very readily propagated in this way.

INARCHING, OR GRAFTING BY APPROACH.

This process bears the same relation to grafting that layering does to propagation by cuttings. The scion is not separated from the mother-plant until a new union has taken place with the stock or foster-mother. The essential principle is exactly the same as in grafting. The two plants are brought together—one at least has usually to be in a pot—the branches selected for union are then fitted together by taking a slice off one and a corresponding slice off the other. The inner barks have to be placed in contact, and the two tied together and finally covered with wax or clay just as for grafting. Inarching often occurs in Nature, especially in trees with crowded branches like limes. The method is too inconvenient to be generally adopted, but a quaint use is sometimes made of it to unite the tops of two young trees of the same sort at the entrance to a garden or summer-house so that they ultimately form a gothic arch.

BUDDING.

Largely practised for the propagation of roses, flowering cherries, peaches, red chestnuts, etc., this process possesses the same merits and demerits as grafting. It only differs from grafting in that the scion is a single bud with a little bark attached, instead of a piece of branchlet. Budding can only be done in summer when the bark parts freely from the wood, usually in July and August. The buds selected are generally those near the base of the current year's shoot. They are cut out with a sharp knife, leaving about half an inch of bark above and below the bud and a narrow strip at each side of it. A little wood is always cut out with the bud, and this must be carefully removed. The process consists in making a T-shaped incision in the year-old (or may be older) bark of the stock, lifting up the pieces at the angles of the cut with the handle of the budding knife and then pushing the newly made bud-scion under the lifted pieces. The latter are then to be laid back over the scion and the whole bound up in worsted or bast, leaving only the bud exposed. The scion-buds should lie dormant until the following spring.

The principle of budding is exactly the same as in grafting, the cambium of the bud and its attendant bark is laid flat on that of the stock. On this account the chances of union taking place are increased; but budding is the more delicate operation because of the softness and tenderness of the material dealt with. Dull days should, if possible, be selected for the work, and the quicker it is accomplished the greater success is gained.

CHAPTER III

HYBRIDISING AND SELECTION.

PERHAPS the most fascinating of all branches of plant cultivation is the production of new forms in the garden itself. New plants of garden origin, as distinct from those newly introduced from other countries, are obtained in three ways: by branch "sports," by selection among seed-raised plants, and by hybridisation. So far as trees and shrubs are concerned, the first process is purely accidental, the second frequently so.

(1) Branch sports are abnormal shoots that occasionally appear on adult trees or shrubs and are taken off and propagated by cuttings, buds, or grafts. Many of them preserve their abnormality indefinitely, but others have a strong tendency to revert to the normal type. Nearly all variegated shrubs and trees, those with deeply cut leaves, and those with double flowers originated as branch sports.

(2) The production of new forms under cultivation by selection from seed has given to gardens some of their most beautiful plants; but in regard to trees and shrubs (trees especially), the intervals between the generations are too long for the work to attract the ordinary man as a set purpose. Most new forms of seedling origin in gardens have originated as chance breaks, noticed by nurserymen or others among batches of plants raised to furnish ordinary stock. Most weeping, fastigiate and dwarf trees have originated in this way; also purple-leaved, large- or small-leaved varieties, and forms with richer-coloured or larger flowers. Like branch sports, they must be increased by vegetative parts—cuttings, grafts, etc.—and propagated in this way they show little or no tendency to revert back to the normal type. Raised from seed they show a strong but not a uniform tendency to revert to the parent type; thus often a small proportion come true or even show the peculiarity of the form to an increased extent; a larger proportion are more or less intermediate; the remainder will be indistinguishable from the type. The purple beech is an illustration; comparatively few of its seedlings come quite true, they are mostly of an ineffective purplish green or coppery hue, but a number of purple beeches have been raised from seed, such as

var. *atropurpurea*, "Swat Magret," etc., whose purple is of a deeper shade than that of the original tree. André's broom, with its maroon wing petals, is a similar instance; most of its seedling progeny are more or less reversioners towards the common *Cytisus scoparius*.

(3) The hybridisation of two plants of varying character is the quickest and surest means of producing new forms under cultivation. One is certain of getting something new, even if it be something in no way superior to either parent, and often the breeder can form some idea of what he is likely to obtain. We undoubtedly owe our most valuable garden shrubs to hybridisation, sometimes by human, sometimes by insect agency. The garden races of rhododendron and azalea, roses and clematis, and such beautiful plants as *Berberis stenophylla*, *Magnolia Soulangeana*, *Salix Salamoni*, *Cytisus kewensis* and *C. Dallimorei*, *Spiræa arguta* and *Hypericum Moserianum*, are a few examples of those which have had their origin in the intentional or sometimes accidental crossing of species. Hybrid trees and shrubs have usually a vigour superior to that of either of their parents. As this is work which any amateur may do, it will be worth while to devote a few words to the operation of hybridising itself.

The first equipment of the operator is a true understanding of the structure of the flowers to be operated on. Ordinarily, a flower consists of sepals, petals, stamens, and pistil, which may be regarded as of two sections: first, the protective or ornamental; second, the essential or sexual parts. The first or outer section consists of calyx (or sepals) and corolla (or petals), sometimes calyx alone. They play no part in the production of seed; their purpose is to protect the sexual parts when young, and later, by displaying bright colour, to help to advertise the flower and attract the notice of insects to fertilise it. That function performed, their work is done, and they usually fall away. The real reproduction of the plant by seed is accomplished by the stamens (male) and the pistil (female). The process of fertilisation or impregnation is brought about by the transference of pollen (usually a minute yellow powder borne in sacs called anthers at the top of the stamen) to the summit of the pistil. The pistil has three parts; at the base is the ovary, a swollen body which contains the incipient seeds, or ovules; above that is a stalk of varying length called the style, bearing at the top a knob (ultimately viscid), called the stigma. It is upon the stigma that the pollen must lodge so that the ovules may be changed into fertile seeds.

Whilst Nature adopts various methods to prevent the fertilisation of a flower by its own pollen (often by the non-synchronous ripening of the pollen and receptivity of the stigma; often by separating the sexes on different plants), her intention is that the impregnation should be done by pollen from a flower of the same species. Thus whilst, in the higher groups, she abhors in-breeding, she also objects to mules. The hybridiser,



SPIRÆA ARGUTA.

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[Face p. 23.

on the other hand, has to bring about the fertilisation of the flower of one species or variety by the pollen of another of his own choosing. His aim is usually to unite in the progeny qualities in the parents severally possessed, such as hardiness or better habit with greater flower beauty. There are limits, of course, to the choice of parents, just as there are in the animal world. Species of the same genus are capable as a rule of being hybridised, although sometimes physical divergences prevent it. Occasionally, too, species of different but closely allied genera will cross-breed. Progeny of the more distantly related parents are generally barren.

To secure hybridisation two essential points must be borne in mind: viz., the stigma should be in a receptive condition, and the impregnation of the flower by pollen from any other flower than the one selected by the operator must be prevented.

The stigma usually indicates its readiness to receive the pollen by becoming sticky, but it is often desirable to dust it over afresh with pollen every day for a few days after the viscosity appears.

The first thing to do in regard to the other point is to protect it from its own pollen. With plants left to themselves, Nature usually secures this herself, but not always. The hybridiser leaves as little as possible to chance, and so the careful operator commences by removing the stamens from the flower he wishes to cross-fertilise, and to do this effectually he breaks open the flower before it expands naturally, and cuts away the anthers before the pollen has become ripe (*i.e.* dust-like). If it be a small shrub, it is often advisable to take it up and keep it in a cool airy glass-house until the impregnating process is over. The only danger then is that a stray bee or other insect may enter and deposit foreign pollen on the stigma; but if the petals be removed as well as the stamens the danger is a very remote one. All flowers other than those impregnated must be removed.

Out-of-doors, owing to wind, insects, and other disturbing agencies, the process is not so much under control. The removal of the stamens from the flower to be impregnated is again necessary before the petals expand; and to prevent a fertilisation other than the desired one, it is usual to enclose that part of the branchlet bearing the flower with white gauze or transparent paper, unless the shrub or tree is in a well-isolated position. The removal of the stamens is best accomplished by the aid of a pair of finely pointed scissors, and it is scarcely needful to say that all bruising and scratching of the pistil is to be avoided. The fertilised flower should be ticketed with a number corresponding to one in a note-book, under which particulars as to parentage, dates, etc., are entered. As soon as the flowering season is past, and consequently all danger of chance impregnation over, the gauze or paper guards must be removed.

CHAPTER IV

NURSERY WORK AND METHODS.

ASSUMING that the young plant has been raised by one or other of the methods just described, a few words may be devoted to its treatment afterwards. Whether raised from seed or from cuttings, the newly rooted plants stand much too closely together to remain long without mutually damaging each other. Cuttings put in at the most usual time, *i.e.*, July and August, do not grow much that year after the roots have formed. They are, as a rule, most conveniently rooted in pots, and in these they may usually remain undisturbed until the following spring, when they are separated and planted in rows in prepared nursery ground. Plants raised earlier in the season from seeds or soft cuttings, having a growing season in front of them, cannot be wintered in the seed- or cutting-pots. If of vigorous constitution and quick growth, they may be planted out in the nursery ground as soon as well rooted. But as by that time the season is well advanced and hot dry days occur, it is usually necessary to give them shading and special attention in watering for a week or two. With delicate, very small or particularly important plants it is better, especially in the case of seedlings, to transplant them ("prick them off" is the common term) into shallow wooden boxes of fine soil, although not so fine as for the seeds themselves. These boxes, 2 or 3 ins. deep, may be purchased cheaply at most horticultural providers. Treated in this way, the baby plants may be kept in frames or even given a mild heat to ensure their quick attachment to the new soil, and loss is reduced to a minimum. Choice rhododendrons and others of the heath family can only be treated satisfactorily in this way. In taking the plants from the seed- or cutting-pots reasonable care should be taken to preserve the roots as much as possible, and, if practicable, to take a little ball of soil as well. As the plants are transferred from the seed-pot to the shallow box, they should be set regularly in rows, so that when again removed from the boxes into the open ground a square block of soil may be cut out and taken with each plant.

The ground or nursery into which young trees and shrubs are planted

should be sheltered naturally or artificially. Clipped evergreen hedges are frequently planted to secure this end, such as of holly, privet, or *Thuya occidentalis*. But in most gardens some nook large enough and sheltered enough can be found. The soil should be of a light rather than a heavy nature, for it induces a more fibrous root system, and the necessary space allotted for peat-loving things should have peat mixed with the ordinary soil.

The chief use of a nursery ground is to enable one to watch over and encourage the growth of trees and shrubs from their babyhood until they are big enough to fight their own battles along with the other occupants of the garden, park, or street to which they may be consigned. A nursery is also very useful, even if only of small size, as it affords material for making good losses by death, or for extending existing plantations at the least expense. There is always as well the peculiar satisfaction of raising one's own plants.

When once the plants are safely established in the nursery their after-care consists chiefly in transplanting, pruning, and training, all of which questions it will be convenient to deal with as affecting hardy trees and shrubs in general, whether in nursery quarters or not.

CHAPTER V

TRANSPLANTING.

THERE is no operation connected with the cultivation of trees and shrubs upon whose proper performance more depends than transplanting. To its successful accomplishment not only the health, the proper placing, but the very presence of a plant in a garden are due. It may be said, indeed, that it is only the art of transplanting that makes a garden possible. In itself, however, it is an evil, although so necessary a one. With few exceptions, a tree that is rightly placed and in proper soil is better left undisturbed at the root.

To understand the importance of transplanting it is well to consider the typical root-system of a plant. If a tree old enough to have formed a woody stem be carefully taken out of the ground and examined, it will be found to have a root-system somewhat as follows:—Proceeding directly from the stem there will be three, four, or more radiating main roots similar to the stem in character; these are, of course, developed from the first roots emitted by the seedling and have become woody with age. Issuing from them are other ramifications, becoming smaller at each subdivision, till at last they cease to be woody and are invested merely by hair-like organs. It is important to remember that the nutrition of the plant is entirely dependent on these hair-like roots. All the other portions serve merely as conduits from them to the stem, and as supports and holdfasts for the plant. In transplanting it will thus be seen how important it is that as many as possible of the finest rootlets should be preserved. A plant bears transplanting well or badly according to its power of renewing these rootlets quickly, or to its capability of existing with little loss of vitality until they are renewed. The finer and less woody portions of the root-system send out these fine fibres more freely and quickly than the older parts do, which is why young plants, even tiny seedlings, are transplanted with less risk than old ones.

Plants like rhododendrons and others of the heath family are easily transplanted because they produce an enormous quantity of fibrous roots close to the stem, enabling a much larger proportion of working roots to

be removed with it than is possible with the majority of trees and shrubs.

The occasional transplanting that young trees undergo in well-managed nurseries is practised for the same reason. The shortening of the roots involved by removal induces the production of a large quantity of fibrous roots close to the stem, which are thus easily removed with the plant. The tendency of the active fibrous roots is to spread out farther and farther away from the stem, and thus enlarge the feeding-ground of the tree. Consequently the longer the tree remains undisturbed, the greater the proportion of them that have perforce to be sacrificed in transplanting, and the greater is the risk involved in its ultimate removal. In selecting trees and shrubs, but more especially trees, the experienced purchaser looks askance at the plants with long clean leads and an aspect of lush vigour. These things are too suggestive of undisturbed roots. He prefers the short-jointed, comparatively stunted growth indicative of judicious transplanting.

Methods of Transplanting.—The commonest and most simple method of transplanting is to take a plant out of the earth, with as many of its roots as can conveniently be saved, and to transfer it to its new quarters nearly or quite free from soil. Trees and shrubs to be sent long distances have necessarily to be dispatched in this state. For the great majority of young trees and shrubs with deciduous foliage the plan is perfectly safe. For evergreen shrubs that do not form close masses of roots, as rhododendrons do, it is risky. And with both deciduous and evergreen plants, the risk is increased the older they become and the longer they remain undisturbed.

Seedlings and cuttings removed from seed-beds, boxes, etc., to more roomy quarters rarely fail if care be taken; but it has to be remembered that the younger and more succulent they are, the less able are they to withstand dryness, exposure, and delay. Seedlings of important kinds have sometimes to be transplanted whilst they are growing, and in that case it is a good plan to lay them on damp moss or canvas as they are taken up. After they are replanted they should be watered thoroughly, and occasionally sprinkled afterwards if they show signs of drooping. But with the seedlings of most deciduous hardy trees and shrubs it is best; and usually most convenient, to transplant them in open weather sometime between the fall of the leaf and the renewal of growth. (See notes on time for transplanting.)

When the removal of a plant has been decided on, it will be incumbent to decide also whether a proportion of the soil in which it is growing shall be carried with it, or whether it shall be taken with naked roots only. Several circumstances will have to be considered, such as the nature of the plant, the distance it has to be taken, the labour and

cost involved, etc. But, generally, it may be said that old plants, plants that have long been undisturbed, and most evergreens should be transplanted with balls of earth. On the other hand, young plants and most deciduous ones may be moved with naked roots.

Transplanting without Soil attached to the Roots.—In transplanting a tree or shrub without soil, it has always to be borne in mind that the greater the proportion of fibrous roots that are retained the greater will be the degree of success. With small plants up to two or three years old it is, as a rule, sufficient to push the spade or fork beneath them and raise them bodily from the ground, and then shake the roots free from soil. But with older specimens more care is needed, such as those whose roots have spread 3 ft. or more from the stem. With such specimens it is necessary to commence operations at a sufficient distance from the stem—proportionate, of course, to the size of the tree, but always far enough away to preserve a considerable proportion of the fibrous roots—by digging a trench; then, by working inwards, chiefly with a fork, the roots should be carefully shaken free from the soil. In the case of large and important specimens this work must not be hurried.

In replanting a tree that has been taken up in the way described, the first consideration should be to provide a hole wide enough to allow the roots to be spread out to fullest extent. This applies to plants of any size, but it is more important the larger they are. Roots should never be doubled back or made to fit the circumference of a hole. They should be placed in the earth as nearly as possible in the same relative positions as they were when taken out. With regard to the depth at which trees should be planted, it may be said that the thickened base of the stem, where it begins to divide into the several main roots, should always be above ground. The mistake of too deep planting is nearly always made, especially where the holes have been deeply dug, because insufficient allowance is made for settling. A convincing lesson may be learnt in connection with this question of depth from naturally sown trees. It will be noticed that there is always some tendency—and often it is a very marked one—for the base of the stem to be elevated above the surrounding ground. When this part is buried the stem is much predisposed to decay at the “collar.” The bark of the stem or trunk, which Nature intended to be exposed to the atmosphere only, is kept permanently dark and moist. This renders it, no doubt, peculiarly susceptible to cell-rupture by alternate freezing and thawing, and to the attacks of fungi. Plants that die from this cause usually die quite suddenly, causing much wonder. Still, some trees, such as poplars and elms, do not seem to mind deep-planting.

When rearranging the roots in their new quarters, the aim should be to spread them out evenly in all directions. The soil in immediate

contact with them should be fine and worked well in amongst the fibres. When once the roots are well covered the soil may be trodden or rammed firmly about them, but the planter should bear in mind that the moister and heavier the soil the less of this consolidating process will be needed. Where the soil is light and free, or even moderately so, a thorough watering has the mechanical effect of settling the soil about the roots thoroughly.

Transplanting with Soil attached to the Roots.—Whilst the removal of trees and shrubs with a mass of earth about the roots is the most troublesome and costly method, it is the safest, and should always be adopted for large or particularly valuable examples. So far as the physiology of the plant is concerned, the operation presents no problems, for the aim is to transfer the plant with its root-environment practically undisturbed. Such difficulties as arise are chiefly mechanical. With the necessary appliances and mechanical skill, trees hundreds of years old can be transferred to new quarters. But in the ordinary routine of garden work one has rarely to deal with masses of soil weighing more than one ton. Below that there is every gradation down to seedlings with an ounce or two of soil attached. Whatever the size may be the chief object is the same, viz., to transfer *intact* the “ball” of earth with the roots that permeate it. With small plants the task is easy. The “ball” may be kept together with the hands; often it may be carried from one place to another on a spade or fork, or on a wheelbarrow or truck. But the larger the ball and the less matted the roots, the more careful has the planter to be. Still, the main object is always the same, and that is, to keep the “ball” from breaking. With rhododendrons and such-like plants with dense masses of fibrous roots, it is often self-supporting, but usually artificial support is necessary. This is best afforded by shaping the ball to a cylindrical form and binding it together with two cords, one near the top, the other near the bottom. The “ball” should first be wrapped round in stout canvas or matting, and a few thin boards should be inserted between it and the cords, so as to prevent the latter cutting into the soil. It is very important that the cords should be made as tight as possible. This is done by making a noose at one end, and, after threading the other end through the noose, pulling each cord as tight as it can be made. An instrument called the *tourniquet* is sometimes used for tightening the cords.

After the soil has been supported by some such means as these, the ball has to be partially undermined, first on one side and then on the other, and a pair of stout lifting-boards inserted. The plant is then ready to be lifted out of the hole and carried away to its new position. When the weight is greater than can be managed by a few men, mechanical appliances have to be used. Transplanting machines of

various sizes, made to lift from $\frac{1}{2}$ to 8 or 10 tons, can be obtained, which reduce the trouble to a minimum, as they have apparatus for hoisting the mass of earth and lowering it again. But it is only on large estates and in public parks and gardens that there is sufficient transplanting to justify the considerable cost of these machines. Much, however, can be done with a lifting jack, rollers, and planks, the plant being rolled up an inclined plane out of its hole on to a low trolley to be taken to its destination.

Preparation of Large Trees for Removal.—Where it is desired to transplant particularly valuable or important trees, especially trees that have long been undisturbed, and are known to have their feeding roots so far spread out from the stem as to make it impossible to take a necessary proportion of them with the tree, it is often desirable to prepare the “ball” six months, a year, or even two years beforehand. It is done in this way. The dimensions of the “ball” to be removed are fixed on and marked out. A trench is dug out rather nearer the stem than the marked lines, and as deep as the roots go. All the roots, of course, are roughly severed in the process, and these should be cut cleanly back. It is important that tap roots, if they exist, should be severed also, and to do this half the “ball” or less should be undermined, and then filled in again before another section is dealt with. After all this is done, the trench should be filled in again, the soil rammed firmly and watered.

The object of this process is to provide the tree with a stock of fibrous roots so near to the stem that they, or most of them, can be taken away with it at the time of transplanting, and thereby enable it to take hold of the soil at once in its new quarters. One growing season at least must elapse between the preparation of the tree and its ultimate removal. Some trees may be prepared in the early spring and removed in the autumn of the same year. With most a full year should be allowed. In some cases it may be well to prepare half the “ball” one year and the other half the next. This is to avoid the check caused by severing all the roots at one time.

Time for Transplanting.—The most convenient time for the removal of trees and shrubs is during the winter months, say from the middle of October to the middle of March. With very few exceptions, all deciduous trees and shrubs may be transplanted with safety during that period. Still, the earlier part of the time is better than the latter part. As far as possible all deciduous plants should be planted after the leaves have changed colour, but just before they fall. The roots are not yet inactive, and they get a grip of the new soil before winter sets in. The period, however, is so short that this must be regarded rather as counsel of perfection than as being always practicable. The worst time for the work is during the period of dry east winds in March and early April. But after that again there frequently comes a time when, if the work has

not been done before, it may still be safely accomplished. This is during soft or showery weather, when the buds are bursting. The roots have by now become active again, and if the plants can be kept moist for a few days (natural rain showers, of course, are best, but watering and spraying are a great help), they start growing again immediately. The deciduous magnolias can be shifted best at this time, usually mid-May with them. In trade nurseries much transplanting has perforce to be deferred until the end of the selling season.

Evergreens.—These are much more difficult to transplant safely than deciduous plants are. The reason of this is that the leaf-bearing part of the plant is never so independent of the root-system. Even in midwinter the leaves both breathe and transpire, so that a cessation in the supply of moisture from the root, however partial, is felt much more than it is by a leafless plant.

In the case of rhododendrons and many other evergreen members of the heath family, the fine roots are so numerous, and get so complete a grip of the soil, that the whole root-system can be removed practically intact. But in their case the problems of transplanting scarcely arise; with ordinary care it can be done at almost any season of the year. It is with such evergreens as hollies, evergreen oaks, cherry laurels and Portugal laurels, arbutuses, and all those with a more or less rambling root-system that difficulties appear. They can, of course, be moved with safety if the "balls" of earth in which they grow are taken with them, but that cannot always be done, as in the case of plants that have to be sent long distances, or those growing close together, as in a holly hedge. Consequently, they have to be removed with little or no soil attached to the roots. It is in such cases that it becomes very important that the right time be chosen.

It is essential with such evergreens as those just named that the plants, although not in the full vigour of their growth, should nevertheless not be in their most inactive state. The best times, therefore, are autumn before growth ceases, or in late spring after growth commences. With regard to autumn planting, warm moist days in late September and early October are particularly advantageous in the south of England. In the cooler, moister north a few weeks earlier are better. Spring planting should be deferred till the drying east winds are over. Showery, warm days in May are best.

Many discussions have been held as to whether the autumn or the spring planting of evergreens is preferable. With suitable weather and smart workmanship at the time, and with due attention to watering the following summer, success, I think, is about equally probable at either season. Just as a hard winter setting in very early might prejudice one against autumn planting, so might a long dry time in May and June

prejudice another against spring planting. This much, however, is certain, from midwinter onward to early April is the most dangerous time. In the case of the most susceptible of these evergreens it is better to be earlier in autumn or later in spring than the reverse. Evergreen oaks transplant better in early June than in April. Bamboos, if planted in autumn, should be moved early; but in their case experience proves that mid-May is equally good.

I am strongly of opinion that it helps considerably towards the recovery of evergreens whose roots have been damaged by transplanting, to remove a proportion of the leaf growth, or even leaves alone, from the branches. By reducing the leaf surface the amount of transpiration is correspondingly reduced, and the demand for moisture is brought nearer to the amount the damaged and reduced root-system is able to supply. In the case of evergreen oaks and vigorous hollies, quite half the leafy part of the plant may often be removed with advantage. In N. America, where the summer is more trying than ours for newly planted hollies, they make a practice of almost denuding them of leaves in these circumstances.

CHAPTER VI

SOILS AND MULCHING.

IF one could choose one's own soil for the cultivation of trees and shrubs generally, it would be a deep loam of a light rather than a heavy nature, and free from all calcareous substances. Such a soil is easily worked and would support the most varied collection of species, including the great family of *Ericaceæ*, whose members give so much beauty to gardens. The species found on limestone are numerous, but to very few of them is lime absolutely essential. For some, such as certain species of clematis and juniper, and such conifers as *Abies Pinsapo*, it is advisable to add lime to soil deficient in it; but generally one is led to the belief that trees and shrubs inhabit limestone regions not so much from choice as from necessity. The beech, for instance, or the whitebeam, commonly found wild on the limestone, thrive just as well apparently where it is absent. Peat-lovers, again, are by no means incapable of thriving on a loamy soil. The heath family, including such genera as *Calluna*, *Erica*, *Rhododendron*, *Azalea*, *Dabæcia*, and *Pieris*, are usually found wild on peaty soil, but everyone of them will succeed in loam of a sandy nature and free from lime, especially if decayed leaves be added to it.

The great value of decayed leaves—the “leaf-soil” of the gardener—as an ingredient in soil of *any* type is not yet generally appreciated, although one hopes the old wasteful practice of burning fallen leaves, after raking them together in early winter, has in a great measure ceased. Every garden of any pretensions should have its “leaf-heap,” where the gathered leaves may be carted and turned over two or three times annually as occasion offers. In two years a black humus is formed which no tree or shrub, so far as I know, will object to, but which, on the other hand, the roots of almost everyone will avidly seize on. For delicate rooting shrubs like the *Ericaceæ*, eucryphias, stewartias, the more delicate magnolias, Chilean and New Zealand shrubs generally, it is particularly useful, and makes an admirable substitute for peat in many cases. As a mulching for evergreens, a layer of leaves has much to recommend it, and in the case of those with low branches like rhododendrons, which prevent the leaves being blown away, it is a good plan in autumn to

cover the ground, say from 6 to 12 ins. deep, with a layer of newly fallen leaves. In the event of a hard winter they keep the soil comparatively warm, gradually decaying and settling down to a shallow covering, which keeps the soil cool and moist during the following summer. The surface roots of rhododendrons and most shrubs thrust themselves greedily into this humus; being light and easily permeated by air, it has not the evil results that sometimes follow heavy top-dressings of loam or manure, which, too frequently given, are apt to bury the plant unduly and set up decay at the collar, just as deep planting does.

Mulching.—This term is applied to the practice of placing material, usually of a feeding nature, on the surface of the soil permeated by roots of trees and shrubs, as distinct from burying it in the ground. It has two allied purposes: that of nourishing the plant, in which case the mulch is usually some form of farm manure; and that of keeping the soil warm in winter, and cool and moist in summer.

In the case of old and failing trees, or starved and weakly ones, especially those of a surface-rooting nature like beech, elm, lime, maples, and numerous others, no treatment aiming at their renovation is more efficacious than a top-dressing of manure, loam and manure, or manure and leaves, from 3 to 6 ins. in thickness. The ground should be lightly pricked over before it is applied. If the tree is standing on a lawn the grass should be taken off in turves and replaced after the mulching is done. In this case leaves are unsuitable as part of the compost, because they decay into such small compass that the ground settles much and unevenly; loam and manure should be used, or even loam by itself. If possible, it is best to mulch lawn trees in early October, and leave the ground open through the ensuing winter and early spring, re-turfing or sowing with grass seed the following April.

The commonest form of mulching, especially of shrubs, is the summer mulch, designed to keep the soil and roots moist and cool in the broiling heats of July and August, especially after transplanting. The material should be of a loose, open nature, and perhaps, for general use, the best of all is a mixture of short rotted manure and leaf-soil. For rhododendrons and the heath family generally, a four-inch layer of decayed leaves is as good as anything. Such a top-dressing is remarkably effective in keeping the ground moist—better, indeed, than many waterings. Newly planted shrubs and trees, and all those liable to suffer more than ordinarily from drought, should always have this mulching. Surface hoeing, persistently done, is an admirable means of keeping ground moist during drought, maintaining, as it does, the top layer of earth in a loose, open state. Mulching with a loose, open material is a still more effective means to the same end and of less trouble, as one dressing is sufficient for a season, sometimes for two or three.

CHAPTER VII

ARRANGEMENT OF SHRUBBERIES.

IT is upon the size, number, and arrangement of the trees and shrubs in a garden that its broad effects depend. Diversities in the surface of the land, its eminences and declivities, provide the most effective variations of scenery; but where these are non-existent, and the lie of the land is flat, the trees then become the most important elements in providing variety of outlook and diversity of background. If the trees and shrubs are not themselves the chief objects of interest in a garden, they must, in all but the smallest areas, form at the least the setting of whatever else the garden may contain. Whatever the picture may be, it is the arboreal vegetation that makes the framing. This being so, it is strange that in so many gardens one should see such striking evidence of no special thought or care for the trees and shrubs they contain. How often one sees, more especially in the case of shrubs, that there has been no endeavour to secure the most suitable and beautiful kinds, or any attempt to draw upon that wealth of material which the enterprise, exploration, and gardening skill of the last fifty years have made available.

Who is not familiar with that depressing thing known as the "mixed shrubbery"—a crowded mass of shrubs, with here and there perhaps a tree, whence all the weaker sorts have disappeared, and in which the stronger ones are left to fight each other for light and space? The result is that what remains is a survival perhaps of the fittest, but certainly not the most beautiful, and is often merely a jumble of laurels, privets, Pontic rhododendrons, weedy lilacs, coarse spiræas, and the like. If it were not that such shrubberies may be seen any day of one's life in process of development, we might hope that so many object-lessons would, before now, have brought about their end.

It is easy to trace their origin and development. A student of human nature would probably say that this sort of "mixed shrubbery" is only one more evidence of the evils of procrastination. At the commencement, the plants are naturally small, and in the hope of producing an immediate effect they are put in rather closely together.

This, of course, is perfectly right, but too often the work stops at that. Plants do not cry aloud, and, as we have so often been reminded since Old Dumbiedykes uttered the profound truth, they grow whilst we are sleeping. When the time comes that they are closing up and ought to be given more space, the work is passed by in favour of something seemingly more needful but probably less important. For when once the proper time has passed by, it becomes increasingly difficult to treat the shrubbery satisfactorily. The plants become drawn and their sides thin, and any interference with them means, at the least, a temporary unsightliness. The remedy for all this is the adoption of a definite plan at the commencement and its rigorous carrying out afterwards.

Value of Grouping.—When either a tree or a shrub is to be grown as an isolated specimen, with plenty of space for its development, as on lawns or in parks, it has simply to be considered in its present and ultimate relationship to the general features of the landscape. Its natural increase in size and height does not involve transplanting and rearrangement. It is, however, quite otherwise with the cultivated shrubbery, which, either large or small, forms so important a part of every garden. Such shrubberies are designed to mask boundaries of gardens and to make secondary boundaries within the garden itself; they are useful in forming dividing lines between diverse types of gardening, as backgrounds for borders of herbaceous plants, as shelter-belts, and so on. The point is, that wherever it is, or whatever its special object may be, a shrubbery should be something more than a mere mass of greenery serving to block out a view. It should, and can be, as much a feature of beauty and interest as any other part of the garden. The initial mistake that is so often made in the planting of shrubberies is in the indiscriminate mixing up of the material employed. The value of grouping—that is, the bringing together of several individuals of one kind—is not generally appreciated. It is even more apparent in beds cut out on lawns than it is in continuous shrubberies. Here an indiscriminate mixture looks its worst, and here, more than anywhere else, should an arrangement of shrubs, be it of one or of more species, strike a clear note. For large gardens and spacious areas, I prefer the grouping together of individuals of the same kind; in smaller areas an association of two or more may be desirable or necessary.

In the case of shrubs of medium and small size, and indeed of almost all the smaller species we cultivate, it is essential, if their beauty and garden value, or even their individuality, are to be revealed to the full, that this system of grouping should be adopted. In fixing on the size of these groups one has to consider the extent of the shrubbery or garden of which it forms a part. In large gardens and in large shrubberies, broad massive effects can be obtained that would be out of place where

the general scheme is on smaller lines. In grouping it is necessary to observe a strict sense of proportion.

One great advantage in the massing of shrubs must be adverted to; it simplifies the management and reduces the labour of keeping the shrubbery in order. Presuming that the plants were first set closely enough together to pretty nearly cover the ground and produce an immediate effect, when the time comes—as it soon will—that more space is needed for each plant, it can easily be afforded by a judicious thinning out. The trouble and expense of an entire planting are avoided. If, however, either through neglect or deliberate choice, the shrubs are allowed to remain as originally planted the crowding does little harm. Each group becomes, as it were, one plant, and the general effect is not spoilt, as it assuredly is where the shrubbery degenerates into a featureless jumble.

In the initial planning of a shrubbery border an attempt should be made to give it a broken or diversified surface. The ideal of many planters appears to be the achievement of a perfectly symmetrical bank of foliage sloping from back to front. But the general effect is infinitely more pleasing where the groups of taller shrubs are pushed out into a sort of promontory reaching almost or quite to the front, and bays of smaller ones recede towards the back. All that one has to avoid is the overgrowing or hiding of the smaller by the larger.

A True Mixed Shrubby.—There is another type of shrubbery which has also its own distinct attractiveness. This is where each individual has to stand on its own merits, and where no attempt is made to produce broad or imposing effects by associating together a number of similar plants. This plan has, perforce, to be adopted where the space available is restricted, and where the taste of the planter leads him to prefer variety rather than beauty merely. Such an arrangement appeals with especial strength to the connoisseur, and is the one which makes the small garden most interesting. Small choice shrubs, particularly evergreen ones, make extremely attractive narrow borders, assembled together as individuals in this way, only the choice should be confined to slow-growing sorts, not likely to rob or overcrowd their neighbours. Many of the *Ericaceæ*, such as the dwarf rhododendrons, kalmias, etc., are very suitable.

But when one gets away from these neat dwarf shrubs to free-growing, more robust ones, it is unquestionable that a shrubbery built up on the same lines is less easily managed than the one where the grouping system is adopted. It gets out of hand more quickly and demands more persistent attention. Each plant, in order that it may show its true character and beauty, must attain to a certain minimum size and needs a certain space for its development to that size. Once that is filled it

becomes necessary to keep them within their limits by pruning, or else to provide room for their continued growth by an occasional thinning and rearrangement. Such a shrubbery ought never to be allowed to get crowded, otherwise the individuality of each plant is lost. A "loose" arrangement should be maintained. It is because shrubberies made on this plan are so often neglected, and the coarse growing plants so often allowed to crush out the weaker species, that the grouping system is so preferable. For public parks the latter is decidedly the best, as it is also for large private gardens or, indeed, wherever sufficient space is available for planting on broad lines.

It would be absurd to suggest that anyone with a small garden should make what little shrubbery they may have consist of masses of a few things merely. But even in a small garden, if the planter is using for his shrubbery three, six, or a dozen of a kind, he will do better to make a group of each sort than to sprinkle them over the whole length of his border. It is for new shrubberies that the grouping system is so desirable. In old, well-managed ones, planted in the mixed style, each plant is attaining or has attained its full size, and produces somewhat the same effect as a group of younger ones. Here, at any rate, dignity is not lacking. But nothing can look more feeble than the common mixed shrubbery in the early years of its being.

CHAPTER VIII

STAKING OR OTHER MEANS OF SUPPORT.

THE artificial support of trees is mainly a concomitant of transplanting. Trees grown on without removal from the spot where the seed was sown, or even those given permanent places when quite young, rarely need support. It is the tree that has attained a considerable size and then been torn from its anchorage that requires artificial assistance to withstand storms. The sooner a tree, and to a less extent, a shrub, is given its permanent place the better, consistent with its safety and capability of holding its own among other plants.

A tree, say 6 ft. or more high, planted in an exposed position must often be given support, unless it has been shifted with a heavy mass of soil attached to its roots. If the plant has been removed without soil, the usual support is afforded by a stake proportionate in length and thickness to the main stem of the tree, and driven firmly into the ground. Some regard must be paid to the avoidance of injury to the roots in driving in the stake. It must be well sharpened, so that it forces its way between the roots a little distance from the stem, rather than crushes through them. It is an excellent plan to drive in the stake *before* the tree is planted and arrange the roots around it. It is only necessary, especially if the soil has been trenched deeply, to see that in the inevitable settling of the soil the ties do not cause the tree to be suspended rather than settle naturally with the soil.

A stake should not go any higher than necessary. It is by no means an object of beauty, and should be as unobtrusive as possible. The chief aim is to keep the stem perfectly steady at the base until the roots themselves are capable of doing it. If a newly planted tree is allowed to sway about so that the base of its stem forms a socket in the soil, its progress will be slow and its appearance ungainly. A short, stout stake standing 3 ft. out of the ground will prevent this better than a longer thin one. (The use of a stake for straightening the crooked stem of a young tree by bracing the two together is a quite different object.) Some soft or elastic substance should be inserted between the tying material

and the stem, and between the stem and the stake, to prevent the ties cutting in and chafing.

A useful temporary support for newly planted trees of goodly size is afforded by affixing three pieces of cord, or, still better, three wires, to the stem well up the tree, and then fastening the lower end of each to a stout stake driven in the ground at equal distances round the tree. Transplanted trees with low branches can also be well supported without any risk of injury by securing three or four of the branches to stout stakes at intervals round the tree near its circumference. Any form of artificial support should be removed as soon as possible; it is unsightly, often through neglect causes damage by chafing or the cutting in of the ties, and, once firmly established, the tree is better without it.

Under TRANSPLANTING, I have advised the reduction of the top-growth with the object of partially restoring the balance between branch and root that must nearly always be more or less disturbed by that operation. It has the further advantage of reducing the power of wind on newly planted trees, and thus rendering staking or other means of support for them less needed.

CHAPTER IX

PRUNING TREES AND SHRUBS.

THE art of pruning as applied to ornamental trees and shrubs may be said to serve one or more of the following purposes:—To improve or alter the shape and appearance of the plant; to increase the quantity and improve the quality of the blossom; to bring about an improvement in health. Of all the arts that go to make up horticulture, pruning is the one most frequently misapplied. Its proper practice necessitates an intimate acquaintance with the habit and nature of the subject operated on. For instance, a collection of flowering shrubs, in so far as they need pruning at all, cannot be pruned properly unless the workman knows the time of flowering of each one. Again, the aim in pruning a large-growing tree is to make it as perfect a specimen of its kind as possible; contrary to the ideas of many, it is not intended to bring it to some arbitrary, more or less formal, outline. Therefore a knowledge of its size and habit is essential. Unless the operator possesses such knowledge the plants are best left alone, for bad pruning or pruning without a definite aim is worse than none.

Pruning for Shape.—Pruning for the purpose of regulating the shape and size of a tree or shrub is usually practised in order to maintain it in some conventional form, such as is seen in topiary work, clipped hedges, rounded or pyramidal bushes, etc. This kind of pruning is of the simplest, being, as a rule, a mere process of clipping. Such matters as time of flowering and habit are of no moment. The chief question is, when is the best time to prune?

Fully grown hedges or bushes of yew, holly, and box are usually clipped in July or August. During these months work in the garden is often less pressing than at other times, and they are as suitable as any other. The plants, moreover, retain their neat appearance throughout the autumn, winter, and spring months. With young hedges more careful procedure is necessary. The clipping should be done earlier, say in June, and a second shortening back of the stronger growths take place in September. This more frequent pruning is necessary to give a thick base

to the hedge or bush. When old hedges need cutting back to the bare wood, as they occasionally do, the work should certainly be undertaken in spring so as to allow the longest possible period for the naked places to become furnished with growth again. The inside branches of a hedge or clipped bush are necessarily stunted and gnarled, and do not break readily into new growth. The same rules as to time of pruning apply also to those level banks of cherry laurel and rhododendron, so often employed to furnish shady places in gardens. The ordinary annual pruning may be done between July and September, but the occasional hard cutting back must be done, say, in March or April.

Pruning large-growing Trees.—This branch of pruning is not generally understood nor often practised. The great majority of trees are planted and left to assume such forms as conditions and circumstances permit. It is the pruning of ornamental trees only that is in question. Forestry, or the growing of trees for profit, is a thing quite apart from ornamental arboriculture in park and garden. The forester aims solely at building up a trunk which will yield the maximum amount of useful timber, whilst the tree occupies the least possible space. The main object of the arboriculturist is to so control the growth of his trees as to produce individually beautiful specimens. He may desire a noble contour of branch and foliage, or a lofty tree showing a fine trunk, or one with its leafy canopy reaching to the ground; but the production of cubic feet of timber is, in itself, a secondary matter.

In pruning such trees as I am now considering—the oaks, elms, ashes, maples, chestnuts, and others of a similar type—it is rarely necessary to give any consideration to the production of flowers and fruit. The flowers are frequently of little beauty, and even in the case of beautiful flowering trees, like the horse-chestnut, such pruning as is required should be done before the trees reach their adult stage. It may be said of all trees that the earlier their training is commenced the less of it will be needed.

Formation of the Tree Trunk.—In the great forest areas of the globe trees are generally found growing in masses and as close together as their minimum requirements of light and space permit. The trunks which the forester loves to obtain are straight, erect, and naked, the branches being killed off by want of light as the tree increases in height, leaving only the canopy of leafy growth at the top. Only occasionally are there found wild specimens well filled out on every side, evenly balanced, and furnished almost to the ground with foliage, such as it is generally the planter's aim to obtain in pleasure-grounds and gardens. In these latter places, however, where often trees from many different parts of the world are congregated on a few acres of ground, and planted singly or in small groups, many species, especially those of exotic origin,

have a tendency to become unduly bushy-headed and dumpy in appearance, and to lose that stateliness which properly proportioned height and breadth give. The first aim in pruning is to prevent this deformity and to obtain a straight strong trunk or central axis of sufficient height.

There is also another consideration. No danger to big trees is so common as that which arises from the forking of the trunk. This divides the tree into two, three, or more parts, which do not always sway in unison during high winds, in consequence of which a crack starts sooner or later at the fork. Damp enters, fungoid parasites follow, and finally a storm comes which rends the tree in twain. In sheltered places and in plantations the danger from winds is not great; but the majority of our specimen trees are given space for their fullest development and need a strong single bole. Most people admire loftiness in trees, but height in isolated specimens adds to the risk of damage by wind. It will nearly always be found that trees of great age and size are comparatively low and spreading, or, if they are lofty, their trunks are undivided for the greater part of their length. All the lofty trees of the earth—the gum trees of Australia, the pines, firs and sequoias of North America, and the palms of the tropics—are of this type.

The Leading Shoot.—To secure the development of a trunk of this character, it is necessary to keep a watch on it when it is young. The first and most important point is that it should always be kept to a single leading shoot. As long as the top of the tree remains accessible to the pruner, rival leaders should be shortened back or removed; and if the original leader by accident gets broken, it should be replaced by another shoot. In most of our deciduous trees a suitable side shoot near the top can usually be selected to replace the broken leader. It should, if necessary, be brought into position by tying to a stake, and may be encouraged to make headway by pruning back other shoots near that might otherwise assume the lead.

But many CONIFERS, especially those of the spruce and fir tribes, produce their branches in regular tiers or whorls, and such branches are of no use for replacing a lost leading shoot. They are not capable of transforming themselves into erect-growing shoots, and if one be tied up it always tries to regain its original horizontal or drooping position. Propagators of these conifers experience the same difficulty when they attempt to increase their stock by grafting, or rooting, side branches. To obtain a new leader for these trees, the broken one should be cut off close to the uppermost tier of branches, and this tier, and, in cases, the one below, must also be very much shortened back. This will cause the cut-back leader to push out one or more shoots of the erect-growing kind, the most vigorous of which must be selected as the new leading shoot and the others removed.

When a tree has reached, say, half its natural height, oftener much less, it may be left to itself, for it will nearly always be found that once a strong leading shoot has developed it will retain its predominance, provided no accident occurs, for as long as the natural form and habit of the tree allow.

Side-pruning.—The greater proportion of the trees used for furnishing our gardens are of exotic origin. Species from all the cool temperate regions of the globe, inhabiting, in their native state, every variety of position and climate those latitudes afford, are brought under practically uniform conditions in the few acres of a British garden. It happens, therefore, in even the most favoured places, that some of the trees are not given the conditions most suitable for them. The effect (especially on species from somewhat warmer countries) is often shown in a tree assuming a stunted, bushy habit under cultivation, whereas in its own home it is lofty and graceful. In such cases it is the work of the pruner to aid the tree in assuming its natural form.

This can be done by two methods. The horizontal development of such trees, as opposed to their vertical development, should (1) be checked by pruning back the side branches. The cut should, as often as possible, be made at a fork, so as to leave a smaller branch with its twigs, rather than a stump. The operator's judgment should also be exercised as to whether (2) a proportion of the branches should not be entirely removed. A comparison of the number of branches on a young tree with those of a fully grown example of the same species shows how drastically Nature thins the branches. The pruner should be guided by this fact in such cases as those under discussion and remove too crowded branches. As a matter of fact, experience has proved conclusively, over and over again, that a tree may be brought out of its stunted state and made to grow again in height by this process alone. The importance of shaping a tree into its proper form whilst it is still young cannot be too strongly insisted on. Much trouble may be saved by removing superfluous and wrongly placed growths whilst they are still young and succulent. Without developing a rigid formality of outline, a young tree should, nevertheless, be kept in the main to a pyramidal shape. This is, in fact, involved in the maintenance of a due balance and symmetry of the branches and the predominance of the leader. Moreover, it is the natural shape of nearly all young trees of the type now under discussion—the larger growing trees of our gardens and parks—as may be noticed from any healthy, uninjured, self-sown young tree. But provided the main fact is recognised, this question as to where symmetry and balance merge into mere formality may very well be left to individual taste and judgment.

The pruning of specimen trees may be summarised thus: keep them

to a single leading shoot; thin out and shorten back the branches of stunted or unduly spreading specimens; preserve, in the main, a conical or pyramidal shape whilst they are young. When once the basis of a trunk has been developed sufficiently, the tree may be left to assume that natural shape and outline characteristic of the species to which it belongs.

Removing Large Limbs of Trees.—The question is frequently asked, what is the best season of the year at which to remove limbs of trees? For such dry woods as oaks, beeches, hornbeams, etc., I find by experience that the season does not matter at all, providing the wound is immediately coated with coal tar. But it is different with the more sappy woods like birch, horse-chestnut, many maples and conifers. The "bleeding" of such trees is often long-continued, and causes much debility if branches are removed in spring; whilst in the case of some conifers it has been known to cause death. The best time for removing branches from such trees, and indeed the safest generally, is November. The flow of sap then is much reduced, and the maximum period is allowed for the surface of the wound to harden, and the coating of tar to set before active growth recommences. The removal of big limbs should be resorted to only when absolutely necessary. It is always dangerous in the case of soft woods like birch, lime, and horse-chestnut, and except in the case of neglected trees, it constitutes no part in the routine of any proper system of pruning. But where limbs have been partially wrenched off by storms, or where questions of safety or other considerations necessitate their removal, it should be done preferably at the time of year recommended above, and in the manner now to be described.

Large branches should always be removed in at least two pieces. Usually they should be cut off in several; but this is a matter to be decided on the spot. One thing, however, is necessary for the proper finishing of the work, and that is, the *last* piece to be sawn off should be light in weight, and only from 6 to 12 ins. long. If the attempt be made to remove a big, heavy branch close to the trunk in one cut, it nearly always results in an unsightly wound, owing to the branch breaking away when the saw is about half-way through the cut, and tearing away part of the bark of the trunk.

A limb or branch must always be *cut off so close to the trunk or larger branch from which it springs that no stump at all remains*. The old, but very pernicious, practice of leaving a stump a few inches long is still too often adopted. It is curious how such a practice lingers in spite of endless examples of its evil results. The stump is sometimes left, I believe, with a view to its ultimate removal, the idea being that this is not such a shock to the tree as close amputation at once. Another advocate of the practice will tell you the stump "draws the sap"—a phrase of obscure meaning, but intended, I believe, to convey the idea that the

sap flows more freely to the wound, and heals it more quickly than when the branch has been sawn close off. The fact is, many "tree-doctors" of the present time have no more real understanding of their work than the fifteenth-century practitioner on the human frame had of his.

Dressing a Wound.—The virtues of ordinary coal tar (as it comes from the gas works) as a dressing for cut surfaces are not generally known. All the raw places left by removing branches or stumps of branches should be covered with this antiseptic substance, and the coating should be renewed as often as is necessary till the wound is covered with new bark. The best armour that a tree can have to protect it against fungoid enemies is that with which Nature has provided it, viz., its bark. But when accident has caused a flaw in the armour, the most efficient substitute, in my experience, is coal tar. Stockholm tar, creosote, and preparations of pitch are also used. The practice of nailing lead or zinc over wounds is a mistaken one unless the surface is tarred over first. It affords no genuine protection against fungoid parasites, and hides whatever mischief may be going on underneath.

Pruning of Flowering Shrubs.—As a general rule, evergreen shrubs do not need pruning at all in a systematic way. Such plants as rhododendrons, arbutuses, kalmias, and others of the heath family, *Berberis Darwinii* and *B. stenophylla*, etc., if they need pruning at all, require it only to improve or alter their shape, or to prevent their becoming too large for their quarters. In such cases pruning should be performed as soon as the flowering season is over. Sometimes evergreen shrubs become thin and lanky in growth, and can only be brought back to a sturdy vigour by pretty hard pruning. This should be done in spring just before the recommencement of growth, so as to allow as long a season as possible for them to become leafy again. This is all the more necessary because one may have to cut back to oldish wood, which does not break so freely. A season's flower must be sacrificed unless the plant is a very early flowering one.

Autumn-flowering heaths, such as *Calluna vulgaris*, *Erica Tetralix*, *E. vagans*, *E. ciliaris*, *E. cinerea*, etc., are much improved by being cut back in spring before new growth starts. This removes the old flowering twigs of the previous season, and helps to keep the plants dwarf. It is the more necessary because of the long, lank growth these heaths make in garden soils, as compared with the hard, dense growth of the wild moorland plants. They should not be clipped back farther than the wood of the previous season.

Deciduous Shrubs.—The pruning of this class of plants, where it is necessary at all, has to be regulated in accordance with the flowering season of each species. For the present purpose they may be roughly divided into two groups, viz.:—(1) Those that flower on the current

season's growth; and (2) those that flower from the wood of the previous year. The first group is much the smaller. It comprises *Ceanothus azureus*, its varieties and hybrids; *Spiræa japonica* and its allies, *S. Lindleyana*, *Hydrangea paniculata*, *Genista tinctoria*, etc. All these shrubs blossom in the latter part of the season; their flowering is, indeed, the culmination of the season's growth. In the second group the flower-buds are formed during the summer and autumn, and remain dormant throughout the winter. To it belong the cherries, spring-flowering spiræas, wild roses, barberries, and, in fact, all the earlier flowering trees and shrubs, which, of course, constitute the great majority.

Briefly stated, the rule which indicates the time to prune all flowering trees and shrubs is this: *Prune at such a season as will allow of the fullest possible period of growth before the next flowering season comes round.*

The first group—those whose flowers are borne on the growths of the current year—should be pruned during winter or early spring; at any rate before growth recommences. The previous year's wood may, if necessary, be cut back "hard," that is, to within a few buds of its base. Such hard pruning, however, is only desirable where the shrub is already as large as is required. Small specimens need only the ends of the shoots removed. It must here be mentioned that a small proportion of our second group have to be pruned in the same manner as that just described. These are the very earliest flowering trees and shrubs, such as Forsythias, peaches, almonds, *Prunus triloba*, *Erica carnea*. Although they blossom on the wood of the previous year, they do so before new growth has started, and if they are cut back as soon as the flowers are past, it is only the old flower-bearing wood that is removed. The entire growing season still remains for the development of the new wood.

Thinning.—I now turn to the remainder—those that flower on the previous season's growth but concurrently with, or later than, the development of the new. These cannot be cut back in the way prescribed for the previous group. To do so early would be to remove all the flowers; to do so later would be to rob the shoots of their best season of growth. Therefore such pruning as is done must be deferred until after flowering, and it must be a form of thinning rather than a process of shortening back.

The term "thinning," as used in the present connection, implies the weeding out of all weakly, crowded, and superfluous shoots and the removal also, if necessary, of a proportion of the stronger ones. Many shrubs, such as the earlier flowering spiræas, the shrubby loniceras, philadelphuses, and deutzias, have a natural tendency to thicken into a dense mass of twiggy growth. A judicious thinning-out, such as that

just mentioned, not only promotes the development of a cleaner, stronger growth, and consequently finer flowers, but it often gives also a more graceful aspect to the plant. It need not necessarily be an annual operation, but the questions, how often? and how much? must be left to the pruner's judgment. The "thinning-out" style of pruning may be applied more or less to nearly all flowering shrubs; but the shortening back style of pruning must only be adopted for those that have a full season of growth between the pruning and the next flowering season.

There are some shrubs, of which *Philadelphus Lemoinei* may be taken as an example, whose growths have the power of renewing themselves from the base every year. This philadelphus flowers about midsummer, by which time the new shoots are 6 to 12 ins. long. By cutting away the entire flowering shoots as soon as the blossoms are over, the plant is reduced to a cluster of new growths springing from near to its base. These now obtain the maximum of light and air, and during the season get to be 1½ to 2 ft. long. Nearly the whole of this will produce flowers the following year, and is in turn cut away as soon as they are faded. By this treatment *P. Lemoinei*, which is naturally about 6 ft. high, may be kept less than half as high, and be made to produce a very much larger crop of flowers—for the whole plant is made up of flowering wood. *Cytisus purpureus*, Crimson Rambler rose, and others of the polyantha group, can be treated in the same way.

CHAPTER X

CARE OF OLD TREES.

ONE frequently sees, in old gardens especially, trees which, although aged and decrepit, are still precious because of their history and associations, or valued perhaps for their size and rarity. There can be no question that the term of years of many such trees is shortened by neglect and wrong treatment. The commonest sources of decay are starvation at the root, droughty summers, and fungoid parasites. For remedying the first the notes on MULCHING (p. 38) should be consulted; the second, of course, is a question of water supply; but these two together do not hasten the end of trees so much as disease, due to the entry of parasitic fungi. The most important of all matters concerning the longevity of trees is the maintenance of a whole skin. But there are many ways in which it may be broken. Insects may bore through the bark, frost sometimes ruptures it, and winds break off the branches and twigs. The last is the commonest source of decay, augmented often enough in gardens by the practice of leaving stumps so long that the bark cannot grow over them (adverted to above), and by leaving raw surfaces unprotected by tar. The raw or jagged surfaces afford a resting-place for moisture and fungus-spores, decay commences and gradually finds its way inwards, until the trunk is reached. But if branches or snags are sawn off as advised above, and the wounds kept covered with tar, the new bark commences to creep over the cut surface from both sides until, if it be not too large, it fills up to the middle, and forms a perfect covering for the wound, of which, in time, all evidences disappear.

Treatment of Hollows in Trees.—From what has just been written it will be seen that the formation of hollows by decay in the branches and trunks of trees is to a great extent preventable. With regard to hollows that already exist, the following treatment is recommended. First remove all, or as much as possible, of the decayed wood, especially the soft, brown, crumbling wood, and the sappy mass found at the bottom. Sound dead wood that has become dry and hard does not matter. Then wash the surface of the wood with a solution of carbolic acid or with

creosote. The carbolic acid solution is made by mixing one part of "commercial" carbolic acid (liquid) with twenty parts of methylated spirit. After this has become dry, a good thick coating of coal tar should be laid on. The object of this antiseptic treatment is to destroy the parasitic fungi and arrest, as far as possible, the decaying process. Hollows that have taken the form of pockets and hold water must be thoroughly drained; the bottom of the hole may be located by poking down with a piece of stiff wire, and its situation marked on the outside of the trunk; a hole must now be bored with an augur from the outside upwards in a slanting direction to the bottom of the hollow, by means of which the moisture can escape and wet decayed matter can be extracted. The hollow or pocket must now be filled up and made watertight, but when once the holes have been cleaned out and drained there is no need to hurry; it is best to let the surfaces get dry before the rest of the work is done. The best "stopping" for small holes is Portland cement, or for small round ones a plug of oak will do (as for the augur hole mentioned above). For very large holes the aid of the bricklayer may be obtained. After the bricks are laid they should be surfaced with cement. In the case of black trunks the outer layer of cement should be heavily dusted over with soot, or lampblack may be mixed with the cement. Asphalt has been recommended in place of cement for "stopping," but I have not tried it.

The chief points are: the keeping out of moisture, and the provision of a surface over which the new bark may grow. If the tree is in a state of vigorous health, as many hollow trees are, the bark will in time close over the "stopping," just as it will over the flat sawn surface where a branch has been newly removed. But unless some such surface is provided on which the new bark can set itself, it forms thickened rolls all round the rims of the hollow, and these in hollows of large size will never meet and close up.

Supporting heavy and dangerous Branches.—The dismemberment of large old trees whose limbs, having become unduly heavy, are at the mercy of an unusually fierce wind, or a heavy fall of snow, may often be prevented or long deferred by supporting the branches to the main trunk, or to one another. The usual method of doing this is to place an iron band, or collar, round each of the two branches that have to be connected and joining them together by means of a chain or iron rod. The iron band should be made with a hinge on the outer side, so that it can be easily removed when the branch has grown too large for it. The great defect of this system is, that the iron band presses on the bark and tends to check the flow of sap, so that the branch soon begins to thicken above and below it. If the band is not moved in time it will become entirely embedded. The remedy is, of course, to move the iron

collar slightly up or down the branch and readjust it to the increased girth of the branch, which is why a hinge is useful. The unfortunate thing is, that this duty is so often neglected that the iron collars in time become hopelessly embedded in the limbs. It is one of the commonest sights in gardens.

The collar and chain system is quite efficacious, but it is more or less troublesome. I strongly advocate an entirely different plan, which has been adopted at Kew for the last twelve or fifteen years with entirely satisfactory results for dry-wooded trees. Instead of supporting the limbs by connecting them together in the old-fashioned way described above, a hole is bored right through the centre of each limb with an augur; they are then joined together by a steel rod proportionate in thickness and strength to the weight of the limbs. The outer side of the limb is supported by an iron plate held on to the end of the steel rod by a screw nut. This iron plate should be bent so as to fit the circumference of the limb, and it should be let into it slightly by cutting out the bark with hammer and chisel. If each end of the steel rod is threaded, the branches can be braced together by screwing up the nut that holds the plate in place. The advantage of this system is that no further trouble is involved—the job lasts as long as the rod and plate do. The bark may in time grow over the plate on the outside, but that is an advantage rather than otherwise. That part of the rod which passes through the limb should be smeared with coal tar before being pushed in, and the openings should be made water-tight. The augur-hole should, however, be only large enough for the rod to be thrust through. The supports are very frequently placed too low down on the branches. The strain on them there is naturally much greater when the branches are swaying than it would be if they were placed towards the summit, where a thinner rod, or chain and band, would suffice. In most instances the tree really requires but little artificial help, for Nature has endowed it with an enormous self-sustaining power. The forking trunk alluded to on p. 47 is the commonest instance of the need of artificial support.

As an alternative to the use of these artificial supports for heavy branches, there is often that of reducing their weight by pruning. It should, of course, only be resorted to when it will leave the contours of the tree unspoilt. (See notes on PRUNING.)

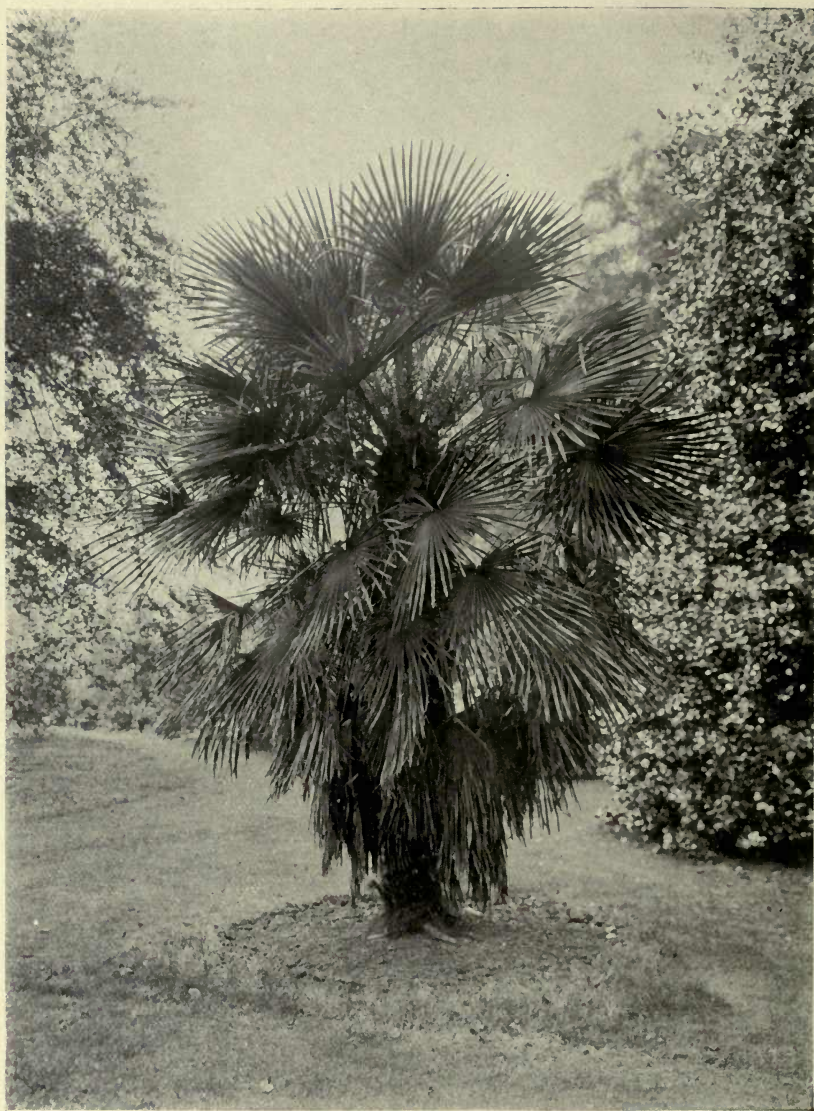
CHAPTER XI

EVERGREEN TREES AND SHRUBS.

IN no class of outdoor plants is our indebtedness to the floras of other countries so evident as in the case of hardy evergreens. The broad-leaved evergreens, as distinct from conifers, represent a type of vegetation which is essentially a tropical and subtropical one. As one gets farther from the equator their gradual displacement by deciduous vegetation and conifers becomes more and more marked. In Great Britain we have the box, the holly, the yew, the Scotch pine, common juniper, gorse, various heaths and other low shrubs, and the ivy. In S.W. Ireland these have a remarkable addition in *Arbutus Unedo*, the strawberry tree.

Conifers and dwarf, small-leaved evergreens of the heather, crowberry, and *Vaccinium* type are some of the hardiest plants of the globe. But most of the choice evergreens of the garden type—broad-leaved trees, or shrubs too tall to be covered by snow in winter—are dependent for their welfare on two conditions, viz., an equable climate and an abundance of moisture at the root and in the atmosphere. They will always be found most abundant, both in nature and under cultivation, where the rainfall is greatest and the climate free from great extremes of heat and cold. Our islands, especially on the western side, afford conditions better adapted to their cultivation than perhaps any other part of northern Europe of similar extent. Japan with its insular climate, and western S. America, bathed with moisture from the Pacific, are both singularly rich in evergreens.

Four of our native evergreens still hold a position of supremacy in spite of the number of their foreign rivals. These are the holly, yew, box, and ivy, each of which fills a place in gardens no exotic evergreen could occupy. With regard to the ivy, it is a singular fact that it is still not only the best, but practically the only genuinely hardy climbing evergreen. The scarcity of evergreen climbers in gardens has been but little relieved by recent exploration in China and elsewhere. Their meagre number in cool temperate regions is even more marked than that of bushy evergreens.



CHUSAN PALM, *Trachycarpus Fortunei*.

The leading conditions suitable for evergreens, more especially foreign ones, have already been indicated, viz., moisture and an equable climate. On the cultivator it becomes incumbent to provide these conditions to the best of his ability. Broad-leaved evergreen shrubs of any rarity or value should be given sheltered spots where the soil is not liable to become parched. The last places for them are high and dry exposed ones. It is unnecessary here to pass the cultivation of evergreens (so far as it differs from that of deciduous shrubs) in review. It is dealt with in the body of the work and may be found by reference to the pages on which the genus and species are described. (See also chapter on TRANSPLANTING.)

The following is a selection of the best evergreens, omitting conifers; those marked * have beauty of flower; those marked † require some protection at Kew:—

TREES.

**Arbutus Menziesii*.
Castanopsis chrysophylla.
Eucalyptus Gunnii.
Ilex Aquifolium and vars.
Laurus nobilis.
 **Magnolia grandiflora*.

Quercus densiflora.
 " *Ilex* and vars.
 " *Lucombeana crispa*.
 " *Suber*.
Trachycarpus Fortunei.
Umbellularia californica.

SHRUBS, *Medium and Large*.

**Arbutus Andrachne*.
 * " *hybrida*.
 * " *Unedo* and vars.
 **Arctostaphylos Manzanita*.
Arundinaria anceps.
 " *fastuosa*.
 " *japonica*.
 " *nitida*.
Aucuba japonica and vars. (handsome in fruit).
Azara microphylla.
 **Berberis Aquifolium*.
 * " *buxifolia*.
 * " *Darwini*.
 * " *Hookeri*.
 * " *japonica* and vars.
 * " *pinnata*.
 * " *stenophylla*.
Buxus balearica.
 " *sempervirens* and vars.
Cassinia fulvida.
 †**Ceanothus papillosus*.
 †* " *rigidus*.
 * " *thyrsiflorus*.
 **Choisya ternata*.

**Cistus cyprius*.
 * " *laurifolius*.
 * " *Loreti*.
Cotoneaster buxifolia (handsome in fruit).
 " *Franchetii* (do.).
 " *pannosa* (do.).
 " *salicifolia* and vars.
 " *turbinata*.
Daphne Laureola.
Daphniphyllum macropodum.
Elæagnus glabra.
 * " *macrophylla*.
 " *pungens*.
 **Erica arborea*.
 * " " var. *alpina*.
 * " *australis*.
 * " *lusitanica*.
 * " *mediterranea*.
 * " *stricta*.
 **Escallonia exoniensis*.
 †* " *floribunda*.
 * " *langleyensis*.
 †* " *macrantha*.
 †* " *pterocladon*.
 * " *rubra*.

Euonymus japonicus.
 *Fatsia japonica.
 *Garrya elliptica.
 Gaultheria Shallon.
 Hedera Helix arborescens.
 „ colchica arborescens.
 Ilex cornuta.
 „ crenata.
 „ integra.
 „ Pernyi.
 *Kalmia latifolia.
 *Ledum latifolium.
 *Leucothœ Catesbæi.
 Ligustrum lucidum.
 „ Pratii.
 *Olearia Haastii.
 Osmanthus Aquifolium and vars.
 „ Fortunei.
 Pernettya mucronata (handsome in fruit).
 Phillyrea angustifolia.
 „ decora.
 „ latifolia.
 Phyllostachys aurea.
 „ Castillonis.
 „ Henonis.
 „ nigra.
 „ Quiloi.
 „ viridi-glaucescens.
 *Pieris floribunda.
 „ japonica.
 Prunus Laurocerasus and vars.
 „ lusitanica and vars.
 Pyracantha coccinea (handsome in fruit).
 Quercus acuta.

Quercus coccifera.
 „ cuspidata.
 „ glabra.
 „ phillyreoides.
 *Raphiolepis japonica.
 Rhamnus Alaternus.
 *Rhododendron amœnum.
 „ Augustinii.
 „ campylocarpum.
 „ catawbiense.
 „ cinnabarinum.
 „ ferrugineum.
 „ Fortunei.
 „ ledifolium.
 „ racemosum.
 „ Smirnowi.
 „ Thomsonii.
 „ yunnanense.
 „ many garden vars. and hybrids.
 *Rosmarinus officinalis.
 Skimmia japonica (handsome in fruit).
 Vaccinium ovatum.
 *Veronica anomala.
 „ Darwiniana.
 „ Traversii.
 Viburnum Henryi (handsome in fruit).
 „ rhytidophyllum (do.).
 „ Tinus and vars.
 „ utile.
 *Yucca glauca.
 „ gloriosa.
 „ recurvifolia.

SHRUBS, *Low.*

*Andromeda polifolia.
 *Arctostaphylos Uva-Ursi.
 Berberis buxifolia nana.
 „ candidula.
 „ repens.
 „ verruculosa.
 *Calluna vulgaris and vars.
 Corema album.
 Cotoneaster congesta.
 „ microphylla.
 „ thymifolia.
 *Daboecia polifolia.
 Danaë Laurus.
 *Daphne Cneorum.
 „ neapolitana.

*Daphne retusa.
 Daphniphyllum humile.
 Empetrum nigrum and vars.
 Ephedra Gerardiana.
 *Erica carnea.
 „ ciliaris and vars.
 „ cinerea.
 „ darleyensis.
 „ Tetralix.
 „ vagans.
 Euonymus radicans and vars.
 Eurya japonica.
 Gaultheria procumbens.
 Gaylussacia brachycera.
 Hedera colchica.



YUCCA RECURVIFOLIA.

L.]

[Face p. 58.

Hedera Helix and vars.
 *Helianthemum formosum.
 Ilex crenata Mariesii.
 *Leiophyllum buxifolium.
 Lonicera nitida.
 *Rhododendron flavidum.
 * " intricatum.
 * " lepidotum.
 Ruscus aculeatus (handsome in fruit).
 " Hypoglossum.

Skimmia Fortunei (handsome in fruit).
 Vaccinium Vitis-Idæa.
 *Veronica carnosula.
 * " Hectori.
 Viburnum Davidii.
 *Vinca major.
 * " minor and vars.
 *Yucca filamentosa.
 * " flaccida.

CHAPTER XII

CLIMBING SHRUBS.

THE value of climbing shrubs in gardens needs no insisting upon. It is by their means that the most effective of all garden pictures, and the nearest approach to tropical luxuriance can be obtained. The one difficulty in cultivating climbers in gardens is the provision of proper supports for them to grow upon. The most convenient of all is the pergola, a pleasing feature in a garden, but one which it is sometimes difficult to place properly. A pergola should lead up to something, and it ought not to be set down anywhere, irrespective of its surroundings. As a rule it is most happily placed over a path. In our climate I do not favour the pergola with continuous sides and top. On all but the hottest days it is too apt to be suggestive of a tunnel; on wet ones it is absolutely gloomy. This type of pergola has also the disadvantage of putting its best side outwards, especially on the top, so that little of its greenery and few of its flowers can be seen from inside. A pergola consisting of a series of square or rounded arches, 12 to 20 ft. apart, linked together by a chain or lathe on each side is, to my mind, to be preferred. The flowers on each arch and chain can in this way be seen quite well,* and at the sides long hanging shoots may be encouraged to grow.

The most natural support for climbers is other trees and shrubs, but the effect on the latter when allowed to be overrun by a vigorous climber is nearly always deleterious, and may in time be fatal. No one would think of giving up a tree they prized for such a purpose, but common, and especially decaying, trees are very suitable for it. The establishment of a climber in close enough proximity to a tree to enable it to overrun it requires some consideration. It is often of little use planting it at the base of the trunk. Although frequently selected, that spot is too dry and too shady, except in decrepit trees or trees with tall, bare trunks. If any branches come near enough the ground to enable the newly planted climber to be attached to them, that is usually the best place to select. It may be necessary, however, to secure the branch against being blown

about too roughly by storm, and so pulling out the climber with it. A stout post set in the ground may serve at once for the climber to grow up and to secure the branch to. The establishment of a climber on living trees and shrubs is also hampered and delayed by its having their active roots to contend with. A good plan in this case is to sink a tub or barrel, with the bottom knocked out, level with the surface of the soil, and fill it with rich soil, in which the climber is to be planted. This allows it to grow free from interference by other roots for at least a year or two, and thus get firmly established. If the tub be of soft wood it may be allowed to remain and decay. The best sorts for clambering over trees are the stronger-growing vines, especially *Vitis Coignetia*, the wistarias (often very beautiful grown in this way in Italian gardens in April), the more vigorous clematises, *Rosa moschata*, *Celastrus articulatus*, *Lonicera japonica*. For covering tall, naked tree trunks Veitch's Ampelopsis, the true clinging Virginian creeper, and *Hydrangea petiolaris* are useful. The two former colour highly in autumn, and are self-supporting, climbing to great heights; the *Hydrangea* flowers prettily and needs but little artificial support. Many of the rambler roses make charming coverings for the bases of tall trunks if they are allowed to grow loosely.

In most gardens climbers are confined to walls, which they often beautify extremely. But, on the whole, I consider walls should be reserved for tender shrubs, or for those that need them to show their greatest beauty in this country. Such lovely plants as *Ceanothus rigidus*, *C. dentatus*, *Escallonia macrantha*, *E. pterocladon*, *Adenocarpus decorticans* and such interesting ones as the myrtle, pomegranate, and loquat, are not climbers in the strict sense of the word, but ordinary bushy shrubs made to do duty as such. For low walls, or the lower part of lofty ones, they make the most beautiful coverings, and they cannot be satisfactorily grown in the open ground. Such plants as the common pyracantha, *Chimonanthus fragans* and *Jasminum nudiflorum* are perfectly hardy, but in our climate are seen to best advantage as wall shrubs.

For climbers grown in the open ground, the best support is that afforded by branches of oak, ash, or elm set firmly in the ground, and with long snags left on them. A single stout branch with a few long forks makes an admirable support for clematises of medium vigour, jessamines, honeysuckles, *Periploca græca*, *Akebia quinata*, and such like. A collection of about forty species of clematis at Kew is accommodated in this way, or, in the case of the stronger ones, by setting up three or more branches with the tops secured together, so that they form a sort of wigwam or tent. These the clematises soon cover, and although somewhat gaunt in winter, they give a pleasing effect throughout the summer and autumn. The clematises of purely garden origin of the *Jackmani*

and *lanuginosa* groups, etc., are often, unfortunately, very short-lived; the greatest success with them has been obtained by growing them on their own roots (not grafted on *C. Vitalba*), and giving them a position where the lower part of the stem is shielded from the direct rays of the sun.

The principles that govern the pruning of climbers on walls or pergolas are the same as those that apply to ordinary shrubs, dealt with in the chapter on PRUNING (*q.v.*). The operation is regulated by two considerations: viz., the space to be covered, and the time at which the plants flower. As with shrubs in the open, climbers that flower on the growths of the year (or those that flower so early in the season that the ordinary period of growth is not thereby curtailed) should be pruned in spring. Those that flower on the growths made the previous summer should be renewed by laying in young wood and cutting out a proportion of the old as soon as the flowers are past. Climbers on trees or wherever space is unlimited need no pruning.

In connection with climbers the following genera and species should be consulted in the body of this work; the list does not include ordinary shrubs made to do duty as climbers on walls.

Actinidia.
Akebia.
Aristolochia.
Berberidopsis corallina.
Bignonia capreolata.
Billardiera longiflora.
Brunnichia cirrhosa.
Celastrus.
Clematis.
Cocculus.
Decumaria.
Eccremocarpus scaber.
Ercilla volubilis.
Euonymus radicans and vars.
Forsythia suspensa.
Hedera.
Holboellia latifolia.
Hydrangea.
Jasminum.
Kadsura japonica.
Lardizabala biternata.

Lonicera.
Menispermum.
Metaplexis Stauntoni.
Muehlenbeckia.
Passiflora cœrulea.
Periploca græca.
Polygonum baldschuanicum.
Rhus Toxicodendron.
Rosa.
Rubus.
Schizandra.
Schizophragma.
Sinofranchetia chinensis.
Sinomenium diversifolium.
Smilax.
Solanum.
Stauntonia hexaphylla.
Tecoma.
Trachelospermum
Vitis.
Wistaria.

CHAPTER XIII

PENDULOUS TREES.

IN the garden proper, pendulous-branched, or "weeping," trees are often undoubtedly very effective ornaments. But it is easy to plant them too abundantly and thus produce an effect of monotony. To my mind a weeping tree is seen to best advantage in a position isolated from other trees. If that position be on a lawn so much the better, for nowhere else do the best of weeping trees, such as the pendulous forms of holly, hawthorn, ash, beech, wych elm, and birch, look so well. A weeping tree is essentially a product of the garden; it has no place in the sylva of the British Isles. Therefore it is better fitted for the trim neatness of the garden than anywhere else. Even in the park, where the grass is grazed or only mown once annually, weeping trees do not meet one's sense of fitness. On lawns near the house, weeping trees of more spreading form, like the beech and wych elm, make delightful shady arbours in summer. Weeping trees, again, have a peculiar value in association with buildings whose contours are severe and angular, just as rigid-branched trees like cedar of Lebanon enhance the effect of domed buildings and rounded architectural lines generally with which they may be associated.

In the training of weeping trees it is important to attend to the training up of one or more leading shoots until the tree has attained the desired height. Unless this is done the tree increases extremely slowly in height, and loses much in elegance by keeping low and dumpy. Many weeping trees are really prostrate in habit, and unless grafted on high standards or artificially trained to form an upright stem, would merely remain low sprawling shrubs. On the other hand, a number of trees naturally pendulous, like *Salix babylonica* and *Tilia petiolaris*, although they form no distinct leader, increase sufficiently in height without assistance, as does also a third type of weeping tree which forms a clean erect leading shoot and stem whilst its branches are pendulous; this latter type is illustrated among others by an ash, *Fraxinus excelsior* var. *Wentworthii*, and a beech, *Fagus sylvatica* var. *miltoniensis*. Other

trees, again, have an erect trunk and leader, more or less horizontal branches and weeping branchlets; they are chiefly found among conifers, and are well illustrated in *Picea Morinda*, *Cupressus nootkatensis* var. *pendula*, and *Taxus baccata* var. *Dovastoni*.

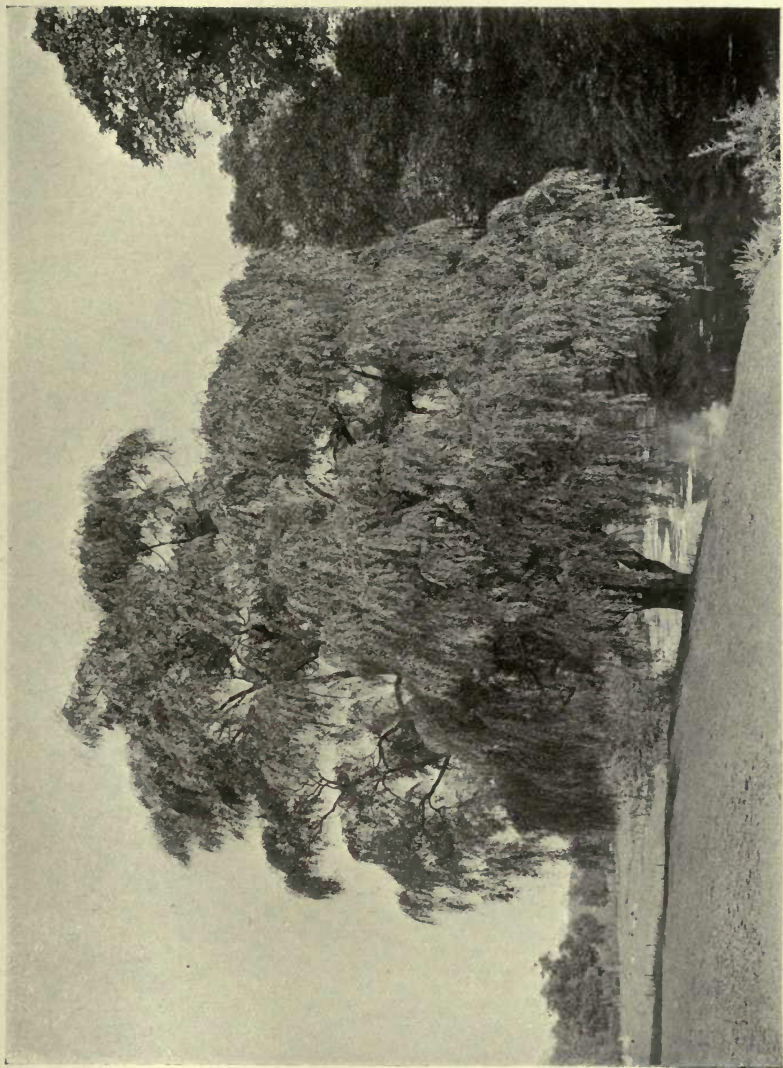
The following is a list of the more important weeping trees and shrubs. Those marked * are naturally pendulous, as distinct from those that have originated as "sports" in gardens:—

Acer dasycarpum pendulum.
Alnus incana pendula.
Betula verrucosa pendula.
 " " *purpurea* pendula.
 " " *Youngii*.
Buxus sempervirens pendula.
Caragana arborescens pendula.
Carpinus Betulus pendula.
Cornus florida pendula.
Corylus Avellana pendula.
 **Cotoneaster multiflora*.
Cratægus monogyna pendula.
Cytisus scoparius pendula.
Fagus sylvatica *bornyensis*.
 " " *miltoniensis*.
 " " *pendula*.
 " " *remillyensis*.
 **Forsythia suspensa*.
Fraxinus angustifolia pendula.
 " *excelsior* pendula.
 " " *Wentworthii*.
 **Genista ætnensis*.
Gleditschia triacanthos pendula.
Ilex Aquifolium pendula.
 " " *argentea* pendula.
 " " *aurea* pendula.
Juglans regia pendula.
Laburnum vulgare pendulum.
Morus alba pendula.
Populus tremula pendula.
 " *tremuloides* pendula.
Prunus Amygdalus pendula.
 " *Avium* pendula.
 " *Chamæcerasus* pendula.
 " *Mahaleb* pendula.
 " *Mume* pendula.
 * " *pendula*.
 " *serotina* pendula.
Pyrus Aucuparia pendula.
 " *prunifolia* pendula.
 " *salicifolia* pendula.

Quercus palustris pendula.
 " *pedunculata* pendula.
Rhus Cotinus pendula.
 **Salix babylonica*.
 " " *annularis*.
 " *Caprea* pendula.
 * " *elegantissima*.
 " *purpurea* pendula.
 * " *Salamoni*.
 " *vitellina* pendula.
Sambucus nigra pendula.
Sophora japonica pendula.
Syringa pekinensis pendula.
 **Tamarix juniperina*.
 **Tilia petiolaris*.
Ulmus montana pendula.
 " *nitens* pendula.

CONIFERS.

Abies pectinata pendula.
Cedrus atlantica pendula.
Cupressus Lawsoniana *glauca* pendula.
 " " *gracilis*.
 " " *pendula*.
 " *nootkatensis* pendula.
Ginkgo biloba pendula.
 **Juniperus formosana*.
 * " *rigida*.
 " *virginiana* pendula.
Larix europæa pendula.
Picea excelsa *Cranstoni*.
 " " *inverta*.
 " " *pendula*.
Pinus Strobus pendula.
Sequoia gigantea pendula.
Taxus baccata *Dovastoni*.
 " " *gracilis* pendula.
 " " *pendula*.
Thuja orientalis pendula.
Tsuga canadensis pendula.
 " " *Sargentii*.



WEeping WILLOW, *Salix babylonica*.

[Face p. 64.

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CHAPTER XIV

FASTIGIATE OR ERECT-BRANCHED TREES.

AMONG the aberrant forms of garden trees those with a pendulous or "weeping" habit are, on the whole, much more planted than those with an opposite tendency of branching. Probably the reason for this is that pendulous-branched trees are prettier and more graceful than the others. A certain kind of sentimentality is attached to weeping trees which is pleasing to many minds. There is more of an aspect of austerity or even rigid sternness about a fastigate tree. Still, if we value trees for the emotions they inspire—and after all that is probably their chief value—there is something to be said for these erect-growing kinds. To me, at any rate, few trees are more admirable than a well-grown, well-placed Lombardy poplar, conveying as it does, in much the same way as a fine church spire, a sense of lofty aspiration.

The value of such trees in the garden landscape is well known, relieving low, monotonous lines of vegetation as they do more effectually than anything else, and enhancing by contrast (as weeping trees do in an opposite way) the beauty and characteristics of other and different types of growth, or even of architecture, with which they may be associated. In the chapter on street planting I have drawn attention to the value of fastigate trees in that connection. This type of tree has, in fact, a very special value for town planting, owing to the small amount of lateral space each individual needs.

Some of these fastigate varieties may be raised from seeds, such as the cypress oak and the Irish yew. Only a small proportion, however, come true; most of them revert to the type, and some show the fastigate shape in a less pronounced degree. To avoid a waste of time waiting to see how the seedlings develop, it is more convenient to propagate them by means of cuttings and grafts. If the typical form of tree from which these fastigate ones have respectively sprung is used as a stock, the latter process is almost free from objection. Cuttings may be employed for all the conifers mentioned below (except the silver fir and the spruce), for the poplars, box, and, with less success, the elms, *Ptelea* and pyruses.

There are probably fastigate forms of more trees than are mentioned below; it is only quite recently that erect-growing forms of beech and Spanish chestnut have come to light. But of common trees I do not know at present that there are any of the following: ash, Turkey oak, lime, durmast oak, sycamore, laburnum, apple, pear, walnut, and field maple. The fact that fastigate, as well as weeping, trees originate only as seedling variations will explain the absence of any fastigate common elm. *Prunus Simoni* appears to be naturally fastigate in its typical form.

Descriptions of each of the following will be found in its place in the body of this work:—

Abies pectinata pyramidalis.
Acer Lobelii.
 „ *saccharum monumentale.*
Æsculus Hippocastanum pyramidalis.
Aralia chinensis pyramidalis.
Betula pumila fastigiata.
 „ *verrucosa fastigiata.*
Buxus sempervirens pyramidalis.
Carpinus Betulus columnaris.
 „ „ *pyramidalis.*
Castanea sativa pyramidalis.
Cephalotaxus pedunculata fastigiata.
Cratægus monogyna stricta.
Cupressus Lawsoniana Allumi.
 „ „ *erecta viridis.*
 „ „ *Wisselii.*
 „ *macrocarpa fastigiata.*
 „ *sempervirens fastigiata.*
Fagus sylvatica fastigiata.
Juniperus communis compressa.
 „ „ *fastigiata.*
Liriodendron Tulipifera fastigiata.
Morus alba fastigiata.

Picea excelsa stricta.
Populus alba pyramidalis.
 „ *nigra italica.*
 „ „ *Thevestina.*
 „ *plantierensis.*
Prunus Padus stricta.
 „ *Simoni.*
Ptelea trifoliata fastigiata.
Pyrus Aucuparia fastigiata.
 „ *pinnatifida fastigiata.*
Quercus pedunculata fastigiata.
Robinia Pseudacacia fastigiata.
 „ „ *monophylla fastigiata.*
Sambucus nigra pyramidalis.
Taxus baccata adpressa stricta.
 „ „ *fastigiata.*
 „ „ „ *aurea.*
Thuya plicata pyramidalis.
Ulex europæus strictus.
Ulmus montana fastigiata.
 „ „ *Wredei.*
 „ *stricta.*
 „ „ *Wheatleyi.*

CHAPTER XV

DWARF TREES AND SHRUBS.

THERE are many places in the garden where dwarf shrubs—shrubs, that is, which never get more than 3 ft. high, or take many years to do so—are almost indispensable. In the Rock Garden, for instance, they are of great value as giving diversity, shelter, and winter-furnishing without encroaching upon or interfering with the regular occupants. In places, too, where plants are wanted not so tall as to obstruct the view, such as in front of windows or alongside low terrace walls, naturally dwarf shrubs are infinitely to be preferred to taller, stronger-growing ones, continually kept low by cropping over with knife or shears. They are also useful in small formal arrangements.

Besides those shrubs whose dwarfness is a natural and specific characteristic, there are numerous others well known in gardens, in which it is an abnormal one. Trees long in cultivation very frequently produce dwarf sports and varieties as well as fastigate and pendulous ones. They mostly retain their dwarfness after being propagated by cuttings or by grafting, and are usually distinguished by such names as nana, pumila, dumosa, and pygmæa. The common spruce, one of the giants of European forests, is very prolific of dwarf varieties; they occur also among other conifers in the Scotch pine, Weymouth pine, Douglas fir, yew, silver fir, Corsican pine, black spruce, common juniper and savin, Lawson cypress and *Cryptomeria japonica*. Some of these forms, although sprung from trees naturally 100 to 200 ft. high, will take twenty years to grow 1 yard high.

The dwarf varieties of deciduous trees are, as a rule, more vigorous in growth than the evergreens, and not so well adapted for the special places mentioned above. They occur in the field and Norway maples, Mahaleb, and gean cherries, *Catalpa bignonioides*, *Viburnum Opulus*, wych elm, common ash, white poplar, *Robinia Pseudacacia*, hawthorn, etc. The dwarf hawthorn (*Crataegus monogyna* var. *semperflorens*) flowers

freely, but some of these dwarf forms are rarely or never seen in bloom—as, for instance, *Catalpa bignonioides nana* and *Viburnum Opulus nana*.

In gardens with a soil free from lime or other calcareous matter, the members of the heath family fill a conspicuous place among naturally dwarf evergreens. It is not necessary here to mention them all. They are dealt with in the body of the work, and many of them may be found by consulting the following genera:—*Erica*, *Calluna*, *Kalmia*, *Gaultheria*, *Rhododendron*, *Phyllodoce*, *Dabæcia*, *Pernettya*, *Cassandra*, *Ledum*, *Bruckenthalia*, *Leucothoë*, *Andromeda*, *Vaccinium*, etc. For other species of naturally dwarf stature the reader is referred to the following genera:—*Astragalus*, *Berberis*, *Corema*, *Cotoneaster*, *Cytisus*, *Daphne*, *Empetrum*, *Ephedra*, *Erinacea*, *Euonymus*, *Helianthemum*, *Hypericum*, *Pachysandra*, *Pachystima*, *Polygala*, *Potentilla*, *Ruscus*, *Salix*, *Sarcococca*, *Veronica*, *Vinca*, *Yucca*.

The following is a list of the more important dwarfs, whose dwarfness is an abnormal character. Such varieties as a rule do not come true from seed:—

<i>Abies balsamea hudsonica</i> .	<i>Fraxinus excelsior globosa</i> .
<i>Acer campestre compactum</i> .	" <i>oxycarpa nana</i> .
" <i>platanoides globosum</i> .	<i>Hypericum hircinum minor</i> .
" " <i>nanum</i> .	<i>Juniperus communis alpina</i> .
<i>Arbutus Unedo compacta</i> .	" " <i>compressa</i> .
<i>Berberis buxifolia nana</i> .	" <i>virginiana compacta</i> .
" <i>Darwinii nana</i> .	" " <i>dumosa</i> .
<i>Betula pubescens crenata nana</i> .	" " <i>humilis</i> .
" <i>verrucosa dentata viscosa</i> .	<i>Kalmia angustifolia nana</i> .
<i>Broussonetia papyrifera laciniata</i> .	" <i>latifolia myrtifolia</i> .
<i>Buxus sempervirens rosmarinifolia</i> .	<i>Lavandula Spica nana</i> .
" " <i>suffruticosa</i> .	<i>Ledum latifolium compactum</i> .
<i>Calluna vulgaris Foxi</i> .	<i>Ligustrum japonicum coriaceum</i> .
" " <i>hypnoides</i> .	<i>Lonicera tatarica nana</i> .
" " <i>minima</i> .	<i>Olearia macrodonta minor</i> .
" " <i>pygmæa</i> .	<i>Philadelphus coronarius nanus</i> .
<i>Caragana arborescens nana</i> .	<i>Picea alba echiniformis</i> .
<i>Cassandra calyculata nana</i> .	" <i>excelsa Clanbrasiliana</i> .
<i>Catalpa bignonioides nana</i> .	" " <i>dumosa</i> .
<i>Cornus Hessei</i> .	" " <i>globosa</i> .
" <i>Mas nana</i> .	" " <i>Gregoryana</i> .
<i>Cratægus monogyna inermis compacta</i> .	" " <i>pygmæa</i> .
" " <i>semperflorens</i> .	" <i>nigra Doumettii</i> .
<i>Cryptomeria japonica nana</i> .	<i>Pinus Laricio pumila</i> .
" " <i>spiralis</i> .	" " <i>pygmæa</i> .
<i>Erica scoparia pumila</i> .	" <i>Strobus nana</i> .
<i>Fagus sylvatica conglomerata</i> .	" <i>sylvestris beuvronensis</i> .
<i>Fraxinus dimorpha dumosa</i> .	" " <i>globosa</i> .
" <i>excelsior atrovirens nana</i> .	" " <i>nana</i> .

Prunus acida humilis.

" *Avium nana.*

" *Laurocerasus compacta.*

" " *parvifolia.*

" *Iusitanica myrtifolia.*

" *Mahaleb globosa.*

Pseudotsuga Douglasii nana.

Ribes alpinum pumilum.

Robinia Pseudacacia Bessoniana.

" " *inermis.*

Robinia Pseudacacia Rehderi.

Taxus baccata nana.

" *cuspidata compacta.*

Thuya dolabrata nana.

" *occidentalis globosa.*

" " *Spæthii.*

" *orientalis globosa.*

Ulmus montana nana.

Viburnum Opulus nana.

CHAPTER XVI

TREES AND SHRUBS WITH HANDSOME FRUITS.

IN gardens attached to houses visited usually, or perhaps only, in the autumn, this group of trees and shrubs possesses a special value. After July very few shrubs are to be had in flower, and the fine-fruited kinds provide a useful element of colour in the dull time that comes between the season of late flower and that of autumn colour. It is also a point in the planting of the parks and gardens of pleasure resorts whose "season" is from July to September that might be given more consideration than at present it receives. The following list may be useful as indicating the most striking of this class; they are all fully described in the body of the work, but the asterisk may be taken as a guide for the best:—

Acanthopanax Henryi and others, black-purple.
 Acer Pseudoplatanus erythrocarpum, red.
 Actinidia chinensis, reddish, edible.
 Ailanthus glandulosa, red and yellow.
 Arbutus Unedo, orange-red.
 *Aucuba japonica, red.
 *Berberis, many species, plum-coloured and red.
 *Billardiera longiflora, blue.
 *Callicarpa japonica, violet.
 *Celastrus articulatus, red and orange.
 „ scandens, red and orange.
 Clematis Vitalba, grey.
 Clerodendron Fargesii, blue.
 „ trichotomum, blue.
 Cocculus trilobus, purple-black.
 Colutea arborescens and others, brown bladders.
 Coprosma acerosa, transparent blue-green.
 *Coriaria, red, yellow.
 Cornus, blue and red.
 *Cotoneaster, red and black.

*Cratægus, red, sometimes yellow.
 Daphne Mezereum, red or yellow.
 Elæagnus multiflora, orange-red.
 *Euonymus, red and orange.
 Fraxinus Mariesii, bronzy red.
 Gleditschia, brown, large pods.
 Hedera, purple-black, sometimes red or yellow.
 *Hippophaë rhamnoides, orange.
 *Hymenanthera crassifolia, white.
 Hypericum Androsæmum, black-purple.
 „ elatum, black-purple.
 Idesia polycarpa, black-purple.
 *Ilex, red, sometimes yellow.
 Jasminum fruticans, black.
 Ligustrum sinense, black.
 Lonicera, red, blue.
 *Lycium, red.
 Magnolia tripetala, red.
 Nuttallia cerasiformis, purple.
 Paliurus, brown, flattish disks.
 *Pernettya mucronata, crimson, purple white.

- Ptelea trifoliata, brown, hop-like.
*Pyracantha, scarlet.
*Pyrus (crabs), red and yellow.
 ,, Aria group, coral red.
 ,, Aucuparia group, red and yellow.
Rhamnus, black-purple.
*Raphithamnus cyanocarpus, blue.
Rhus glabra, red.
 ,, trichocarpa, red.
*Rosa, red and scarlet.
Rubus phoenicolasius, red.
Ruscus aculeatus, red.
Sambucus glauca, blue-white.
- Sambucus nigra, black.
* ,, racemosa, red.
*Skimmia, red.
Solanum Dulcamara, red (poisonous).
Staphylea, brown bladders.
*Symphoricarpus racemosus, snow white.
 ,, orbiculatus, red.
Symplocos, blue.
Vaccinium, black.
*Viburnum, red and blue.
*Viscum, white.
*Vitis heterophylla, porcelain blue.
Zanthoxylum planispinum, red.

CHAPTER XVII

HANDSOME-BARKED TREES AND SHRUBS.

THE value of certain trees and shrubs for making a bright or pleasing effect in winter by reason of their coloured barks has never been fully appreciated. Planted in groups, such plants give masses of soft colour which, in the wilder parts of the grounds at any rate, are more appropriate to our climate and landscape than are variegated evergreens. Near the waterside several willows, such as the red- and yellow-barked forms of *Salix vitellina*, and the blue-white bark of *S. daphnoides* and *S. acutifolia*, are very attractive. But to get the colour finely developed, it is necessary to cut them back every spring, so as to induce the growth of a crowd of wands of goodly length. These are trees, and the colour is, of course, confined to the young shoots and disappears the second year; therefore, a mode of cultivation like this is to be preferred, which causes the plant to renew itself every year from near the base, keeps it continuously of about the same size, and provides the greatest proportion of highly coloured young wood. The best willows are *Salix vitellina* (yellow) and its var. *britzensis* (red).

Next to the willows are various species of *Cornus* or cornels, amongst which, with red stems, we have *C. alba*, *C. alba* var. *sibirica* and other varieties, *C. Baileyi* and *C. stolonifera*. *Cornus stolonifera* var. *flaviramea* has yellow shoots. Being naturally shrubs, these cornels do not need to be kept artificially dwarf like the willows; but they are all the better if the older branches are occasionally cut out so as to encourage new basal growths. Two good variegated forms of *C. alba*, viz., *Spæthii* and *sibirica variegata*, will recommend themselves to many by their winter as well as summer beauty. The young shoots of *Berberis virescens* are red the first winter.

A group of shrubs which has received several additions in recent years from China are the white-stemmed species of *Rubus*. The whiteness (usually bluish) is caused by an external layer of waxy particles on the bark. For many years the Himalayan *R. biflorus* has been known in gardens, and it is still one of the most striking of the group. *R. Girdaldianus* and *R. biflorus* var. *quinqueflorus*, both new and from China,

are perhaps the best. The character is displayed in a less marked degree in *R. lasiostylus*, *R. coreanus*, *R. occidentalis*, *R. thibetanus*, and in our native dewberry, *R. cæsius*.

Of a different type of whiteness is the silvery hue of the birches, amongst which the common *B. verrucosa* occupies a foremost place. Perhaps even more silvery are the trunks of *B. papyrifera* and *B. Ermani*. Others of a similar character are *B. utilis* and *B. Jacquemontii*. All these give charming winter effects, especially in association with evergreens. Several birches, especially when young, have rich reddish or yellowish brown bark, like *B. lutea* and *B. occidentalis*; so also has *Prunus Maackii*.

A beautiful and striking bark is that seen in *Acer pennsylvanicum* (Moose-wood). On branches two or more years old the bark becomes striped with conspicuous, jagged, blue-white lines. Quite similar is the bark of the new Chinese species *A. Davidii* and the Japanese *A. cratægifolium*. The young shoots of a form of Moose-wood (var. *erythrocladum*) turn a rich red after the leaves have fallen. On fine winter days the red twigs of *Alnus incana* var. *ramulis coccineis* give a pretty glow, enhanced later by the red of the catkin scales. The yellow-barked variety of the common ash stands out quite distinctly among its fellows in winter. It retains its colour on branches several inches in circumference. A lime with golden yellow twigs is *Tilia platyphyllos* var. *aurantia*.

There are several shrubs whose young shoots retain a vivid green or brown during their first winter. Amongst them are the *kerrias* and *stephanandras*; but although very pleasing as an addition to their other beauties, the colour of their stems scarcely justifies special plantings of the species.

CHAPTER XVIII

VARIEGATED AND COLOURED TREES AND SHRUBS.

PERHAPS more rubbish is foisted on purchasers of trees and shrubs in the shape of variegated sorts than of anything else. A variegated plant should have its leaf-colouring bright, well-defined, and abundant to be of value. Yet by some dealers every spotty or muddy coloured form is thought worthy of a name and a flattering description. There can be no question but that purple or variegated plants have a disturbing effect on the general landscape. Their place is in the garden proper, where the eye is accustomed to, and seeks for, unusual effects; but even there they should never be sprinkled about indiscriminately. Coloured shrubs are best in groups or masses, composed either of one sort or of two or more that enhance each other's beauty. Trees like the purple beech or variegated English elm are very effective as solitary specimens on a lawn; so is a group of Spath's cornel, perhaps the best deciduous variegated shrub in cultivation. The value of such plants is most apparent after midsummer, when the great flowering season of trees and shrubs is over. They then furnish bright patches of colour which would otherwise be lacking. In large gardens, I favour the plan of associating in a few broad masses collections of good variegated shrubs and small trees, and if such masses can be placed in somewhat secluded spots, or at any rate in places where they are not for ever obtruding themselves on the vision, their charm and effectiveness are, I think, enhanced.

Variegated evergreens have an especial value in giving colour and warmth to a garden during the dullest months of the year. In the following select list of variegated trees and shrubs they are marked with an asterisk (*):—

- Acanthopanax spinosum variegatum*, white.
- Acer campestre postelense*, all yellow.
- „ „ *Schwerinii*, purple.
- „ *cratægifolium Veitchi*, rose-coloured and white.
- „ *japonicum aureum*, all yellow.
- „ *Negundo aureo-variegatum*, yellow.
- „ „ *aureum*, all yellow.
- „ „ *variegatum*, white.

- Acer palmatum* (various).
 „ *pictum aureum*, yellow.
 „ *platanoides* (various).
 „ *Pseudoplatanus* (various).
Alnus incana aurea, all yellow.
Aralia chinensis, white and yellow variegated forms.
 * *Arundinaria auricoma*, yellow.
 * „ *Fortunei*, white.
Atriplex Halimus, all silvery.
 * *Aucuba japonica*, yellow and creamy white.
Berberis vulgaris purpurea, all purple.
Betula verrucosa purpurea, all purple.
 * *Buxus sempervirens argentea*, white.
 * *Calluna vulgaris aurea*, all yellow.
 * „ „ *cuprea*, coppery.
Castanea sativa aureo-marginata, yellow.
Catalpa bignonioides aurea, all yellow.
Cornus alba sibirica variegata, white.
 „ „ *Spæthii*, yellow.
 „ *controversa variegata*, white.
 „ *Mas elegantissima*, yellow and pink.
 „ „ *variegata*, white.
Corylus maxima atropurpurea, all dark purple.
Diervilla florida Looymansii aurea, all yellow.
 „ „ *variegata*, white.
Elæagnus argentea, all silvery.
 * „ *pungens* (various).
 * *Eucalyptus Gunnii*, all grey.
 * *Euonymus japonicus* (various).
 * „ *radicans* (various).
Fagus sylvatica purpurea, purple.
 „ „ *tricolor*, white and pink.
 „ „ *variegata*, white.
 * *Hedera* (various).
Hibiscus syriacus variegatus, white.
 * *Ilex* (various).
Jasminum officinale aureum, yellow.
Kerria japonica variegata, white.
 * *Ligustrum ovalifolium aureum*, yellow.
Liriodendron Tulipifera aureo-variegata, yellow.
Lonicera japonica aureo-reticulata, yellow veins.
Magnolia acuminata aureo-variegata, yellow.
Neillia opulifolia lutea, all yellow.
 * *Osmanthus Aquifolium purpureus*, purplish.
 * „ „ *variegatus*, white.
Philadelphus coronarius foliis aureis, all yellow.
 * *Pieris japonica variegata*, white.
Populus alba Richardii, all yellow.
 „ *serotina aurea*, all yellow.
Prunus cerasifera atropurpurea (and forms), all purple.
Pyrus Niedzwetzkyana, all reddish purple.
 „ *salicifolia*, all silvery.

- Quercus Cerris variegata*, white.
 * " *cuspidata variegata*, white.
 " *pedunculata Concordia*, all yellow.
 " " *purpurea*, all dark purple.
 " *rubra aurea*, all yellow.
 **Rhamnus Alaternus variegata*, white.
Rhus Cotinus purpurea, all purplish.
Ribes alpinum foliis aureis, all yellow.
Robinia Pseudacacia aurea, all yellow.
Rosa rubrifolia, all reddish purple.
Salix alba argentea, all silvery.
 " *repens argentea*, all silvery.
Sambucus nigra foliis aureis, all yellow.
 " " *variegata*, white.
 " *racemosa plumosa aurea*, all yellow.
 **Santolina Chamæcyparissus*, all silvery.
Symphoricarpus orbiculatus variegatus, yellow.
Syringa Emodi variegata, yellow.
Ulmus campestris Louis van Houtte, all yellow.
 " " *variegata*, white.
 " *viminalis variegata*, white.
 **Vinca minor*, white and yellow variegated.
Vitis Henryi, white.
 " *Thomsoni*, all purplish.
 " *vinifera purpurea*, all dark purple.
 **Yucca gloriosa variegata*, white.

CONIFERS.

- | | |
|---------------------------------------|--|
| <i>Abies concolor violacea</i> . | <i>Cupressus pisifera squarrosa</i> . |
| " <i>nobilis glauca</i> . | " " " <i>sulphurea</i> . |
| " <i>Pinsapo glauca</i> . | <i>Juniperus chinensis aurea</i> . |
| <i>Cedrus atlantica glauca</i> . | <i>Picea excelsa argenteo-spica</i> . |
| <i>Cryptomeria japonica elegans</i> . | " <i>pungens glauca (argentea)</i> . |
| <i>Cupressus Lawsoniana glauca</i> . | <i>Pinus sylvestris aurea</i> . |
| " " <i>gracilis aurea</i> . | <i>Taxus baccata adpressa aurea</i> . |
| " " <i>lutea</i> . | " " <i>aurea</i> . |
| " " <i>Silver Queen</i> . | " " <i>Dovastoni aureo-variegata</i> . |
| " <i>macrocarpa lutea</i> . | " " <i>fastigiata aurea</i> . |
| " <i>nootkatensis lutea</i> . | " " <i>semperaurea</i> . |
| " <i>obtusa aurea</i> . | <i>Thuya occidentalis aurea</i> . |
| " " <i>tetragona aurea</i> . | " <i>orientalis aurea</i> . |
| " <i>pisifera plumosa aurea</i> . | <i>Tsuga Pattoniana</i> . |

CHAPTER XIX •

FINE-FOLIAGED TREES AND SHRUBS.

NONE of the native trees and shrubs of Britain have leaves at all striking for their large size, but among N. American, N. Asiatic, and S. European species there are many which are well worth growing for the beauty, striking dimensions and shape of their foliage alone. There are the long-leaved walnuts of N. Asia, for instance, such *as *Juglans mandshurica*, *cordiformis*, *Sieboldiana* and *cathayensis*, whose beautiful pinnate leaves are 2 to 3 ft. long on young trees. Of a similar but scarcely as remarkable a type are the N. American species, *J. nigra* and *J. cinerea*; also several of the hickories, like *Carya tomentosa* and *C. alba*. Such trees, essentially of an exotic type, give to the garden landscape a peculiar interest and variety. The following is a representative but not exhaustive list of some of the best of such trees and shrubs.

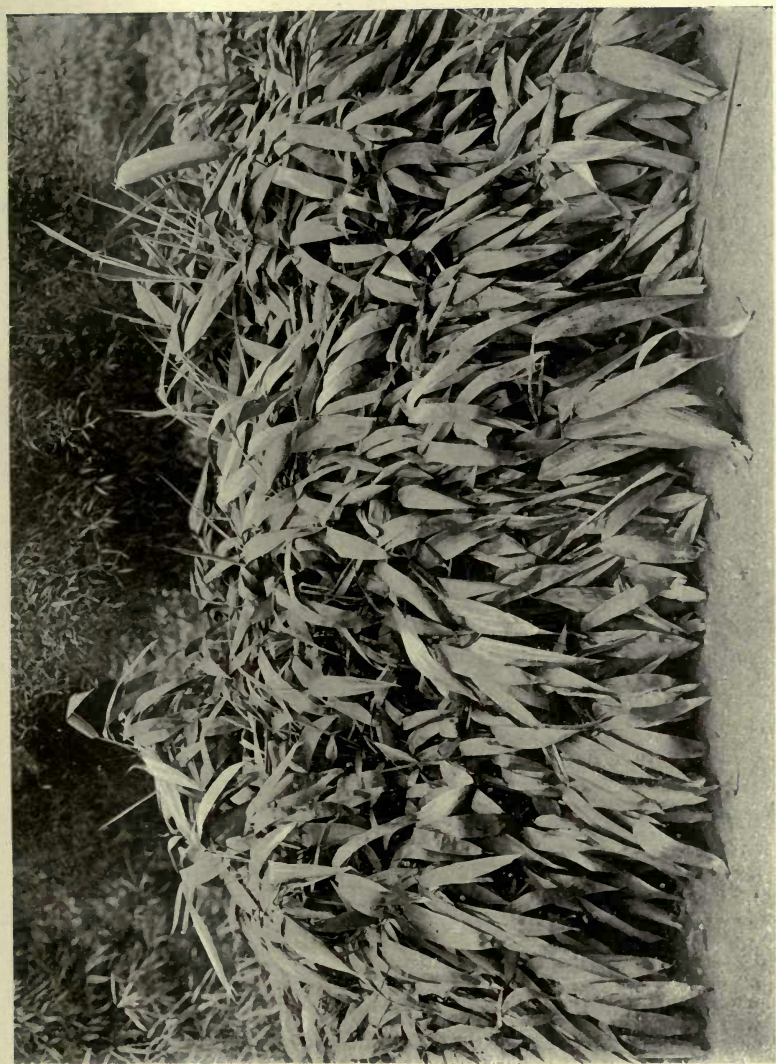
Those marked with an asterisk (*) are especially to be recommended for cutting down annually, with a view to the production of strong shoots bearing leaves of unusual size. For this mode of cultivation a rich loam 1½ ft. deep is required, annually enriched by a top-dressing of manure. The plants, kept to from one to three leads, are cut back in spring nearly to the old wood. Of the several young shoots that start, the strongest is selected and the remainder rubbed off. The leaves produced on such shoots are remarkably large and striking. One may, for instance, measure leaves of *Paulownia* 3 ft. in diameter grown in this way. Both for effect and convenience of cultivation, it is best to grow such shrubs in beds or groups. The bareness of the ground in spring may be relieved by planting early flowering bulbs there. In order that the stump at the base may be kept low and unobtrusive, the spring pruning should be as "hard" as possible. Trees like *Paulownia* cultivated on this system are not long-lived. They maintain an astonishing vigour for six or eight years and then begin to decline, or decay may attack the stumps. When this begins to be evident a new plantation should be made.

Acanthopanax ricinifolium.
Acer macrophyllum.
**Allanthus glandulosa*.

| *Æsculus indica*.
" *turbinata*.
| *Alangium platanifolium*.

Aralia chinensis.
Aristolochia Siph.
Arundinaria palmata.
 " *Ragamowski*.
Berberis japonica Bealei.
 " *nepalensis*.
Broussonetia papyrifera.
Carya alba.
 " *tomentosa*.
Catalpas (all).
Cedrela sinensis.
Decaisnea Fargesii.
Fatsia japonica.
Fraxinus americana.
Gymnocladus canadensis.
Hedera colchica.
Hydrangea quercifolia.
Idesia polycarpa.
Juglans cathayensis.
 " *cordiformis*.
 " *mandschurica*.
 " *regia laciniata*.
 " *Sieboldiana*.
Koelreuteria paniculata.
Liriodendron Tulipifera.
Magnolia Delavayi.
 " *Fraseri*.
 " *hypoleuca*.
 " *macrophylla*.
 " *tripetala*.

**Paulownia imperialis*.
Phellodendron (all).
Populus heterophylla.
 " *lasiocarpa*.
Prunus Laurocerasus magnoliæfolia.
Pterocarya caucasica.
Pyrus Sorbus.
Quercus dentata.
 " *pontica*.
 " *rubra*.
 " *velutina rubrifolia*.
Rhamnus imeritina.
**Rhus glabra*.
** " Osbecki*.
" typhina.
 " *verniciifera*.
Rubus crataegifolius.
 " *irenæus*.
 " *odoratus*.
 " *trifidus*.
Salix magnifica.
Tilia Michauxi.
Trachycarpus Fortunei.
Vitis armata.
 " *Coignetiae*.
 " *Labrusca*.
 " *megalophylla* and others.
Yucca gloriosa.
 " *recurvifolia*.



ARUNDINARIA (BAMBUSA) RAGANOWSKI.

[Face p. 78.]

CHAPTER XX

AUTUMNAL COLOUR IN TREES AND SHRUBS.

IN our always uncertain and frequently dull summers and autumns, the colouring of leaves of deciduous trees before they fall can never be counted on, or foretold, to the same extent as in countries where the seasons are more defined in their duration and less changeable whilst they last. The change in the colour of leaves from green to various tints of red, yellow, purple and brown in autumn is due to certain changes in their composition, partly brought about by sunlight, and influenced by other factors, such as moisture and temperature. There is no doubt that a hot summer and a fine autumn induce a richer and more certain colouring in the majority of trees and shrubs than dull or wet ones. Yet after even the wettest of seasons a good deal of autumn colour is always produced. It is possible also to have too much heat and sunshine. In 1911, on deep, rich soils, some of the most gorgeous colour effects ever seen among the trees and shrubs in this country were developed; but on dry shallow soils, the leaves either fell early or were too desiccated by heat and drought for the necessary chemical changes to take place.

On the whole, trees and shrubs that have passed their vigorous young stage colour better than those producing thick succulent shoots, whether these are induced by youthful vigour or by a specially rich soil in which they grow.

<i>Acer circinatum</i> , red and orange.	<i>Berberis vulgaris</i> , rich red.
„ <i>cissifolium</i> , yellow and red.	„ <i>Wilsonæ</i> , rich red.
„ <i>japonicum</i> , crimson.	„ <i>yunnanense</i> , crimson.
„ <i>nikoëse</i> , rich red.	<i>Carya alba</i> , rich yellow.
„ <i>palmatum</i> , rich red.	„ <i>tomentosa</i> , rich yellow.
„ <i>rubrum sanguineum</i> , red.	<i>Cladrastis tinctoria</i> , rich yellow.
„ <i>Tschonoskii</i> , canary yellow.	<i>Cornus florida</i> , red and crimson.
<i>Amelanchier canadensis</i> , red, sometimes yellow.	„ <i>sanguinea</i> , red.
„ <i>florida</i> , yellow.	<i>Cratægus Crus-galli</i> , red and orange.
<i>Berberis coccinea</i> , red.	„ <i>pinnatifida</i> , bronzy red.
„ <i>Thunbergii</i> , rich red.	„ <i>prunifolia</i> , red and orange.
	<i>Disanthus cercidifolia</i> , claret colour.

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Enkianthus (all), red and yellow.
Euonymus alatus, rosy scarlet.
 " *europæus*, purplish red.
 " *latifolius*, purplish red.
 " *yedoënsis*, purplish red.
Euptelea polyandra, red and yellow.
Fothergilla alnifolia, red.
 " *major*, yellow.
Ginkgo biloba, pale gold.
Gleditschia triacanthos, yellow.
Liquidambar styraciflua, purple-red.
Liriodendron Tulipifera, yellow.
Lonicera japonica flexuosa, red-purple.
Oxydendron arboreum, red.
Nyssa sylvatica, red and yellow.
Parrotia persica, gold and crimson.
Pieris mariana, rich crimson.
Pistacia chinensis, crimson.
Prunus Avium, red.
Pseudolarix Fortunei, golden.
Pyrus arbutifolia, red.
 " *cratægifolia*, crimson or scarlet.
 " *Torminalis*, bronzy red.
Quercus coccinea, crimson.
 " *heterophylla*, red.
 " *palustris*, red.

Rhododendrons (*Azalea* group), red.
Rhus cotinoides, orange, claret, crimson.
 " *glabra*, red.
 " *Toxicodendron*, red.
 " *trichocarpa*, blood red.
 " *typhina*, red.
 " *Vernix*, red.
Ribes americanum, crimson and yellow.
Spiræa Thunbergi, red.
Taxodium distichum, rich brown.
Vaccinium corymbosum, red.
 " *parvifolium*, red.
Viburnum acerifolium, red.
 " *alnifolium*, red.
 " *Opulus*, red.
Vitis amurensis, crimson and purple.
 " *armata Veitchii*, crimson.
 " *californica*, deep crimson.
 " *Coignetiae*, scarlet to blood red.
 " *inconstans*, red.
 " *Pagnucci*, blood red.
 " *quinquefolia*, rich crimson.
 " *semicordata*, rich crimson.
 " *vitacea*, rich crimson.
Zelkova acuminata, yellow.
 " *crenata*, yellow.

CHAPTER XXI

EARLY- AND LATE-FLOWERING TREES AND SHRUBS.

THE great flowering season of hardy trees and shrubs extends over April, May and June, reaching its zenith in the middle month of the three. At least nine out of every ten flower during that quarter of the year, and consequently a peculiar value attaches to any that bloom outside it. Shrubs and trees blossoming between November and March especially have a great attraction. Besides enlivening the dulllest months of the year, they have another recommendation in being the heralds of Nature's most glorious time. So that even if their beauties are of only a modest kind, they are welcome for the promise they bring.

After midsummer, shrubs in flower become scarce as compared with those of the three preceding months; but when a list is made of those that flower, say, from mid-July to October, it is found to be richer in numbers than one would expect. Gardens are not lacking in blossom at that time, because a wealth of herbaceous plants reach their full beauty then. The following selection of trees and shrubs that flower during late summer and autumn may be useful. Many country houses are only visited at that season, and it is a decided waste for spring-flowering trees and shrubs to monopolise the ground as they usually do in such places. The same applies to the parks and gardens of pleasure resorts, which during the holiday season often wear a dull, uninteresting aspect so far as their woody vegetation is concerned. In this connection the chapters on autumn colour, on variegated trees and shrubs, and on those with ornamental fruits should also be consulted.

It must be remembered that the date of flowering, especially from December to March, is almost entirely dependent on the weather.

SEPTEMBER AND OCTOBER.

Abelia grandiflora.
Alnus maritima.
 " *nitida.*
Amorpha canescens.
 81 " *fruticosa.*

Aplopappus ericoides.
Artemisia tridentata.
Ascyrum hypericoides.
Berberis Fortunei.
Buddleia japonica.
 " *paniculata.*
 " *variabilis* (varieties).

82 EARLY- AND LATE-FLOWERING TREES AND SHRUBS

Bupleurum fruticosum.
Cæsalpinia Gilliesii.
Calycanthus occidentalis.
Caryopteris Mastacanthus.
Cassia marylandica.
Ceanothus americanus.
 " *azureus.*
 " many garden hybrids.
Cephalanthus occidentalis.
Clematis apiifolia.
 " *connata.*
 " *Durandii.*
 " *Flammula.*
 " *Hendersonii.*
 " *heracleæfolia* and vars.
 " *Jackmani* (group).
 " *Jouiniana.*
 " *lanuginosa* (group).
 " *orientalis.*
 " *paniculata.*
 " *Rehderiana.*
 " *tangutica.*
 " *Vitalba.*
Clerodendron Fargesii.
 " *trichotomum.*
Clethra alnifolia and *C. tomentosa.*
Colutea arborescens.
 " *media.*
Coronilla emeroides.
Cyrilla racemiflora.
Daboecia polifolia and vars.
Dendromecon rigidum.
Elsholtzia Stauntoni.
Erica ciliaris.
 " " *Maweana.*
 " *Mackayi.*
 " *Tetralix* and vars.
 " *vagans* and vars.
 " *Watsoni.*
Escallonia exoniensis.
 " *floribunda.*
 " *montevidensis.*
 " *organensis.*
Fatsia japonica.
Fuchsia (various).
Hamamelis virginica.
Hedera Helix.
Hibiscus syriacus.
Hydrangea arborescens grandiflora.
 " *paniculata.*
 " " *grandiflora.*
Hypericum (various).
Indigofera Gerardiana.

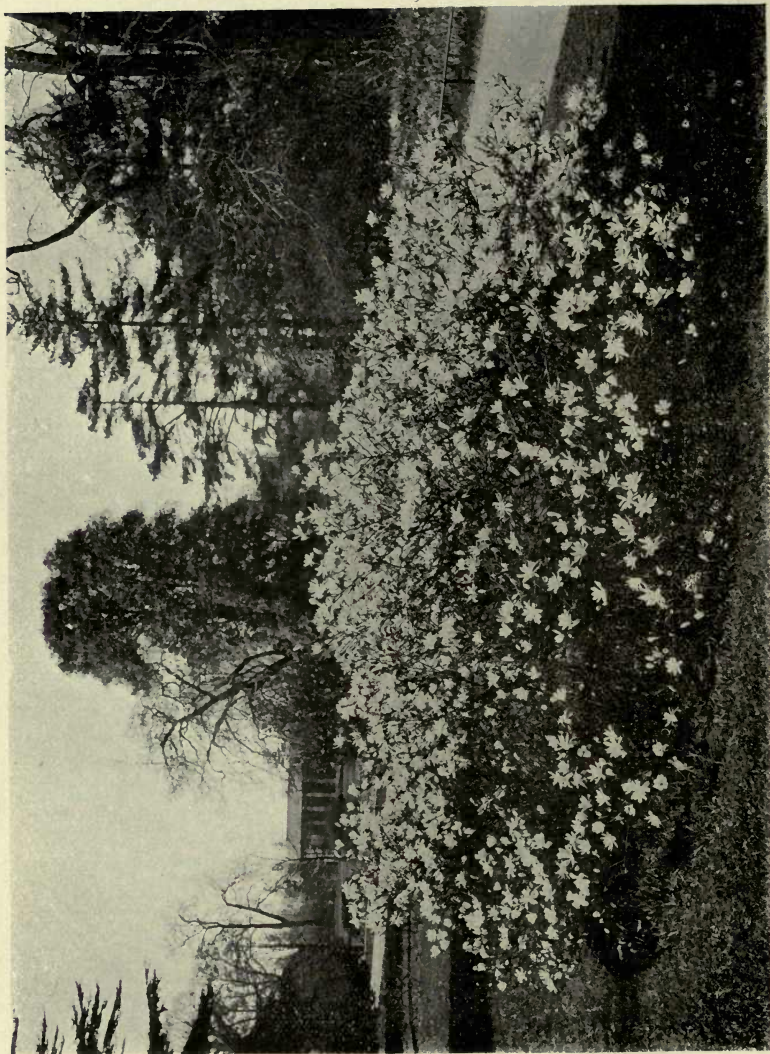
Laburnum caramanicum.
Lespedeza bicolor.
 " *Sieboldii.*
Ligustrum lucidum.
 " *Quihoui.*
Lonicera alseuosmoides.
 " *etrusca.*
 " *Periclymenum.*
Magnolia glauca.
 " *grandiflora.*
Osmanthus Aquifolium.
 " *Fortunei.*
Paliurus australis.
Perowskia atriplicifolia.
Potentilla fruticosa.
Rhus Osbecki.
Romneya Coulteri.
 " *trichocalyx.*
Rosa bracteata.
Rubus thyrsoides flore pleno.
 " *ulmifolius bellidiflorus.*
Salix Bockii.
Sophora japonica.
Spartium junceum.
Tecoma grandiflora.
 " *radicans.*
Ulex Gallii.
 " *nanus.*
Veronica angustifolia.
 " garden varieties.
Vitex Agnus-castus.
Yucca gloriosa.

NOVEMBER.

Arbutus hybrida.
 " *Unedo* and vars.
Daphne Mezereum grandiflora.
Elæagnus glabra.
 " *macrophylla.*
 " *pungens.*
Jasminum nudiflorum.
Lonicera fragrantissima.
 " *Standishii.*
Prunus microlepis Smithii.

DECEMBER AND JANUARY.

Chimonanthus fragrans.
Clematis calycina.
 " *cirrhusa.*
Cratægus monogyna præcox.
Erica carnea.
 " " *alba.*
 " *darleyensis.*



MAGNOLIA STELLATA.

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1.]

EARLY- AND LATE-FLOWERING TREES AND SHRUBS 83

Eucalyptus Gunnii.
Hamamelis mollis.
Viburnum Tinus.

FEBRUARY AND MARCH.

Acer Opalus and vars.
Arctostaphylos Manzanita.
Azara microphylla.
Berberis japonica.
 " nepalensis.
Cornus Mas.
 " officinalis.
Corylopsis pauciflora.
 " spicata.
Corylus Avellana.
Cydonia japonica (on walls).
Daphne Blagayana.
 " Laureola.
 " Mezereum.
 " " alba.
Dirca palustris.
Ercilla spicata (on walls)
Erica arborea.
 " lusitanica.
 " mediterranea.
 " Veitchii.
Forsythia intermedia.
 " suspensa.

Garrya elliptica.
Hamamelis japonica.
 " " arborea.
 " " Zuccariniana.
Magnolia stellata.
Nuttallia cerasiformis.
Parrotia persica.
Populus tremula pendula.
Prunus Amygdalus.
 " cerasifera and vars.
 " Davidiana.
 " divaricata.
 " Mume.
 " spinosa.
 " tomentosa.
Rhododendron dauricum.
 " fulgens.
 " moupinense.
 " mucronulatum.
 " Nobleanum.
 " parvifolium.
 " præcox.
 " Thomsoni.
Ribes laurifolium.
Salix Caprea.
Stachyurus chinensis.
 " præcox.
Ulex europæus.

CHAPTER XXII

STREET PLANTING.

WHILST the cultivation of trees in the streets of large towns and cities undoubtedly presents many difficulties not encountered under the ordinary conditions of parks and gardens, it cannot be said generally that the authorities who have control over these matters have risen to the level of their opportunities. An enormous number of new varieties and species of hardy trees have been added to our collections during the last fifty years, yet it is very rarely indeed that one sees any attempt made to go outside a certain restricted group of common trees for the adornment of streets. The only consideration appears to be "Will it grow?" That, of course, must always remain the most important consideration, but it need not be the only one.

The three commonest trees planted in towns in the S. of England are plane, horse-chestnut, and common lime, not one of which can be regarded as a perfect tree for ordinary streets.

For many parts of London the plane has proved to be the greatest boon to the street planter. It thrives in Central London and in city yards as no other tree has yet been found to do, and for such places it would be absurd to decry its use. But in the outer suburbs, where the atmosphere is better, and the streets often narrow, the plane is not a suitable tree. Naturally one of the noblest in its proportions of all deciduous trees, and one of the largest, it is very much out of place occupying two sides of a street, the whole width of which would not half accommodate a fully grown tree. Yet even in the outer suburbs of London, in districts as yet only half built over, and where many streets still have orchards and gardens at their sides, the imagination of local authorities often fails to rise beyond the plane.

With respect to the horse-chestnut the same objections as to size obtain. The tree does not bear pruning so well as the plane, owing to the soft nature of its wood, which enables fungoid parasites to find an easy entry at the wounds, unless great care is taken. On the other hand, the foliage is perhaps the handsomest of all trees commonly grown

in streets, and, if not pruned too recklessly, the tree gives more or less blossom. I offer a few substitutes for the common horse-chestnut farther on.

Of the third popular subject—the lime—it is difficult to say anything in favour except its good nature under adverse circumstances. But it is very apt to decay in the trunk where branches have been removed, and its leaves are about the earliest to fall of those of all hardy trees. Often towards the end of July, if the summer be dry, they commence to turn rusty on the tree and soon after to litter the pavement. The English summer is not long enough for it to be good that suggestions of autumn should be thrust on one so soon. A still worse defect of the lime is its liability to be infested with aphides. In my own district I have seen the pavements black with their excrement, not to speak of the covering of filth on garden walls and shrubberies near.

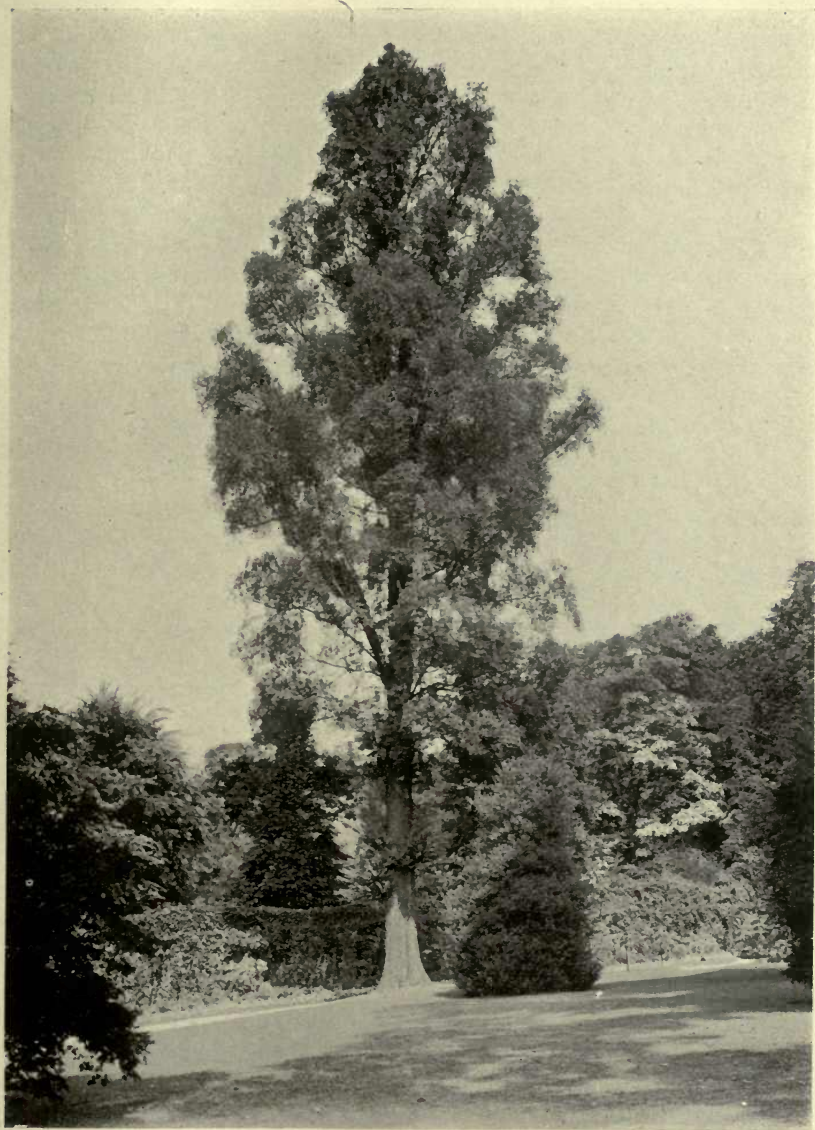
There is perhaps no more unthankful task than the pruning of such trees as these in town streets. The pruner is the butt of every retired citizen who, taking his walks abroad, sees what he considers the wanton mutilation of ratepayers' property going on. He usually relieves his feelings by writing to the local paper. Yet, with a considerable experience of tree pruning, I am not able to see how the present system is to be improved upon, so long as two rows of naturally big trees are crowded in one narrow street. It is all very well to cry out about "mutilation" and "barbarous treatment," and so on—and certainly the winter aspect of many street trees as left by the pruner is suggestive of nightmare—but the real problem involved is the restriction of a tree year after year to dimensions a mere fraction of what it should naturally attain, and yet preserve its natural beauty. And of that problem I have never yet seen offered a satisfactory solution. Some people put off the evil day until the trees overgrow and overshadow their area, then the inevitable lopping has results more hideous than ever.

Therefore, the first great principle in street planting is the selection of suitable trees. If one takes the average provincial city or town, the conditions are not generally bad. I am not referring to the centre of such cities as London, Glasgow, Manchester, or Liverpool, or to the swarm of large towns in Lancashire, Yorkshire, etc., whose belching chimneys blacken the earth and everything upon it. In such places street planting presents special problems, and the choice of tree is very much narrowed. But after all the air of most towns in the British Isles is pure enough to involve little disadvantage to deciduous vegetation, and in limiting themselves to their present restricted choice, I believe that local authorities have denied themselves a very important method of beautifying their towns and brightening the lives of those who live in them.

The planting of streets has become stereotyped not only in the material but in the system. The chief difficulties are due to the narrowness of our streets. If Parliament should ever concern itself effectually with town-planning, the streets of the future will no doubt be wider, and some provision either at the side or in the middle should be made for tree-planting. That would make the task of the street planter easier in many ways. The planting of streets down the centre can, of course, only be carried out in the broad arterial thoroughfares of great cities. A famous example of this style is the Unter den Linden in Berlin. Here the limes are planted in an avenue up the centre of the roadway, and beneath them pedestrians may stroll, the wheeled traffic passing along the sides. I recently saw a very interesting piece of street planting in Rochester in the State of New York. The centre of the street is planted with magnolias of the Yulan and Soulangeana types. These are now fine trees, and their flowering in spring is one of the notable annual events of the city. But for such effects as these the first essential, of course, is sufficient width—a greater width probably than will ever be accorded to all but the arteries of great cities. Most streets will always have to be planted at the sides.

My contention is that the trees now generally planted in streets are naturally too big, and that their restriction to the needful limits involves—and inevitably involves—a system of pruning which makes them eyesores rather than objects of beauty through the long months they are without foliage. Yet, as every forest lover knows, the leafless tree has a charm, more subtle perhaps, but in its season as satisfying as that of the lush growth of June. The plane and horse-chestnut are admirable where they have room, as in town squares, to assume something like their normal dimensions, and the former will probably always be the chief stand-by for the planter in the central depths of large cities. The following notes are intended to apply to the average streets of the outer London suburbs and provincial towns.

Jersey Elm.—In the first place I would call attention to trees of a naturally pyramidal habit. It is essential in nine-tenths of the street planting, as we have to deal with it to-day, that the trees should maintain a tapering form. The middle of the street must be open to the sky, and the house windows must not be obscured. Therefore one great gain would be secured by planting trees whose shape conformed to these requirements with little or no pruning. In Kew are grown several examples of what is commonly known as Wheatley's or the Jersey elm—*Ulmus stricta* var. *Wheatleyi*. Some of them I have known for thirty years, and although during that time they have never been subjected to the least pruning, they are still within the dimensions suitable to streets of average size in the suburbs of London. How



JERSEY ELM, *Ulmus stricta* var. *Wheatleyi*.

well might such a tree fill the place of thousands of tortured planes and limes! It was not until I visited Eastbourne some years ago that I found its value had already been appreciated by, at any rate, one township. It is the chief tree of that popular resort, lining the streets, I imagine, to a total of several thousands. Whilst it is there, to my mind, planted too much to the exclusion of other trees, it offers a splendid example of the ideal street tree. Some of the older specimens, like those in Devonshire Place, have trunks 18 ins. in thickness, but if they have ever been pruned the evidences of it are not visible.

The Cornish elm, *Ulmus stricta*, is very similar to the Wheatley elm, but rather less erect in its branching. There is a pyramidal form of hornbeam, *Carpinus Betulus* var. *pyramidalis*, somewhat slower of growth than the two elms just mentioned, but of similar habit. It is sometimes planted in the towns of Northern France.

Poplars.—Of this genus two sorts stand out for recommendation: the one, Bolle's poplar (*Populus alba* var. *pyramidalis*), quick-growing, of slender growth, broader based and not so slender as the Lombardy poplar, is attractive for the pure white undersurface of the leaves. It would be effective alternated with a broader tree. The other is *P. berolinensis*, a suitable tree for sunny, not too moist, localities. It is a hybrid probably from the Lombardy poplar and *P. laurifolia*. I saw a street avenue of it in the environs of Berlin a few years ago, which had a very handsome effect. (For other trees of pyramidal shape, the reader is referred to the chapter on "FASTIGIATE TREES.")

Horse-chestnuts.—Whilst the common horse-chestnut is not, in my opinion, a very suitable tree for any but wide streets, it possesses such a marked beauty of leaf and flower that it ought, if possible, to be represented. There are two of its varieties which for the present purpose are preferable to the type. The first is var. *pyramidalis*, whose naturally pyramidal form well adapts it for street planting, as it does not grow in diameter to the same extent as the common form. The second is var. *flore pleno*. This, the double-flowered horse-chestnut, is not much known, but it has at least three advantages over the type. Its flowers last longer in beauty; the tree is of slower, closer, and more compact growth; and, finally, as no fruits are developed, it escapes the annual battery of sticks and stones which the youth of the neighbourhood with a passion for "conkers" inflict on fruit-bearing trees.

Of all horse-chestnuts the one I would most strongly recommend is *Æsculus plantierensis*, a description and history of which occur in the body of the book. It will suffice to say here that it is a hybrid between the red and the common horse-chestnuts, and is less vigorous than the latter. Its flowers are pink, and as it is sterile it escapes, like the double-flowered one just referred to, the attentions of boys. Then there is

the red horse-chestnut itself (*Æ. carnea*). There seems no reason why this tree should not be planted more. Left to itself it is apt to branch low, but that tendency, of course, is easily overcome by early training and the removal of lower branches—as I know from experience. The tree itself is rarely more than 30 ft. high in this country, and is of great beauty in blossom.

Tilia euchlora.—Although this lime is beginning to find its way into gardens, its value as a street tree does not appear to have anywhere been appreciated in this country. It is otherwise on the Continent. In several German nurseries it is grown by the tens of thousands to sell for street planting. It is a very handsome lime, as may be seen in the Arboretum at Kew, and it does not appear likely ever to become anything like so tall as the common lime. The leaves are larger than those of the common lime, and of a dark glossy green. Still, its greatest recommendation is its cleanliness. The summer of 1909 will be remembered for the extraordinary abundance of insect life that infested the leaves of nearly all trees, and especially limes. Yet although I searched several times, I never saw a single insect on the leaves of *Tilia euchlora* which could be called parasitic.

Robinia Pseudacacia.—The common acacia, or locust, has a great beauty of leaf and flower, but has a bad reputation, owing to the brittle nature of its branches and the tendency of the trunk to split. The latter defect is obviated by keeping the tree to a single lead, and the former is not sufficient to deter its use in streets. I know of several in a fairly wide but very busy road which flower profusely almost every year, and are still shapely, although they have been over thirty years in their present position.

Fraxinus Ornus.—The manna ash is a tree worth trying for streets. Its foliage is luxuriant and handsome, and it flowers abundantly about the end of May. It has one quality of especial value in this connection: it bears pruning well and recovers quickly from even severe lopping. Its size, too, is quite suitable for all but the smallest streets, as it does not increase very rapidly and is easily kept within bounds.

Small Flowering Trees.—Except the horse-chestnut, there is no tree commonly planted in streets which has any striking beauty of flower or fruit. It is difficult to see why this should be so, except in crowded streets and large or smoky cities. Many handsome flowering trees are of a size suitable for the average street of clean suburbs and country towns. There is the mountain ash, for instance, a tree of the middle size, of erect growth, and beautiful in leaf, flower, and fruit. I have recommended it to superintendents of town planting, and the only objection to it that has been made is that its fruits would be an irresistible attraction for town boys. The same recommendations and the same objections may

be made with regard to the white-beam tree, of which the handsomest and most vigorous form is *Pyrus Aria* var. *majestica*. There are also the nearly allied *P. pinnatifida* and *P. decurrens*. *Pyrus spectabilis* is another beautiful flowering tree that rarely reaches 30 ft. in height, and would be very suitable to experiment with in quiet streets of residential suburbs. The same may be said of *Prunus Avium flore pleno*, a quick-growing tree in a young state, easily kept to the desired pyramidal shape. The double-flowered bird cherry is a very handsome small tree worth trying. The double-flowered varieties of these and other trees are preferable, because the blossom lasts longer and gives a finer display, and the tree is relieved of the strain of fruit-bearing.

Handsome Foliaged Trees.—*Ailanthus glandulosa* is now being extensively planted as a street tree, and few more ornamental foliage trees are available. It grows quite well in the south-western suburbs of London, but needs careful attention when young to get it to develop a good leading shoot. Left to itself, it is very apt to branch low and form a bushy head. Owing to the objectionable odour of the male flowers, female trees only should be planted. As the tree is easily raised from root suckers, or cuttings made of the roots, there need be no difficulty in getting up a stock of the desired sex, once that is known.

The black walnut is one of the handsomest of trees, with large pinnate leaves, and in the young state has a slender pyramidal form. Where there is abundant room it may be recommended, as it thrives very well in the western suburbs, but the tree has two defects. It does not transplant so well as most of the trees here mentioned, nor is it adapted for severe pruning.

The glorious hues of autumn foliage ought more often to be seen in streets. The plane simply turns a grey-brown, the lime naturally turns yellow, but this is often obscured by a layer of filth. The horse-chestnut and its varieties turn a fine yellow. Two varieties of Norway maple should be tried, vars. *Reitenbachii* and *Schwedleri*; the leaves of the former turn a rich red in autumn, and the tree itself is easily grown and kept within bounds; the leaves of Schwedler's maple are rich red when young, and give very pleasing effects. The common Norway maple turns yellow in autumn.

The beautiful oak called *Quercus coccinea splendens* would probably only thrive in favoured places, where the soil and air are good, and a grassy border runs between the footpath and the carriage road; but an avenue of this tree, with its leaves scarlet and crimson from October to December, would add much to the fame of any town lucky enough to possess it. In Washington, U.S.A. (where some of the most interesting street planting in the world has been done), there is an avenue of the maidenhair-tree—one of the most striking objects of that city. This tree,

Ginkgo biloba, is too slow-growing as a rule in this country to be generally recommended for streets. But its habit is perfect, it thrives in towns (for very many years a tree has lived at the side of Brentford High Street, not far from the gasworks), and in the autumn its foliage invariably turns a lovely pale gold. Some of the southern towns with a good soil, climate, and other conditions should give this tree a trial. Of the tulip tree, *Liriodendron Tulipifera*, much the same may be said, but neither of them should be planted where severe pruning would be necessary.

The use of trees with variegated or coloured foliage in street avenues might easily be overdone, and in any case is not appropriate to the dignity of large thoroughfares. But in the short, quiet, side streets common to the outskirts of all large towns, one can imagine bright effects being produced by them. A good tree of this type is *Acer Negundo* var. *aureum*, the leaves of which are wholly pale gold and the tree itself of very moderate growth. Another good yellow-leaved tree is the variety of *Ulmus campestris* known in nurseries as "Louis Van Houtte." Either of these might be alternated with the purple sycamore or with the purple plum, *Prunus cerasifera* var. *atropurpurea*, which gets to be 20 or 30 ft. high. One of the best variegated trees is the Corstorphine plane, a variety of sycamore with green and yellow leaves. There is also a very finely variegated variety of common elm. Although the elm and sycamore are both trees of the largest size, they stand pruning very well. (See chapter on VARIEGATED TREES AND SHRUBS.)

The ideal young street tree when it is planted should have a straight sturdy trunk based by a compact, fibrous root-system, and crowned by a symmetrical, pyramidal head of branches. The average street tree must ultimately be clear of branches up to at least 10 ft. from the ground, and at the time of planting should have a clean stem 6 to 8 ft. high. In the arrangement of trees along narrow streets a certain amount of space may be gained by planting them not directly opposite each other, but midway between the opposite pair.

In preparing the site for the street trees of towns, it should always be remembered that their future progress is hampered by many disadvantages that their fellows in garden and park are free from, and that the provision of suitable conditions at the root is never so convenient and economical as at planting time. A piece of ground at least 8 ft. in diameter and 2½ ft. deep should be prepared for each tree. The soil should be finely broken up to that depth and, if not naturally of desirable quality, a sufficient proportion of it should be changed for some of better quality. Soil broken up to that depth will ultimately settle 3 ins. at least, for which allowance should be made. The very important matters of guarding and supporting the tree are chiefly questions of expense. Nothing, perhaps, is better than a circular cage of iron, 18 ins. in

diameter at the base, tapering to about 1 ft. at the top, where the rods are spiked. This can be thrust into the ground far enough to render the whole sufficiently firm to make it not only a guard but, by tying the young tree to the top band, a support as well. Various patterns of tree-guard, both in wood and iron, are employed, but the matter need not be further discussed here.

It is a mistake to close up all the ground close to the trunks of trees planted on the pavement. When once trees have become well established and of considerable age, they are capable to a surprising extent of rising superior to adverse root conditions. One may see, in and near streets, large trees apparently quite sealed up by stone or other pavement from surface moisture and air, yet thriving and vigorous. The roots of many such trees have, no doubt, reached unsuspected distances. It is otherwise with young trees. During the first few years of their existence in streets they should be artificially watered during dry hot spells, and means should be adopted to allow water and air to reach the roots naturally. The best way, where the sidewalks are paved, is to have iron gratings laid down round the tree, which provide a dry footing and enable both artificial and natural moisture to reach the roots. By taking the gratings up occasionally, the surface soil may be broken up. Visitors to Paris will have noticed the large circular gratings, 8 ft. or perhaps more in diameter, at the base of many of the trees in the boulevards, and men early in summer mornings watering the trees through them from the street hydrants.

Pruning.—The vexed question of pruning street trees is one of the most difficult to discuss on paper. Nothing in connection with their treatment is so much a matter of individual judgment and taste exercised on the spot. As will have been gathered from what has already been said, I am of opinion that much of the barbarous lopping so commonly practised at present is inevitable, in view of the average width of streets and the natural dimensions of the trees now mostly planted in them, but that with the use of more suitably habited and smaller trees much of it might be avoided.

One of the commonest defects noticeable in street trees is that the branches are too numerous and too small. If one compares the branch system of a big tree of almost any sort with a young one of the same species, it will be seen that the number of main limbs of the former is scarcely one-tenth that of the latter. The fact is, of course, that a fight for existence and a selection of the fittest is going on amongst the component parts of a tree just as it is with the tree itself in a state of Nature. The most vigorous and best placed branches crowd out and eventually smother the others. That is how Nature prunes. But in our streets, where each tree is overhauled and its branches pruned and regulated at

fixed intervals, the natural law ceases to operate, and branches which ordinarily would have dwindled away maintain their existence indefinitely. The result is that the trunk is seen after the annual lopping to support a swarm of branches mostly of the calibre and general aspect of bean-poles. A gradual reduction of these to one-half, or even one-third, by removing them right back to the trunk, and thus encouraging a lateral branching in those that remain, would considerably improve the winter aspect of many trees.

Every wound made by the saw should be coated over with ordinary coal-tar before it is left, and this should be renewed as often as necessary until the wound is covered with new bark. With soft wooded trees like lime and horse-chestnut, this treatment is especially important. (For this and similar questions, see chapter on PRUNING.)

CHAPTER XXIII

HEDGES.

HEDGES have several uses. They may serve merely as barriers to prevent horses and cattle, or even human trespassers, from reaching places where their presence is not desired ; or, in gardens, they may be employed to screen undesirable objects from view, to define and separate areas where particular or diverse types of gardening are carried on, such as purely formal arrangements, rose gardens, etc., and lastly, they may provide shelter by acting as wind-breaks.

If it be desirable to keep the hedge to a strictly formal outline by an annual clipping, the number of plants is not large whose capacity for making good hedges has been proved. Among hedge plants in this country whose use is merely to provide an unclimbable barrier, the quick or hawthorn (*Cratægus monogyna*) is easily first. The marvellous network of hedges that gives to cultivated England so characteristic an aspect, as compared with other countries, is composed almost entirely of quick. No other plant at once so cheaply and easily raised, so formidably armed, so amenable to persistent clipping and so hardy, has been found. But in gardens something more is usually wanted, a hedge of a more ornamental character and one that will give shelter. For these reasons an evergreen is desirable.

Holly.—For forming a dense, ordinarily impassable hedge of handsome appearance no evergreen has yet been found to equal the holly. It can be made to grow into a wall-like mass 12 ft. or more high, and makes one of the best of wind-breaks. A holly hedge should be clipped annually between July and September, and will grow healthier and thicker if it is made to narrow upwards. When the hedge is first made, plants should be used that have been grown for the purpose and trained into columnar form in the nursery. Such plants, well furnished to the base, may be obtained from 2 to 5 ft. high in first-class nurseries, which will form a good hedge in three or four years from planting, especially if watered and taken care of the first season. The considerations that govern the transplanting of hollies generally apply to hedge plants also. The work must

be done either in the late spring (May) or towards the end of September, the latter as a rule being the better, and the ground should be thoroughly prepared by trenching.

Yew.—Next in value to the holly as an evergreen hedge comes the yew, but it is not so bright, and near towns, or in smoky districts, is decidedly inferior. In country places, however, where the air is pure it makes an admirable hedge up to 10 or 12 ft. high, and one of the best possible wind-screens. It needs clipping annually, like the holly. How remarkably well the yew withstands persistent clipping is shown by the existence of hedges 100 to 150 years old. It is a grosser feeder than the holly, but both, when they show signs of starvation at the root, will derive benefit from having the loose top soil scraped away, and replaced with a top-dressing of 4 to 6 ins. of one-third loam and two-thirds rotted manure.

Box.—For moderately high hedges, say up to 6 ft., the box is useful, but it has one defect, in that a hedge which has got into bad health is not so easily restored to vigour as holly or yew. It is a strong-feeding shrub, and like the yew is benefited by an occasional mulching with rotted manure. When any indication of failing vigour is apparent this mulching should be given, because, owing to its reluctance to break into new growth from the old wood, the box cannot be made to renew its youth by hard pruning so easily as holly and yew can. For making neat dwarf hedges up to 3 ft. high, the common edging box (*Buxus sempervirens suffruticosa*) is very useful. It is much used for this purpose in formal gardens about Vienna.

Euonymus.—In the south coast towns, *Euonymus japonicus* is largely used for garden hedges. It is a cheerful evergreen, but its beauty in recent years has been in a great measure destroyed by the attacks of a white mildew. *E. radicans*, in both its green and variegated states, will make a neat low hedge 1½ to 2 ft. high.

Holm Oak.—Owing to difficulty in transplanting, the holm oak (*Quercus Ilex*) is not much used in this country as a hedge, but in all except the more inclement parts of these islands, it would make a useful shelter hedge up to 20 or 30 ft. high. It bears clipping well and keeps well furnished at the bottom. Hedges of holm oak are not uncommon in the old gardens of Italy, such as the Boboli Gardens at Florence.

Conifers.—After the holly, yew, and holm oak, not many evergreens of large size remain that will make really handsome clipped hedges in most parts of the British Isles. A few conifers are sometimes used, especially *Thuja occidentalis*, *T. plicata (gigantea)*, the Lawson and Nootka cypresses, and, in warmer parts of the country, the Monterey cypress (*Cupressus macrocarpa*). All these have the advantage of making an effective shelter hedge in much quicker time than holly or yew, for

which reason they are frequently used to screen propagating plots in nursery gardens. They are also cheap. But not one of them, either in permanence or beauty, compares with the holly or yew for the present purpose, and they are all more liable to become bare at the base and patchy at the sides. In Perthshire, I have seen a very good tall hedge made of Douglas fir.

Laurels.—Both the laurels, “common” and “Portugal,” are sometimes recommended, but should be religiously avoided. Hedges made of them are coarse and rough, and terribly ugly after pruning with shears. Secateurs or the knife should be used. The small-leaved variety of the Portugal laurel (*Prunus lusitanica* var. *myrtifolia*) possibly might make a neat hedge if not kept too narrow, but one would have to propagate one’s own plants, as it is not stocked in quantity by nurserymen. All the laurels are greedy plants.

Privets.—The oval-leaved privet is one of the most useful plants we possess for making an effective hedge quickly, especially in towns and smoky districts. In the villa gardens of London suburbs the golden-leaved variety is very popular, and helps to produce the gaudy effects so much beloved by proprietors of these places. Both these privets have the disadvantage of being greedy-rooting plants, and are, therefore, not suitable for making hedges behind borders or plots where other plants are grown. If they already exist in such places, the spade should be thrust down as far as it can be once or twice during the summer, about 1 ft. from the hedge and all along it, so that all top roots are cut off. It is the fashion to condemn the oval-leaved privet as a hedge, and really there is little necessity for it in high-class gardening, as better and more effective hedges can be made. At the same time, where other plants are not near enough to be robbed by its roots, it is permissible to use it, and, as stated above, in dark, smoky places it is decidedly the best shrub available. It requires pruning twice a year at least—in summer and autumn. It is not strictly evergreen, and in hard winters loses its leaves.

The common privet is deciduous and makes an inferior hedge, but some of the new species of *Ligustrum* from China, like *L. Pratii*, will be worth trying for this purpose.

For ornamental hedges that need not be kept close trimmed, nor are intended as barriers, and from which flowers may be obtained, large numbers of evergreens are, of course, available. In Mrs Chambers’ garden at Haslemere, and at Kew, very ornamental hedges are made of *Berberis stenophylla*, cut back annually after flowering. *B. Darwinii* may also be used in the same way. In Lord Annesley’s garden at Castlewellan, *Cydonia japonica* makes a good flowering hedge. In Cornwall a frequent and beautiful broad hedge is formed of *Escallonia*

macrantha—too tender, of course, for all but such districts. In the south coast towns the common gorse makes a dense and very effective hedge, 4 or 5 ft. high, especially useful for poor soils, but it cannot be relied on as a permanency, especially if very hard clipped.

For large rough hedges, of use for cattle shelter, the common beech and hornbeam are sometimes used. They afford shelter in winter, when young and when kept pruned, through their curious habit of retaining their dead leaves through the dark months. For this reason they should be clipped in spring just before growth recommences.

There are a number of shrubs which may be planted to form dwarf ornamental hedges, such as lavender and rosemary; but they are shrubs planted in a row and kept to a more formal shape than usual, rather than hedges in the proper sense of the word. It is not necessary to enumerate shrubs that may be used in this way as their suitability in habit and general character is apparent enough.

Anyone wishing to have something out of the common in hedges may plant that interesting ally of the orange, *Egle sepiaria* (or *Citrus trifoliata*, as it is sometimes called). It is quite hardy, and there is nothing among hardy shrubs quite so formidably armed. A hedge composed of it may be seen in the Public Garden at Milan, clipped to about 4 ft. high. The spines are not so big and stout as in unpruned plants. The Osage orange (*Maclura aurantiaca*), a hardy deciduous small tree from the United States, presents a formidable array of spines; it is used in its native country for hedges, and is worth trying in this by lovers of the curious.

CHAPTER XXIV

TREES AND SHRUBS FOR WET PLACES.

IN this connection I do not propose to discuss trees and shrubs which will thrive near the sides of ponds or lakes, with their roots near but not actually in the water. Such plants are, as a matter of fact, very numerous, and include a large proportion of those described in this work. Planted on the sloping banks of a piece of water, trees and shrubs are really placed in a very favourable position. They can extend their root system towards or away from the water as suits their individual requirements, and can scarcely suffer from drought.

It is very different when we come to discuss trees whose roots are wholly or mostly in water, or those that will grow in permanently wet or swampy ground. The number of such trees and shrubs is not very great, especially after those belonging to two or three genera, such as *Salix*, *Populus* and *Alnus*, have been allowed for.

Swampy areas, from their very nature, are not frequently planted for ornament. Where they are small, the coloured-stemmed willows, such as the red and yellow barked varieties of *Salix vitellina*, *Salix daphnoides*, and *S. acutifolia*, should be used. The economic value of larger sites is not so frequently taken advantage of as it might be. At the present time, for instance, no English timber is so valuable, or gives such quick returns, as the cricket-bat willow—*Salix cærulea*. The timber of *Salix fragilis*, and the strong, quick-growing poplars like *Populus serotina* and *P. Eugenei*, is much in demand for those ephemeral uses of which, in modern civilisation, there are so many. Individual trees of the cricket-bat willow sell readily enough, but of the others plantations must be fairly extensive to be remunerative. The expenses connected with felling, cutting up and hauling are proportionately so much more in the case of odd trees that timber dealers will not give paying prices for them.

The following may be recommended for boggy ground:—

Alnus glutinosa and vars.
" *incana*.
" *nitida*.
" *serrulata* and others.
Andromeda polifolia.
Betula nana.
Hippophaë rhamnoides.
Leitneria floridana.
Myrica Gale.
Oxycoccus macrocarpus.
" *palustris*.
Picea sitchensis.
Populus alba.
" *canescens*.
" *Eugenei*.

Populus serotina.
" *tremula* and others.
Salix alba and var.
" *babylonica*.
" *Caprea*.
" *daphnoides*.
" *fragilis*.
" *incana*.
" *purpurea*.
" *Salamoni*.
" *triandra*.
" *viminialis*.
" *viridis* and others.
Taxodium distichum.



1.)

SALIX SALAMONI.

[Face p. 98.]

CHAPTER XXV

SHRUBS FOR DRY POSITIONS AND POOR SOILS.

A FREQUENT problem in gardens is the furnishing of arid slopes and poor soils with an ornamental shrubby growth. Such places are, of course, ill-adapted to the cultivation of the majority of those trees and shrubs on which the ornamentation of our gardens chiefly depends. There is, nevertheless, a considerable number of shrubs which not only thrive in these dry places, but even succeed better there than in ordinary soils and positions. Many of them are of great beauty in flower, and it is always more economical and often much more satisfactory to rely on them than it is to attempt the cultivation of more exacting plants, by supplying good soil and giving extra attention in watering, mulching, etc.

In preparing pieces of ground of this character, it is essential to remember that although the plants mentioned below withstand and even enjoy heat and drought when fully established, they need some help and consideration until the roots have taken hold of the ground. The soil, therefore, should be deeply dug over, and freed from weeds both before and after planting. It is also a help to mulch the ground the first summer. The greatest success is obtained by planting small specimens. Most of those mentioned below transplant badly and should, if possible, be grown in pots until they are 6 to 12 ins. high. Some, like the brooms and gorse, might be sown on the spot.

No better shrub for a dry slope can be found than the double-flowered form of gorse. It gives a dense, evergreen effect in winter, and its habit in such a spot is dwarf and close. It is much to be preferred to the common gorse, which in a few years becomes gaunt in habit, and whose flowers do not last in beauty anything like so long. *Ulex nanus* may also be planted and, in the south and west, *U. Gallii*, both useful in flowering late in the season. Dotted about among the gorse may be planted *Spartium junceum*, valuable in flowering from midsummer onwards for many weeks. Its base, which is always naked, will be hidden by the gorse.

Several species of *Cistus* are excellent for these places, the hardest

100 SHRUBS FOR DRY POSITIONS AND POOR SOILS

of them being *C. laurifolius*, *C. cyprius*, *C. corbariensis*, *C. Loreti*, *C. populifolius* and *C. monspeliensis*. Their near allies, the sun roses, are also exactly adapted for the same purposes: *H. formosum*, *H. halimifolium*, *H. ocymoides*, and *H. alyssoides* should be planted. *H. vulgare* does well, but is dwarf and only suitable for front places.

Adenocarpus decorticans.
Aplopappus ericoides.
Astragalus Tragacantha.
Atriplex Halimus.
Caragana arborescens and var.
 " *jubata*.
Caryopteris Mastacanthus.
Cistus (all).
Colutea arborescens.
 " *cruenta*.
 " *media*.
Coriaria myrtifolia.
Cytisus scoparius.
Erinacea pungens.
Genista anglica.
 " *dalmatica*.
 " *germanica*.
 " *hispanica*.
 " *horrida*.

Genista nyssana.
 " *pilosa*.
 " *radiata*.
Helianthemum (all).
Lavandula (all).
Linum arboreum.
Lycium chinense.
Moltkia petræa.
Ononis arragonensis.
Purshia tridentata.
Rosmarinus officinalis.
Santolina Chamæcyparissus.
Spartium junceum.
Teucrium fruticans.
Ulex (all).
Vella Pseudocytisus.
 " *spinosa*.
Yucca (all).

CHAPTER XXVI

SHRUBS IN SHADY PLACES.

ONE of the most frequent inquiries is for shrubs which will grow in dense shade, such as under the branches of other trees, and in places which buildings never allow the sun to reach. It must be admitted that the number is small, and that the shrubs themselves are not of the gayest. No spot worse fitted for the welfare of most shrubs could, indeed, be found than under the branches of large trees, such as beech, horse-chestnut, lime, and elm. They are not only robbed of light—one of the prime necessities of plant life—they have to fight for moisture and sustenance against the roots of the giants under which they are condemned to live. Yet in such places a screen is frequently needed to hide undesirable objects or mean buildings from view, and it is often an improvement in a well-kept garden to have an evergreen ground-covering beneath trees on lawns under which it is too dark for grass to grow.

Of the taller evergreens, *Aucuba japonica* stands an easy first. It is remarkable how healthy this shrub will keep even under such greedy trees as lime and horse-chestnut. The green varieties should be planted more frequently, and thus reduce the present superabundance of the spotted-leaved one in gardens. For the very worst places, where an evergreen is desired up to 6 ft. high, reliance must almost entirely be placed on the aucuba; but in places not quite so densely shaded the common holly is useful. Both, but especially the holly, should be helped the first two summers by giving good soakings of water in hot weather and by mulchings. *Rhododendron ponticum* will thrive very well under such trees as oak or sweet chestnut, also in woods where the trunks are lofty. Although it is apt to grow lanky and thin in such places, this tendency can be corrected by cutting back the long sprawling shoots every few years. In the south and west, *Euonymus japonicus* is useful. *Ligustrum ovalifolium* does very well in shade, but does not retain its foliage through the winter so well there as in full light. The common privet may also be used, but is almost or quite without foliage in winter. *Ribes alpinum*, a deciduous shrub but very dense in growth, thrives well in shade.

Of dwarfier plants, *Berberis Aquifolium* is excellent, and grows well in

shady places. Equalling the aucuba in its capability of withstanding shade and the roots of trees under which they may be planted, are *Ruscus Hypoglossum* (12 to 18 ins. high) and *R. aculeatus*, somewhat taller. *Gaultheria Shallon* loves shade, but needs moisture as well. The new sarcococcas—*S. humilis* and *S. ruscifolia*—are said to thrive in shade.

For forming an evergreen carpet beneath either evergreen or deciduous trees, the various forms of green ivy are, on the whole, the best, especially where the shade is very dense. Next to them in value are the green and variegated forms of *Euonymus radicans*, but they will not survive in so dense a shade as ivy. The greater and lesser periwinkles (*Vinca major* and *V. minor*) are charming under deciduous trees, but need more light than the ivies do, especially if the blue flowers are to develop at all freely. *Hypericum calycinum* is also admirable in similar spots, and may be soon made to form a dense carpet of large extent; provided it gets a certain amount of light, it will hold its own and flower prettily under lime, elm, and suchlike trees. If the previous year's growths are cut away every spring the effect is neater. In wilder parts of the grounds the various forms of British bramble are perfectly at home under deciduous trees, and the double-flowered forms of *R. ulmifolius* and *R. thyrsiflorus* are worthy of special note for such positions. The common elder will grow in deepish shade, but is too rank and weedy to recommend as a screen plant.

There are, of course, numerous shrubs that will thrive in semi-shade; some, like most of the bamboos, prefer it. The choice, in fact, is so extensive that planting in such places presents no problems.

In planting shrubs of the taller size mentioned above under big trees, it is necessary to dig out good-sized holes for them, irrespective of the destruction it may cause to the roots of the tree. This may sound barbarous, but if the thing is to be done at all, it is imperative to keep the roots at bay for a year or two to enable the aucuba or whatever it may be to get a foothold. The whole proceeding is more or less unnatural. In Nature there is very little shrubby growth beneath the dense shade of trees, and such shrubs as do establish themselves there start as seedlings. Still, the chopping out of a few roots of such vigorous trees as lime, elm, and horse-chestnut is scarcely felt.

Before planting the low carpet shrubs like ivy, periwinkle, or *Hypericum*, all that is necessary is to dig the ground over, preferably with a fork, and to give a thorough watering after. It is, however, a convenient time to top-dress trees that need it with four to six inches of loam. In this the ivy, etc., may be planted and thus avoid any injury to the roots of the tree itself.

CHAPTER XXVII

SEASIDE PLANTING.

THE moderating influence that the sea has upon temperature and the greater degree of humidity it imparts to the atmosphere are, on the whole, favourable to vegetation. This is very evident all round the coasts of the British Isles, even on the east coast, where, in sheltered valleys, trees and shrubs can be grown that are too tender for similar positions inland. On the western and southern coasts, where the influence of the Gulf Stream is more directly felt, this phenomenon becomes much more evident, and a vegetation of an almost subtropical character is supported. There is no point, therefore, in the long lists usually given in books and articles on this subject, made up of trees and shrubs that are known to thrive in the vicinity of the sea, provided they are not actually exposed to the full force of sea gales. Such lists might be extended so as to include almost all the subjects dealt with in this work.

The one problem in seaside planting is to find trees and shrubs that will withstand the full blast from the sea, carrying, as it does, more or less salt-laden moisture with it. Once a rampart of such vegetation has been made of sufficient width and height to stand between the garden and the sea, the rest becomes comparatively easy. The clothing of exposed headlands must, of course, always be difficult, just as is that of windswept elevations inland, the only difference being that, near the sea, the additional drawback of salt in the atmosphere has to be encountered.

In planting absolutely naked ground in such places it saves much time and trouble if some, perhaps only temporary, windguard be set up to start with; it may be a low wall, a bank of earth, or even wattled hurdles. Behind this the first plantings are made, and it need hardly be said that small plants only must be set out, and they must stand thickly together for mutual protection. By this means they are enabled to get a firm hold of the soil before they reach above their shelter. When that happens their growth may be very slow indeed, but each successive row grows higher than the one in front of it, so that ultimately there is formed a bank of vegetation sloping upwards from the sea, which makes an admirable first line of defence.

Among the best things to use for such a purpose are *Pinus Pinaster* and the Scotch pine. These two species, but especially the former (the Scotch pine is often discoloured by sea spray), bear the brunt of the south-west gales in the famous pine plantations on the Bournemouth cliffs. *P. Thunbergii* is also to be recommended, but is scarcer. In the milder counties *Cupressus macrocarpa*, *Pinus radiata (insignis)*, *P. muricata*, and *P. halepensis* are excellent. But in the colder parts of the coast no pine is so valuable as the Austrian pine. Among other evergreen trees, *Quercus Ilex* may be recommended; although very slow-growing, it makes a dense growth and a perfect screen. Although only a small tree, *Euonymus japonicus* must be mentioned. On the south coast it thrives admirably on high cliffs with nothing between it and the sea. *Abies Pinsapo* has been recommended for chalk cliffs, but it needs shelter at first.

Of all the above, most reliance may be placed on *Pinus Pinaster* in the south and on the Austrian pine in the north.

Turning to deciduous trees, the choice is greater. I know nothing more useful in forming the outer "rampart" than the common sycamore. Often sadly battered, it still holds its own. The "wych elm" is very useful, as are also two willows: (*Salix alba* and *S. Caprea*) *Populus deltoidea* and the white poplar (*P. alba*). Among the numerous species of *Pyrus*, the wild pear (*P. communis*), the mountain ash (*P. Aucuparia*), and, in chalk especially, the whitebeam (*P. Aria*) are the best for the present purpose. For mixing with other things in the plantation there are the hornbeam, the hawthorn, and the ash. Where the ground is damp the common alder may be used.

It is not to be expected that any of these will make shapely specimens. On the contrary, they will be usually stunted and gnarled and lop-sided; but if they provide a living and permanent shield, inside which other and choicer trees will thrive, they fulfil their purpose.

Shrubs.—Close to the sea, as in cliff or shore gardens, the space is too narrow to admit of any attempt being made to establish a shelter belt of vegetation. In such places reliance must be entirely placed on such shrubs or small trees as will thrive fully exposed. That there are a considerable number is evident to any one who studies the vegetation on the slopes between the "front" and the shore of many seaside towns.

Among evergreens mention has already been made of *Euonymus japonicus*, sometimes a small tree, usually a shrub. The grey-leaved *Atriplex Halimus* and other species are quite maritime shrubs. *Olearia Haastii* is not so much used as it might be, nor are the numerous forms of *Aucuba japonica*, *Berberis stenophylla*, *B. Darwinii*, *Pinus montana*, common juniper, *Baccharis patagonica*, and *Bupleurum fruticosum*. Of hollies, the broad, thick-leaved varieties are the best, and amongst the



BISHOP'S PINE (*Pinus muricata*), at Claremont.

most useful of evergreens for exposed places. In the milder counties all the New Zealand Veronicas should be tried, or as many as are available; some of them thrive in places drenched by spray. The common gorse and its double-flowered variety are valuable. The less known *Ulex Gallii* may be seen at Bournemouth hanging on shelves on the cliffs fully exposed, but it will not stand so much frost as the common *U. europæus*. A companion plant with it there is *Erica cinerea*, the two making, when in flower in the early autumn, a lovely contrast in gold and purple. *Ulex nanus* will no doubt succeed as well as the other two gorses.

Turning to deciduous shrubs, none is better than *Tamarix tetrandra*, *T. gallica*, and probably *T. pentandra*. On the south coast the first two thrive on the most exposed cliffs. *T. anglica*, closely allied to *T. gallica*, is common in places on the Suffolk coast. I have not seen *T. pentandra* grown near the sea (it is comparatively new to gardens) but mention it as a likely shrub valuable in flowering later than the others and during the "season" of most seaside towns. Succeeding equally well in similar places is the box-thorn, *Lycium chinense* (the shrub nearly always alluded to as "*L. barbarum*" or "*L. europæum*"). *Myricaria germanica*, also useful, is a close ally of the tamarisks. The common elder (*Sambucus nigra*) and its varieties are apt to look battered, but, like the sycamore, they are irrepressible, and therefore valuable in the first line of defence. *Hippophaë rhamnoides* is essentially a maritime shrub, and as a fruit-bearing one is the handsomest of those here mentioned. The goat willow (*Salix Caprea*) will grow on fully exposed cliffs, as, no doubt, will many other willows. The common hawthorn is one of the hardiest of all trees, and although not reaching beyond the dimensions of a shrub in places like those under discussion, is worth planting. A more beautiful one is the Scotch Laburnum (*L. alpinum*), hardier than, and to be preferred before, the common one. The oval-leaved privet is partially deciduous, but valuable as thriving in the most exposed places. Among wild roses, *R. canina* (the dog rose), *R. rubiginosa* (sweet-briar), *R. spinosissima* (Scotch rose), *R. multiflora* and *R. hibernica* may be recommended, as may also the Wichuraiana roses, common dogwood (*Cornus sanguinea*), the blackthorn (*Prunus spinosa*), *Cotoneaster bacillaris*, *Celastrus articulatus*, and *Baccharis halimifolia*.

To all these, others, no doubt of equal value, might be added; certainly there might for the south-western counties, as, for example, *Escallonia macrantha*, *E. rubra*, etc; but sufficient have been named to enable effective plantings to be made. As has already been emphasised, it is trees and shrubs that will themselves bear the full brunt of the storm and, if need be, afford protection for others, that are wanted. Given those, the chief problem has been solved.

GLOSSARY

TECHNICAL terms have been avoided as much as possible, but to avert inconvenient length of phrase, especially in regard to shape of leaf and form of inflorescence, a few botanical terms have been employed. They are also necessary to define the parts of the flower and the particular kind of fruit.

Acuminate. Having a gradually tapered point.

Acute. Pointed, but less gradually tapered than acuminate.

Anther. That part of the stamen carrying the pollen.

Apex. The end (applied to the termination of leaf, petal, etc.)

Auricle. An appendage or lobe shaped like an ear.

Axil. The angle formed on the upper side by the union of leafstalk and stem, or by the chief veins and midrib.

Axillary. Springing from an axil. Usually applied to an inflorescence arising at that part of a stem, as distinct from the end.

Berry. A fruit whose seeds are immersed in a pulpy or juicy substance enclosed by a skin.

Bract. A leaf-like organ or a degenerate leaf from whose axil the flower or inflorescence is borne.

Calyx. The outer envelope of the flower (outside the petals).

Capsule. A dry fruit of two or more cells.

Carpel. One part of a several-celled ovary or fruit.

Catkin. A slender, often tail-like, inflorescence, with scale-like bracts and stalkless flowers.

Ciliate. Fringed with hairs; usually applied to the margins of leaves or petals.

Compound (composite). Made up of several parts or units, like a rose leaf or the flower head of a daisy.

Cone. The fruit of pines, firs, spruces, etc., made up of overlapping scales.

Connate. United organically (seen sometimes in the bases of opposite leaves).

Cordate. Shaped like a heart, with the point uppermost

Corolla. The inner envelope of the flower (inside the calyx).

Corymb. An inflorescence of flat or flattish shape, in which the stalks of the outer flowers are long enough to bring them to approximately the same level as the inner ones.

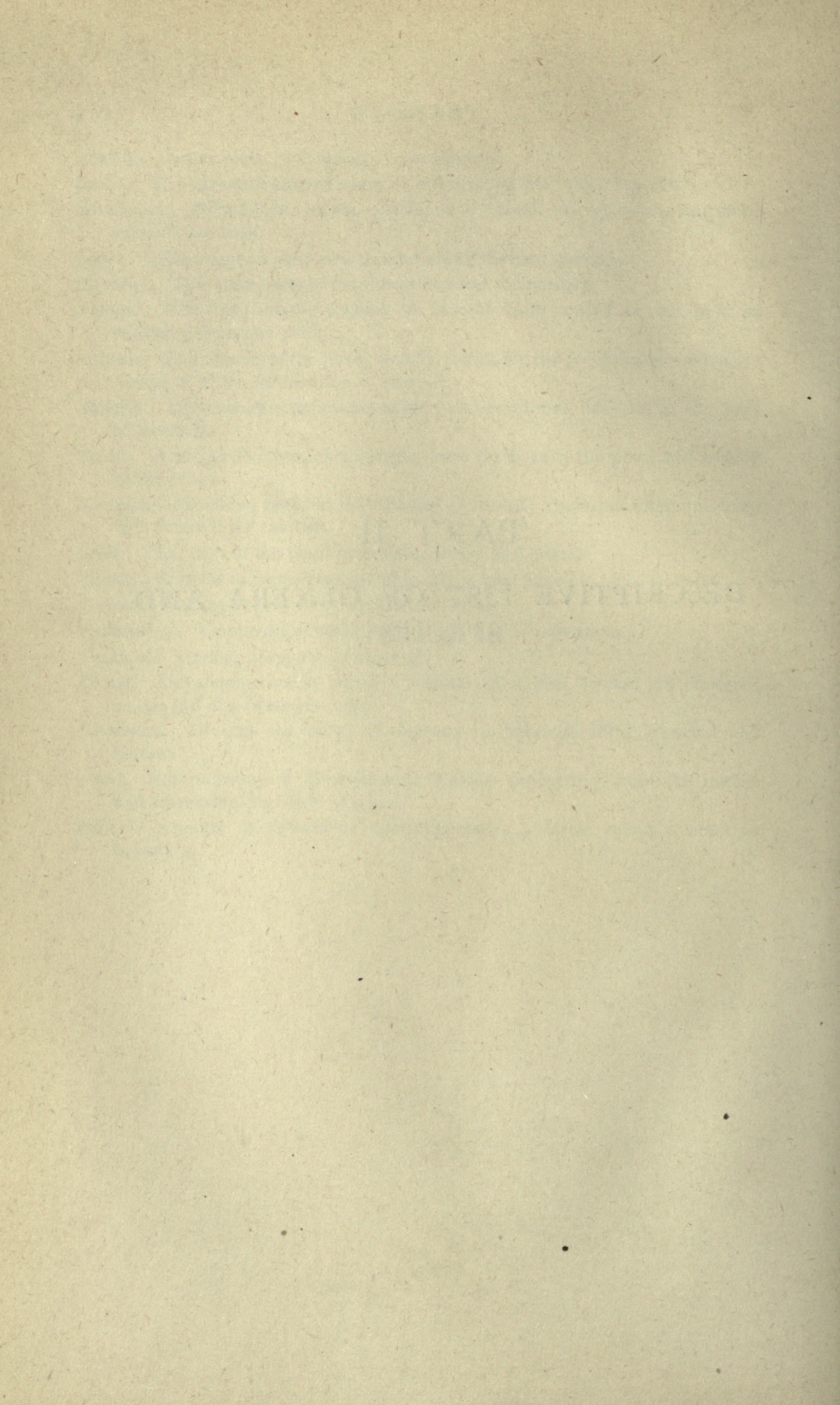
- Crenate.* Applied to leaf margins with rounded teeth.
- Cyme.* A broad, flattish, flower cluster, the inner or terminal flowers opening first, as in *Euonymus*.
- Decussate.* Applied to leaves arranged oppositely, but with one pair standing at right angles to the next pair (as in *Veronica*).
- Digitate.* Applied to compound leaves, in which the leaflets are borne at the end of the common stalk (as in horse-chestnut).
- Dimorphic.* Occurring in two forms on the same plant, *e.g.*, leaves of many junipers, or applied to a species existing in two distinct forms, as *Colletia spinosa*.
- Diœcious.* Applied to plants which have male and female flowers borne on separate individuals.
- Distichous.* Applied to leaves arranged oppositely, and superposed in two ranks.
- Drupe.* A fruit in which a hard stone is enclosed in a fleshy layer (plum).
- Emarginate.* Notched at the tip.
- Entire.* Not toothed or lobed (applied to leaf-margins, etc.).
- Fasciated.* Applied to branchlets which have become united, several into one, to form a broad, flat shoot.
- Fasciculate.* Applied to a cluster of flowers each with its own stalk but all arising from the same point, say a leaf-axil.
- Fastigate.* Of close erect growth, *e.g.*, the Lombardy poplar.
- Glabrous.* Smooth, without hairs or down.
- Gland.* A protuberance on leaves, young shoots and parts of flowers, sometimes on hairs or bristles, often secreting and viscid.
- Glaucous.* Covered with a white or blue-white bloom.
- Habit.* Manner of growth.
- Internodes.* The spaces on a branchlet between the joints or nodes.
- Involucre.* Two or more bracts united below an inflorescence.
- Lanceolate.* Shaped like a lance-head; applied to leaves several times longer than wide and broadest below the middle.
- Lenticel.* A corky or wart-like protuberance on young bark.
- Linear.* Applied to narrow leaves, petals, etc., several times longer than wide, with parallel margins.
- Limb.* The expanded portion of a petal, as distinct from its stalk or claw.
- Lip.* Applied to the upper and lower divisions of a corolla, as in the Labiate Order (lavender, etc.).
- Lobes.* The primary divisions of a simple leaf or other organ (leaf of sycamore).
- Midrib.* The primary or central rib of a leaf; the prolongation of its stalk.
- Monœcious.* Applied to plants which have male and female flowers borne on the same individual.
- Mucro.* A small abrupt point or tip.
- Node.* The joint of a branchlet; the place bearing bud or leaf.

- Oblanceolate.* Inversely lanceolate, the broadest part being above the middle.
- Oblate.* Flattened ; applied to leaves much wider than long.
- Obovate.* Inversely egg-shaped in outline, the broadest part being above the middle (see *ovate*).
- Obovoid.* Having the shape of an egg, the thickest end uppermost.
- Ovary.* The part of the flower which ultimately develops the seeds ; the lowest part of the pistil.
- Ovate.* Having the outline of an egg, the widest part being below the middle. A common shape of leaf and petal.
- Ovoid.* Having the shape of an egg. Common in fruits.
- Palmate.* Applied to leaves with radiating lobes, as in *Fatsia japonica*.
- Panicle.* A branched inflorescence, as distinct from raceme or spike.
- Pappus.* The limb of the calyx in the Natural Order of Compositæ, much divided or downy, to assist in the dispersion of the seed by wind.
- Pedicel.* A term used to distinguish the stalk of individual flowers in a compound inflorescence (see *peduncle*).
- Peduncle.* The mainstalk of a cluster of flowers, or the stalk of a solitary flower.
- Peltate.* Applied to leaves which are attached to their stalks by the lower surface, not at the margin.
- Perfect.* Applied to flowers which have effective male and female organs, as opposed to unisexual or sterile.
- Perianth.* The envelope of the flower. Usually applied in practice to flowers which have only calyx or corolla, or in which the two are not distinguishable.
- Petal.* A division of the corolla ; strictly, only applicable when it is quite separate and distinct.
- Pinnæ.* The leaflets of a pinnate leaf, or the primary divisions of a doubly pinnate one.
- Pinnate.* Applied to leaves composed of leaflets arranged along each side of a common stalk ; feather-like.
- Pistil.* The female part of the flower.
- Pollen.* A usually yellow powder borne in the anthers ; the male or fecundating material.
- Polygamous.* Applied to flowers sometimes perfect, sometimes unisexual.
- Pome.* A fruit made up of several carpels enclosed in a thick layer of flesh, e.g. apple.
- Raceme.* An inflorescence in which the flowers are about equally stalked and borne on an elongated common stalk.
- Rachis.* The common stalk of a compound leaf or raceme, spike, etc.
- Rhomboidal.* Diamond- or lozenge-shaped.
- Scale.* Applied to scarious bodies borne on various parts of plants ; such as the enclosing parts of flower-buds, leaf-buds, acorn-cups, etc.
- Sepals.* Divisions of the calyx.

- Simple.* In one piece ; as opposed to compound.
- Sinus.* The variously shaped space or opening between the lobes of a leaf.
- Spathulate.* Applied to leaves, petals, etc., broad at the apex, narrowed towards the base.
- Spike.* Like a raceme, but with the individual flowers stalkless.
- Stamens.* The male parts of the flower bearing the anthers.
- Stellate.* Star-like ; usually applied to several hairs united at the base or radiating from one point.
- Stigma.* The summit of the pistil, usually viscid, for the reception of pollen, by means of which fertilisation is effected.
- Stipules.* Appendages, sometimes scale-like, sometimes leaf-like, at the base of leafstalks.
- Stolon.* A sucker-like branch springing from the base of the plant and rooting at the joints.
- Stomata.* Breathing pores in the surfaces of leaves ; apertures communicating with internal air cavities.
- Style.* That part of the pistil connecting ovary and stigma
- Terete.* Circular in transverse section ; like a lead pencil.
- Ternate.* Arranged in threes ; applied to leaves.
- Trifoliolate.* Composed of three leaflets, *e.g.* leaf of Laburnum.
- Truncate.* Ending abruptly, as if cut off.
- Umbel.* An inflorescence in which a number of stalked flowers are clustered at the end of a common stalk.
- Unisexual.* Of one sex only, as opposed to hermaphrodite, bisexual and perfect.
- Veins.* Ramifications of fibro-vascular bundles proceeding from the midrib and traversing the blade of a leaf.
- Whorl.* Applied to flowers or leaves borne in a circle round a stalk or branchlet.

PART II

DESCRIPTIVE LIST OF GENERA AND
SPECIES



ABELIA. CAPRIFOLIACEÆ.

A GENUS of shrubs named in honour of Mr Clarke Abel, who first discovered *A. chinensis* whilst attached to Lord Amherst's embassy to China in 1816-17. About half a dozen species are at present in cultivation, which come from China, Japan, the Himalaya, and Mexico. Leaves opposite, or in threes; corolla tubular to bell-shaped; calyx composed of two to five sepals, which remain long on the plants after the corolla has fallen; stamens four.

With two or three exceptions, the Abelias are scarcely hardy enough to succeed in the average climate of the British Isles unless wall protection be given; but provided the situation is warm enough, they are not in any way difficult to cultivate. They like an open, loamy soil, and can very easily be increased by means of cuttings made of half-ripened wood in July; these should be placed in pots of sandy soil, and plunged in a frame where there is a little bottom heat. The species are very much confused in gardens, but the following key to the cultivated species will assist in their identification.

1. SEPALS UNIFORMLY FIVE.

Chinensis. Corolla $\frac{1}{2}$ in. long; flowers in pairs; stamens much protruded.

Floribunda. Corolla $1\frac{1}{2}$ to 2 ins. long; stamens of about the same length.

Spathulata. Corolla $\frac{3}{4}$ in. long; stamens shorter than corolla; flowers in pairs.

Triflora. Sepals very narrow, linear, feathered.

2. SEPALS USUALLY TWO.

Uniflora and *Engleriana*.

3. SEPALS TWO TO FIVE.

Grandiflora. A hybrid (*chinensis* $\times$ *uniflora*).

A. CHINENSIS, *R. Brown*.

(*A. rupestris*, *Lindley*, Bot. Reg., vol. 32, t. 8.)

A deciduous shrub 3 or 4 ft. high, of spreading habit, the young branches covered with minute reddish down. Leaves ovate, pointed, tapered or rounded at the base, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide, toothed (sometimes obscurely so), downy at the base of the midrib beneath, and with few or many hairs scattered over the upper surface. Flowers white, fragrant, produced during summer and autumn in forking clusters from the terminal leaf-axils, the whole forming a short terminal panicle; the flowers are mostly in pairs on each stalk. Corolla $\frac{1}{2}$ in. long, scarcely as wide, funnel-shaped, hairy inside. Calyx composed of five rosy-tinted, slightly downy sepals, each $\frac{1}{4}$ in. long and obovate. Stamens protruded.

Native of China, where it is widely spread; discovered in 1816-17 by Mr C. Abel. It is usually regarded as a greenhouse plant, but is hardy in the south and west of England. The true plant is rare in cultivation, the shrub usually grown under the name being *A. grandiflora*—a hybrid between it and *A. uniflora*.

A. ENGLERIANA, *Rehder*.

(*Linnaea Engleriana*, *Graebner*.)

A deciduous shrub of bushy habit, 2 to 4 ft. high, with brown, minutely downy young bark, afterwards smooth and shining, ultimately peeling. Leaves oval-lanceolate, tapered at both ends, but more slenderly at the apex; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{2}{3}$ in. wide; bright green and smooth above, paler and glossy beneath, with scattered hairs on the midrib and veins; margins bristly-hairy; stalk $\frac{1}{2}$ in. or less long. Flowers borne usually in pairs from the end of short lateral twigs; sepals two, narrowly oval, $\frac{1}{2}$ in. long, minutely ciliated; corolla $\frac{3}{8}$ in. long, funnel-shaped, curved, minutely downy outside, rose-coloured. Stamens shorter than the corolla.

Native of Szechuen, China; originally discovered by Henry about 1888; introduced to cultivation twenty years later by Wilson when collecting for Harvard University. Flowered at Kew in 1911.

A. FLORIBUNDA, *Decaisne*.

(*Bot. Mag.*, t. 4316; *Garden*, May 18, 1873.)

An evergreen shrub 6 to 10 ft. high in a wild state, but rarely seen half as high in this country; young shoots reddish, downy. Leaves ovate to roundish ovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. broad, shallowly toothed, pointed, firm in



ABELIA FLORIBUNDA.

texture; glossy green and smooth on both surfaces, but paler beneath; hairy only on the margin; stalk $\frac{1}{2}$ in. or less long. Flowers pendulous, rosy-red, produced in June at or near the end of short twigs which spring from the year-old wood. Corolla slenderly funnel-shaped, narrowing towards the base, $1\frac{1}{2}$ to 2 ins. long, nearly 1 in. wide at the mouth, where are five rounded, spreading lobes. Sepals five, green, linear-oval, $\frac{1}{2}$ in. long. Stamens hairy.

Native of Mexico on the Cordilleras of Oaxaca at 10,000 ft.; introduced to Europe in 1841. This is the handsomest of the Abelias that can be grown out-of-doors with us, but it needs the protection of a wall. At Kew, a plant growing against the wall of a greenhouse has flourished for many years and flowers well

most seasons, but it is quite unable to live in the open unprotected. For a low south wall in the S. of England, this shrub, with its shining, rich green foliage and gay flowers, is an attractive ornament.

A. GRANDIFLORA, *Rehder.*

(*A. chinensis* × *uniflora*; *A. chinensis*, *Hort.*)

An evergreen shrub 3 to 6 ft. high, with slender, arching branches clothed with minute down. Leaves of a brilliant dark green, ovate, pointed, 1 to 2½ ins. long, half as wide, mostly more or less shallowly toothed; quite smooth above, pale shining green beneath, downy only on the lower part of the midrib. Flowers slightly fragrant, produced from July to October at the end of the shoots of the year and in the leaf-axils; solitary to as many as four on a stalk. Corolla white tinged with pink, funnel-shaped, ¾ in. long, nearly as wide at the five-lobed mouth; throat hairy. Sepals two to five, ½ in. long, but varying in width according to the number, the lower number being proportionately wider; they persist for several months, and are often of a purplish tinge.

A hybrid between *A. chinensis* and *A. uniflora* whose origin is apparently unrecorded. Like many hybrids it appears to have acquired a vigour and constitution superior to that of either of its parents. It is hardy at Kew in all but the severest winters, when it is cut to the ground; it is also the most ornamental of really hardy kinds. The habit is graceful, the foliage a singularly brilliant green, and it is useful in blossoming so late in the season.

A. SPATHULATA, *Siebold.*

(*Bot. Mag.*, t. 6601.)

A deciduous shrub 3 or 4 ft. high, much branched; twigs downy when young. Leaves oval-lanceolate, rhomboidal, or ovate; 1 to 2 ins. long, ½ to 1 in. wide; unequally toothed; with scattered hairs above, and down on the nerves below; margins red when young. Flowers in pairs at the ends of short side twigs; corolla white with yellow in the throat, ¾ to 1 inch long, widely funnel-shaped. Sepals usually five, ¼ inch long, rosy, oblong-spathulate, slightly downy. Stamens shorter than corolla.

Native of Japan; introduced by Maries for Messrs Veitch in 1880. It is hardy in the milder parts of the southern counties, and, among other places, thrives with Sir E. G. Loder at Leonardslee, near Horsham, and with Mrs Chambers at Haslemere.

A. TRIFLORA, *R. Brown.*

(*Lindley and Paxton's Flower Garden*, vol. 3, t. 91.)

A deciduous shrub or small tree of vigorous, erect habit, 8 to 12 ft. high, sometimes more; young shoots furnished with reflexed bristles; bark of main stem pale, greyish, and conspicuously corrugated. Leaves ovate lance-shaped or lance-shaped, tapering more abruptly to the base than to the apex, 1½ to 3 ins. long, ½ to 1 in. wide; dull dark green, paler beneath; more or less hairy on both surfaces and at the margins until late in the year, when they become nearly or quite smooth. Most of the leaves are neither toothed nor lobed, but the lowest leaves on the twigs are frequently deeply and sharply cut. Flowers fragrant, produced in June in erect clusters 2 ins across, terminating short twigs; often three flowers on a stalk. Corolla delicate rosy white, with a slender downy tube ⅝ in. long, expanding at the mouth into five rounded lobes, and these ½ in. across. Sepals five, persistent, reddish, very narrow and linear, ⅓ to ⅝ in. long, feathered with silky hairs.

Native of the N.W. Himalaya, introduced in 1847 to the Glasnevin Botanic Garden, and first flowered there in 1852. This is the hardiest of the Abelias, and has grown vigorously at Kew in the open for many years. When it flowers freely (which does not happen every year) it makes a pretty display, and remains interesting because of the curious persistent calyces surmounting the fruits.

A. UNIFLORA, *R. Brown.*

(Bot. Mag., t. 4694.)

An evergreen shrub of spreading habit, 5 or 6 ft. high, ultimately with arching branches; shoots slender, minutely downy when young. Leaves ovate, often with long, tapered points, rounded or tapered at the base, sparsely and shallowly toothed; 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; dark glossy green and smooth above, paler beneath and downy on the midrib. Flowers solitary, in pairs, or in threes in the terminal leaf-axils, produced from June onwards. Corolla white, blush-tinted, with orange markings in the throat; 1 in. long and the same in width across the mouth, where are five ovate lobes; it has much the shape of a miniature foxglove. Calyx of usually two sepals, but occasionally three or four, persistent.

Native of China, originally introduced to cultivation by Fortune in 1845, now very rare. It is one of the parents of *A. grandiflora*, which owes to this species its hardiness and the brilliant green of its leaves, and which appears to have displaced it in gardens. *A. uniflora* is hardy in the south of England in all but the severest winters. Its flowers are the largest of the cultivated Chinese species, and being abundantly produced make a very pretty display.

ABIES. SILVER FIRS. CONIFERÆ.

A group of about thirty evergreen trees found in Europe, N. Africa, N. Asia, and N. America. They are mostly pyramidal and very symmetrical in form, especially when young, and the finest are from 200 to 300 ft. high. They produce their branches in whorls or tiers, one tier yearly. Leaves always linear or nearly so, from $\frac{1}{20}$ to $\frac{1}{8}$ in. wide, with invariably two bands of stomata beneath, occasionally lines of stomata above also; they are always attached to the shoot in a spiral arrangement, but by a twisting at the base are usually made to appear in two opposite sets, the green faces of all uppermost. Female cones always erect, in which respect they differ from those of *Picea* (the spruces), and from *Tsuga* (the hemlocks), both of which genera have been, and still are, often called "Abies." There is a simple way of distinguishing a fir (*Abies*) from a spruce by pulling off a living leaf from the shoots: In the firs the leaf breaks off sharply at the base where it joins the twig, but in the spruces (*Picea*) it tears away a little of the bark with it.

The cones are built up of a close spiral arrangement of overlapping, usually more or less fan-shaped scales, to the outer surface of which a bract is always attached. The length of this bract and whether or not it protrudes beyond the scale, affords a good distinguishing character between the species. Seeds are borne in pairs on the inner side of the scales, and are winged. The male flowers occur on branches separate from the females, and are borne on the under side of the branch; anthers

highly coloured. On flowering and cone-bearing branches the leaves frequently alter much in character, becoming shorter, stiffer, sharper pointed, and more erect.

The silver firs are undoubtedly best suited in a moist climate where late spring frosts are rare. Nowhere in the British Isles, perhaps, do they, as a whole, succeed quite so well as in the Perthshire valleys. Where the rainfall is deficient, lack of moisture can to some extent be compensated for by a good deep soil. Whenever possible they should be raised from seeds, but of some sorts cuttings may be made to take root. The cuttings should always be taken from leading shoots, as distinct from lateral ones, which rarely develop a good leader. The best plan is to head back a plant, thus inducing it to make several shoots; these are then taken off with a slight heel of old wood attached, and placed singly in small pots of sandy soil in a gentle bottom heat. But both cuttings and grafts should only be resorted to when seeds are unobtainable.

Several species, amongst them *amabilis*, *magnifica*, *nobilis*, and *Nordmanniana*, are liable in many places to the attacks of aphids and chermes. In either case the best remedy is spraying with an emulsion of paraffin and soft soap in spring, about the time the young are being produced.

A detailed description is given in the following pages of about a score of species; the four following are sometimes seen in gardens, but having little general interest, brief mention will suffice:—

A. LASIOCARPA, *Nuttall* (*A. subalpina*, *Engelmann*). **ROCKY MOUNTAIN FIR**.—Apparently of little value in this country, but a fine tree in Western N. America, where it is 100, occasionally 175, ft. high. The leaves are $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. broad, arranged like those of *A. nobilis*, and with stomata on both surfaces. Cones dark purple, $2\frac{1}{2}$ to 4 ins. long. Shoots downy; buds resinous. Var. **ARIZONICA** was introduced in 1903, and is remarkable for its thick, corky, yellowish white bark, and its more glaucous leaves, but there is no reason to suppose that it will thrive better than the type. [The name *lasiocarpa* is often erroneously applied to *A. Lowiana* and *A. concolor*, *q.v.*]

A. RELIGIOSA, *Schlechtendal*. **MEXICAN FIR** (*Bot. Mag.*, t. 6753).—It is only in the very mildest parts of the British Isles that this tree will thrive. I have seen trees at Fota, near Cork, and at Castle Kennedy, in Wigtownshire. It has the same arrangement of leaves on the shoot as *A. Nordmanniana*, and they are $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, pointed, and usually undivided at the apex. Shoots downy; buds resinous. Cones about 4 ins. long, bluish, ultimately brown. Introduced by Hartweg, in 1838, from Mexico, where the branches are used for church decoration—hence the specific name.

A. SACHALINENSIS, *Masters*. **SAGHALIEN FIR**.—A tree 130 ft. high, native of N. Japan, Saghalien, etc., but so liable to injury by late spring frost in this country as to be of no value. It has the *Nordmanniana* arrangement of leaf, but in the forward-pointing leaves, which are $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long and very white beneath, it resembles *A. Veitchii*; buds white, resinous. Cones $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. long. Introduced in 1878, by Maries for Messrs Veitch. I saw a tree about 16 ft. high at Murthly Castle, near Perth, in 1906, but even there, not in the best of health.

A. SIBIRICA, *Ledebour*. **SIBERIAN FIR**.—Allied to *A. sachalinensis*, this is equally unsatisfactory. It has similar leaves, but they have only four or five lines of stomata in each band beneath, whilst *A. sachalinensis* has seven or eight. The shoots also are not roughened with the raised leaf bases as in that species. Introduced in 1820, and a native of Siberia, etc.

A. AMABILIS, *Forbes*. WHITE FIR.

A tree up to 250 ft. high in nature; bark on young or middle-aged trees whitish; young shoots downy; winter buds small, globose, very resinous. Leaves crowded at the sides and on the upper surface of the shoot, which they completely hide from above; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{16}$ to $\frac{1}{15}$ in. wide, broadest towards the apex; the uppermost leaves are considerably the shorter, and point forwards, the lower ones spread horizontally; all are rich glossy green and deeply grooved above, vividly blue-white and with broad bands of stomata beneath; apex notched. Cones rich purple, 4 to 6 ins. long, 2 to $2\frac{1}{2}$ ins. wide, tapering slightly towards the rounded top; bracts enclosed.

Native of British Columbia, Oregon, and Washington; discovered by Douglas in 1825, introduced five years later. This beautiful fir, which in open situations clothes itself to the ground with gracefully drooping branches, has not been a success in British gardens, and very few specimens of any notable size exist there. Some years ago I saw several healthy trees in Scotland. It is sometimes confused with *A. Nordmanniana*, which it resembles in several respects, notably in the arrangement of the leaves on the shoot; but the winter buds, looking like globes of resin, easily distinguish it, and the leaves have an odour like orange peel.

A. BALSAMEA, *Miller*. BALSAM FIR.

A tree 50 to 70 ft. high; young shoots downy; winter buds red, very resinous, roundish. Leaves on young trees in two opposite sets spreading horizontally, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{16}$ to $\frac{1}{15}$ in. wide, the uppermost leaves much the shorter; rounded or notched at the apex, glossy green above, with two whitish bands beneath each composed of four to eight lines of stomata. On cone-bearing shoots the leaves are often pointed (sometimes sharply) as well as rounded or slightly notched, and they are stiffer, broader ($\frac{1}{12}$ in. wide), and curved upwards rather than arranged in two sets. Cones $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, 1 to $1\frac{1}{4}$ ins. wide, dark purple or olive-green, the bracts either quite enclosed within the scales or slightly exposed.

Native of Eastern N. America from Labrador to Virginia; introduced by Bishop Compton in 1697. Although trees in Scotland have attained considerable dimensions, notably at Keillour in Perthshire, it is usually short-lived, and one of the biggest failures among firs in this country. The only tree I know of any size near London is on the lawn in front of Miss Willmott's house at Great Warley, Essex, 30 to 40 ft. high. The species is closely allied to *A. Fraseri*, under which the distinctions are referred to. It yields a transparent balsamic resin, known as Balm of Gilead, or Canadian Balsam. The leaves are curiously brittle and snap when bent.

Var. HUDSONIA, *Sargent*. DWARF BALSAM FIR.—A curious, very dwarf mountain form rarely more than 2 ft. high, which never bears cones. Leaves about $\frac{1}{4}$ in. long. Found originally on the White mountains of New Hampshire, U.S.A.

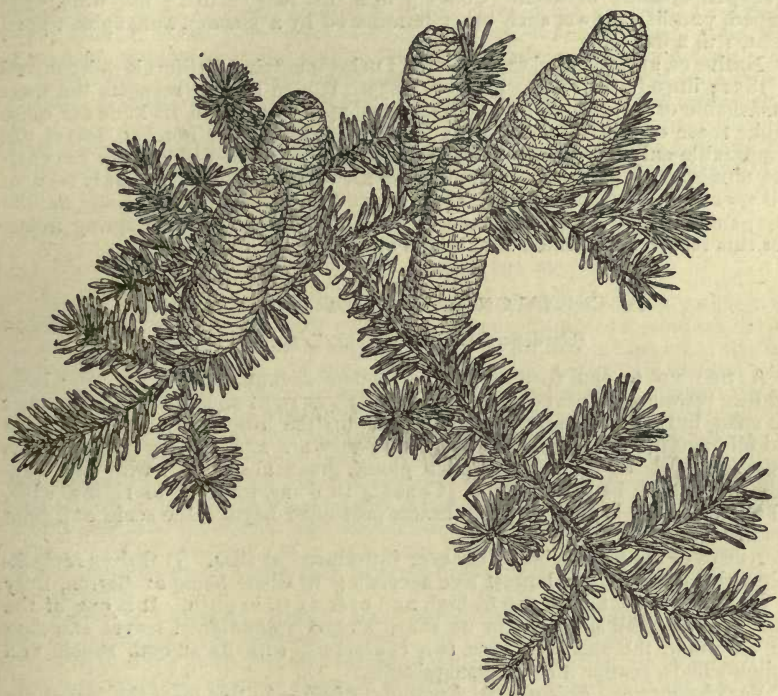
A. BRACHYPHYLLA, *Maximowicz*. NIKKO FIR.

(Bot. Mag., t. 7114.)

A tree 100, occasionally 130, ft. high in Japan; young shoots without down, but corrugated with the wrinkled protuberances on which the leaves are seated, the groove between the leaf-bases being deep; buds resinous. Leaves $\frac{1}{2}$ to $1\frac{1}{8}$ ins. long, about $\frac{1}{16}$ in. wide; slightly notched at the flattish apex, dark bright green above, with two broad, blue-white stomatic bands beneath. The under-

most leaves are the longest, and they spread horizontally; above them each succeeding rank becomes smaller and more erect, leaving at last a very narrow or scarcely perceptible V-shaped opening along the top. Cones 3 to 4 ins. long, $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. wide, tapered at top and bottom, purple, finally brown; bracts quite enclosed.

Native of Japan; introduced about 1870. This is one of the most thriving and handsome of firs, and very hardy. It occasionally bears good crops of its rich purple cones, and is then very beautiful. It is, perhaps, best distinguished by the deeply corrugated branchlets, the grooves in which become deeper the two following years, by the scaly bark of the trunk and the short, notched



ABIES BRACHYPHYLLA.

leaves. In gardens a Japanese silver fir is sometimes seen under the name of—

A. HOMOLEPIS, *Siebold* (*A. umbellata*, *Hort.*).—It is quite closely allied to, and may be merely a form of, *A. brachyphylla*, but the leaves are more distinctly separated into two opposed sets, and the V-shaped opening left by the uppermost leaves is much wider; they are also longer (up to $1\frac{1}{2}$ ins.), the stomatic bands beneath are narrower and duller white, the apex is much more tapered, and the double points made by the notch are sharp, almost spiny. An interesting distinction is pointed out by Henry in the corrugation of the branchlets: in *A. homolepis* this is less apparent in the second and third years; in *A. brachyphylla* it is more pronounced. A cut branchlet bears a considerable resemblance to that of *A. firma*, but the downy unroughened surface of the shoot of the latter at once distinguishes it. *A. homolepis* appears to have all the beauty and hardiness of *A. brachyphylla*.

A. BRACTEATA, *Nuttall*. SANTA LUCIA FIR.(Bot. Mag., t. 4740; *A. venusta*, *Koch*.)

A tree 100 to 150 ft. high, of pyramidal form, but abruptly narrowed near the top into a slender, steeple-like apex; young shoots pale green, perfectly glabrous; winter-buds $\frac{1}{2}$ to $\frac{3}{4}$ in. long, slenderly conical, the scales being loose, pale brown, non-resinous. Leaves flat, stiff, and spine-tipped; $1\frac{1}{4}$ to $2\frac{1}{4}$ ins. long, $\frac{1}{10}$ in. wide; dark shining green, with two blue-white bands of stomata beneath; the leaves are aggregated into two sets, one each side the shoot, leaving a broad, V-shaped opening between. Cones 3 to 4 ins. long, 2 to $2\frac{1}{2}$ ins. wide, egg-shaped, purplish brown, each bract terminated by a slender, stiff, spine-tipped point, 1 to 2 ins. long.

Native of, and confined to, the Santa Lucia mountains, California; discovered in 1832; introduced by W. Lobb in 1853. It is in several respects the most remarkable of all firs: its pyramidal spire-topped shape and its buds are quite unlike those of any other species; its spine-tipped, never notched, leaves are comparable only with those of *A. cephalonica*; and, chief of all, the bayonet-like terminations of the bracts projecting all round the cone are only seen in this species. There are a number of trees 50 to 80 ft. high in England; but the tree generally is not a success, owing to its susceptibility to late spring frosts. For this reason an elevated situation is best for it.

A. CEPHALONICA, *Loudon*. GREEK FIR.

(Gardeners' Chronicle, 1884, i., fig. 105.)

A tree up to 100 ft. high; young shoots smooth, shining brown; buds reddish, resinous. Leaves standing out nearly at right angles to, and all round the stem, but more densely above than below; the lower ones are the longer and all have the green surface uppermost; they are stiff, sharply pointed; $\frac{5}{8}$ to $1\frac{1}{8}$ ins. long, $\frac{1}{16}$ to $\frac{1}{8}$ in. wide; rich glossy green above, and with two well-defined stomatic bands beneath. Cones 4 to 6 ins. long, $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. wide, cylindric, velvety brown, with the bracts protruded beyond the scale and bent downward.

Native of the mountains of Greece; introduced in 1824. It thrives remarkably well in Britain, the largest tree according to Elwes being at Barton, Bury St Edmund's, now nearly 100 ft. high and over 13 ft. in girth. It is one of the most distinct of all silver firs in its sharp almost spine-tipped leaves standing out all round the shoot. These two characters, with its smooth shoots and resinous buds, render it easily recognisable.

Var. *APOLLINIS*, *Beissner* (*A. Apollinis*, *Link*).—In this form the leaves are more crowded on the upper side of the shoot, leaving comparatively few beneath; they are thicker, more abruptly pointed, sometimes rounded at the apex, and more inclined to point forwards. There is a good example of this form in the Botanic Garden at Padua, and one in Shrublands Park near Ipswich. Intermediate ones between it and the type exist. There are often two or three short lines of stomata on the upper surface of the leaf near the tip.

A. *VILMORINII*, *Masters*. *VILMORIN'S FIR*.—A hybrid between *A. cephalonica* and *A. Pinsapo*, the latter the seed-bearer. Only one fertile seed was produced, but from it has developed the fine tree at Verrières, near Paris, now about 50 ft. high. Its leaves are intermediate, but more like those of *A. Pinsapo*; they resemble those of *A. cephalonica* in having stomata on the lower surface only. The cross was made by the late Henri de Vilmorin, in 1867. Many seedlings, mostly intermediate between it and one or other of the parents, have been raised at Verrières.

A. CILICICA, *Carrière*. CILICIAN FIR.

A tree up to 100 feet high in a wild state, and already more than half as high in cultivation ; buds non-resinous, the bud-scales ridged at the back and with free points ; young shoots greyish brown, furnished with scattered, stiff, small bristles. Leaves $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{10}$ to $\frac{1}{12}$ in. wide ; notched, rounded, or pointed at the apex ; rather pale bright green above, with two bands of stomata beneath. On strong shoots the leaves are spread equally all over the upper side of the branchlet, those in the middle being shorter, erect, and pointing forwards ; on weak shoots they are in two opposite sets, with a narrow or wide V-shaped opening between. Cones cylindrical, about 7 or 8 ins. long and 2 to $2\frac{1}{2}$ ins. wide, reddish brown ; the scales are of remarkable size, being $1\frac{3}{4}$ to 2 ins. wide, 1 in. deep, not including the claw at the base ; bracts completely hidden.

Native of Asia Minor and Syria, and often associated in a wild state with the cedar of Lebanon ; discovered in 1853, introduced one or two years subsequently. It is still rare in gardens and although very handsome where it thrives is frequently injured by spring frosts. Allied to *A. Nordmanniana*, it differs in its paler, less dense foliage, and in the larger scales and enclosed bracts of the cones.

A. CONCOLOR, *Lindley*. COLORADO FIR.

(Gardeners' Chronicle, 1890, ii., figs. 147, 148.)

A tree 80 to 100 feet high in nature ; young shoots yellowish, patched with minute down, or smooth ; buds very resinous, egg-shaped, rounded at the top. Leaves glaucous green, 1 to 3 ins. long, $\frac{1}{12}$ to $\frac{1}{10}$ in. wide ; tapered at the base, rounded (with sometimes a slight notch) at the apex ; otherwise of even width, not grooved above. There are not very conspicuous lines of stomata on both surfaces ; they cover the whole centre of the leaf above, but beneath they are in two bands. The leaves are mostly aggregated into two opposite sets, but on the upper side of the branchlet there are a number of leaves pointing upwards, and beneath some pointing downwards ; the arrangement therefore is irregular, and the upper leaves are considerably the shorter. On cone-bearing shoots the leaves generally are shorter and stouter and curve upwards. Cones about 4 ins. long, $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide, of a rich plum colour, as I have seen them in Mr Waterer's nursery at Knap Hill, turning brown with age ; bracts enclosed by the scales.

Native of Colorado, Arizona, New Mexico, etc. ; discovered in 1847 ; introduced in, or perhaps previous to, 1872. It is one of the most beautiful of all conifers, and the more glaucous forms, of which var. *VIOLACEA*, *Masters*, is the best, are amongst the most effective of their type. Var. *WALLEZI* has foliage of a rather striking silvery yellow when young. The relationship of this species with *A. Lowiana*, a much debated point, and the differences between them, are referred to under that species.

A. FIRMA, *Siebold*. JAPANESE FIR.

(*Flora Japonica*, ii., t. 107 ; *A. bifida*, *Siebold*, *Flora Japonica*, ii., t. 109.)

A tree 120 to 150 ft. high in nature ; young shoots downy in the grooves between the prominences on which the leaves are seated ; buds small, resinous. Leaves aggregated into two opposite sets, spreading at about right angles to the shoot and leaving a broad, V-shaped opening along the upper side ; they are deep glossy green above, with two not very conspicuous bands of stomata beneath ; $\frac{3}{8}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{12}$ to $\frac{1}{8}$ in. wide, very stiff, tapered somewhat towards both ends, the apex distinctly notched, leaving two sharp, slender points.

Cones $3\frac{1}{2}$ to 5 ins. long, $1\frac{1}{2}$ to 2 ins. wide, brown; bracts exposed and not reflexed.

Native of Japan; introduced to England by John Gould Veitch in 1861. Sargent describes wild trees as the most beautiful of Japanese firs. The leaves are not invariably notched at the apex, and the notch is deepest in young plants. It is comparatively rare in gardens, but according to Elwes a tree at Pencarrow was 59 ft. high in 1908. It is a handsome tree with a very sturdy aspect.

A. FRASERI, *Poiret*. FRASER'S BALSAM FIR.

(Garden and Forest, 1889, fig. 132.)

A tree 30 to 40, occasionally 70, ft. high; young shoots covered with short reddish hairs; buds small, resinous. Leaves amongst the shortest in firs, $\frac{1}{2}$ to 1 in. long, $\frac{1}{16}$ to $\frac{1}{12}$ in. wide; rounded and usually notched at the apex; dark glossy green above, with two broad, very white bands beneath, each composed of six to twelve rows of stomata. Cones $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, 1 to $1\frac{1}{2}$ ins. wide, purple; bracts golden brown, much protruded, and bent downwards so as to hide the scales.

Native of the mountains of the S.E. United States, often forming forests at elevations of 4000 to 6000 ft. It was introduced by John Fraser, after whom it was named, about 1807. No silver fir ever introduced has proved of less value in English gardens than this, or shorter-lived; there is perhaps scarcely a good tree in the country. Most of the trees called "Fraseri" in gardens are really *A. balsamea*, a nearly allied fir distinct enough in the bracts of the cones being very little or not at all protruded, but very similar in the leaves. In *A. balsamea*, however, they are not so white beneath, and have only four to eight lines of stomata in each band.

A. GRANDIS, *Lindley*. GIANT FIR.

A tree 230 to 300 ft. high in nature, with a trunk 4 to 5 ft. thick; young shoots glossy, olive green, not corrugated, minutely downy; winter-buds small, conical, resinous, bluish. Leaves in two opposite sets, spreading flatly and horizontally, each set composed of two ranks, the upper ones much shorter than the lower; the leaves are $\frac{3}{4}$ to $2\frac{1}{4}$ ins. long, $\frac{1}{16}$ to $\frac{1}{10}$ in. wide; the apex notched and rounded; dark shining green, with two broad white stomatic bands beneath. Cones cylindrical, 3 to 4 ins. long, $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. wide, bright green; the bracts enclosed.

Native of Western N. America, from Vancouver Island to California; discovered by Douglas in 1825, and introduced six or seven years later. This, probably the tallest silver fir in the world, thrives exceedingly well in the moister parts of the British Isles, where it is already over 100 ft. high. In deep moist soil it grows very quickly, often at a rate of 2 to 3 ft. annually. Very distinct in the flat, comb-like arrangement of the leaves, it is in this respect most nearly approached by *A. Lowiana*, but that species has stomatic lines on the upper surface, absent in *A. grandis*.

A. LOWIANA, *A. Murray*. LOW'S SILVER FIR.

(Gardeners' Chronicle, 1890, ii, figs. 149, 150; *A. lasiocarpa*, *Hort.*)

Neither Sargent nor Jepson distinguishes this fir specifically from *A. concolor*, but as seen in gardens it is easily recognisable. It has also a separate natural habitat, being found in Oregon and on the Sierra Nevada in California (where, Jepson observes, it is one of the four most important forest trees in

the main timber belt); *A. concolor* is from Colorado, New Mexico, and Arizona. *A. Lowiana* is a tree up to 200 ft. high, the young shoots pale green, with a slight down which often falls away by winter. Buds resinous, smaller than in *A. concolor*. Leaves mostly in two opposite sets spreading out flatly and horizontally, as in *A. grandis*; in this respect they differ from those of *A. concolor*, as they do also in the frequently notched apex and the grooved upper surface. Both species have broken stomatic lines on the upper side (as well as on the lower one), but they are more conspicuous in *A. concolor*. The leaves of *A. Lowiana* are from $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, and pretty uniform in length; in the latter respect they differ from those of *A. grandis* (with which species also *A. Lowiana* has been associated), whose leaves moreover are devoid of stomata on the upper surface. Cones of the same size as those of *A. concolor*, brown. The name "*lasiocarpa*" is generally adopted in France.

This is a handsome tree, introduced in 1851, and is now represented by specimens 80 to 100 ft. high in various parts of the country. Cultivated trees of *A. concolor* are not so large, but they are more striking in their richer foliage and glaucous tint. The branching of *A. Lowiana* is mostly on one plane, but in *A. concolor* the production of axillary buds renders the branching less regular, and in this way shoots frequently appear midway along the shoot on the upper side.

A. MAGNIFICA, A. Murray. RED FIR.

As represented by the finest specimens in this country, now 60 to 80 ft. high, this tree has a slender pyramidal shape and is strikingly elegant; young shoots furnished with a minute down; buds resinous at the top, more or less concealed by leaves. Leaves 1 to $1\frac{3}{4}$ ins. long, $\frac{1}{2}$ in. wide; glaucous green, with stomata on all surfaces; blunt, but not notched at the apex, nor grooved along the upper surface. On old cone-bearing branches they are pointed, stiffer, shorter, and diamond-shaped in cross-section. The leaves are crowded on the top as much as on the sides of the shoot; those on the top have their bases flattened to, and nearly hiding the stem, then curve upwards. Cones 6 to 8 ins. long, about half as wide, purple when young, afterwards brown; bracts enclosed (except in the variety mentioned below).

Native of Oregon and California; introduced by Jeffrey in 1851. This remarkable fir is seen at its best, perhaps, so far as the British Isles are concerned, in Perthshire, where I have seen fine trees at Blair Atholl and Abercairney, 60 to 70 ft. high. It thrives badly and is rare in the Thames Valley. It has been much confused with *A. nobilis* (even associated with it as "*var. robusta*"), but can be distinguished by its longer, never-grooved leaves.

Var. *XANTHOCARPA, Lemmon* (*var. shastensis, Lemmon*). *SHASTA RED FIR*.—Is distinguished only by the shorter, thicker cones, having the bracts conspicuously protruded.

A. MARIESII, Masters. MARIES' FIR.

A tree 40 to 50, occasionally 80, ft. high, of compact, pyramidal form; young shoots very densely covered with red-brown down, which persists several years; buds small, globose, completely encased in resin. Leaves $\frac{3}{4}$ to 1 in. long, $\frac{1}{2}$ in. wide; dark shining green and deeply grooved above; glaucous beneath, with two broad bands of stomata; apex rounded and notched. The lower ranks spread horizontally, whilst the upper and shorter ones point forward and completely hide the shoot. Cones 3 to 4 ins. long, about 2 ins. wide, rounded at the top, egg-shaped, purple when young; bracts hidden.

Discovered on Mt. Hakkoda, in Japan, by Chas. Maries in 1878, and introduced by him at the same time. It is one of the rarest of silver firs, and

scarcely a good tree exists in the country. I saw a small healthy specimen at Scone Palace in 1906. Two years later, in Mr Hesse's nursery at Weener, in Hanover, I saw a healthy batch he had raised from seeds. I do not know that it has borne cones in this country (the fir figured in the *Botanical Magazine*, t. 8098, is *A. Webbiana*). Maries' fir is best distinguished by the thick red-brown covering of down on the twigs.

A. NOBILIS, *Lindley*. NOBLE FIR.

A tree up to 200 ft. high in nature, and already more than half that height in cultivation in Britain; young shoots clothed with a reddish brown minute down; buds roundish, resinous, surrounded at the base by a collar of long-pointed scales free at the tips. Leaves $\frac{1}{2}$ to $1\frac{1}{3}$ ins. long, $\frac{1}{18}$ in. wide, distinctly grooved on the top, round at the apex, glaucous green, with stomata both above and below; the leaves are very densely arranged on the upper side and at the sides of the shoot, leaving it exposed only underneath; the upper leaves have their bases flattened to the shoot (completely hiding it), then curve abruptly upwards. Cones 6 to 10 ins. long, 3 to $3\frac{1}{2}$ ins. wide, cylindrical, rounded at the top, of a rich brown-purple, with the green bracts conspicuously protruded and reflexed.

Native of Oregon, Washington, and California; introduced by Douglas in 1825. No fir introduced from Western N. America has succeeded better than this in certain parts of the British Isles, in Scotland especially. It varies in the intensity of its glaucous hue, the form most striking in this respect being distinguished as var. *GLAUCA*. The larger trees in this country produce cones in great profusion. These cones are the largest among firs, and, standing stiffly erect, their size and rich colour render them very striking. The finest trees I have seen are at Murthly, near Perth, and the species evidently enjoys a moist climate and a deep soil. It is liable to the attacks of an insect which induces gouty swellings; the best remedy for this is spraying with an emulsion of paraffin and soft soap in April. This fir is most closely allied to *A. magnifica* (*q.v.*), but is of more spreading habit, and the leaves are different. Both are distinct from other firs, in the crowded leaves on the upper side of the branchlet having their bases flattened against it.

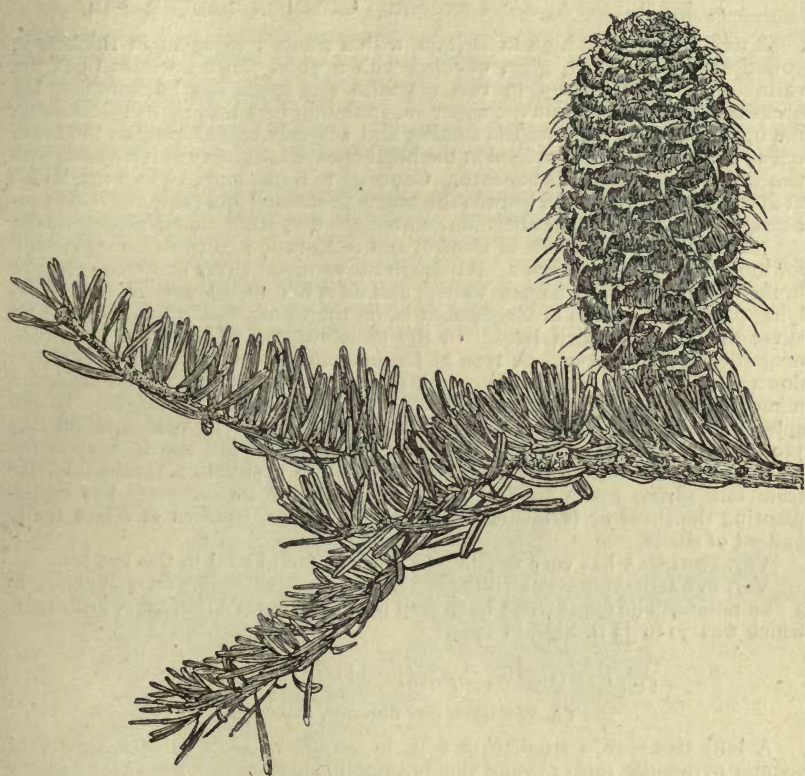
A. NORDMANNIANA, *Spach*. CAUCASIAN FIR.

(*Bot. Mag.*, t. 6992.)

A tree described as reaching 200 ft. in height in a wild state, with a trunk 4 to 5 ft. in diameter; young shoots shining grey-brown, furnished with short stiff hairs; buds not resinous, ovate. Leaves very densely arranged, mostly on the upper side of the shoot, the lower ones being the longer, and spreading horizontally; the upper ones shorter, and pointing forward; it is only on weak shoots that any indication of a two-ranked or V-shaped arrangement is seen. The leaves measure $\frac{3}{4}$ to $1\frac{1}{2}$ ins. in length, $\frac{1}{18}$ to $\frac{1}{12}$ in. wide, apex rounded and notched; very dark glossy green above, midrib sunken, two whitish stomatic bands beneath. Cones 5 or 6 ins. long, $1\frac{3}{4}$ to 2 ins. wide, cylindrical or tapered towards the top, reddish brown; scales $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. wide, $\frac{5}{8}$ to $\frac{3}{4}$ in. deep; bracts conspicuously protruded and bent downwards.

Native of the Caucasus, Greece, and Asia Minor; discovered in 1836, and introduced about ten years later. It is undoubtedly one of the handsomest and, in most places, best-growing of the firs, although in some places it is very subject to the attacks of aphids. Trees approaching 90 ft. in height exist in the British Isles. In foliage it is not unlike the W. American *A. amabilis*, which has, however, more rounded and resinous buds, and cones with enclosed bracts.

Botanically it is more nearly related to *A. pectinata*. At Powerscourt, in Ireland, there are large numbers in splendid vigour and size.



ABIES NORDMANNIANA.

A. NUMIDICA, *De Lannoy*. ALGERIAN FIR.

A tree said to become 70 ft. high, but at present rarely more than half as high in this country ; buds not, or very slightly, resinous ; young shoots shining brown, glabrous. Leaves arranged all round the shoot, but with those underneath mostly brought upwards into a horizontal position ; on strong shoots the leaves on the upper side are erect or pointed backwards, but on weaker shoots there is a V-shaped opening formed by the separation of the leaves into two sets. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{12}$ in. wide ; rounded, or notched, or somewhat pointed at the apex ; dark glossy green above, often with a grey patch near the apex made up of a few broken lines of stomata ; lower surface with a conspicuous grey band of stomata each side the midrib. Cones 5 to 7 ins. long, $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide, cylindrical, brown.

Native of Mt. Babor, in Algeria, where it grows in association with *Cedrus atlantica* ; discovered in 1861, and soon afterwards introduced. It is a handsome fir although still uncommon. Vigorous plants are very distinct in the grey patch of stomata on the upper side of the leaf and in the dense array of

thick, round-ended, or notched leaves all over the upper side of the shoot, the middle ones of which often point backwards. On weak shoots these characters are not so marked.

A. PECTINATA, *De Candolle*. COMMON SILVER FIR.

A tree up to 120 ft. high in Britain, with a trunk 5 to 6½ ft. in thickness; young shoots brownish grey, covered with a short down; winter buds not resinous. Leaves usually in two opposite sets spreading horizontally, but occasionally with others on the upper side pointing forwards; ½ to 1½ ins. long, the upper ranks of each set the smaller and scarcely half as long as the lower ones; ⅛ to ⅓ in. wide, notched at the blunt apex, dark glossy green above, with two white stomatic bands beneath. Cones 4½ to 6 ins. long, 1½ to 2 ins. wide; at first green, then reddish brown; the bracts protruded and reflexed. On cone-bearing branches the leaves become pointed, shorter, stiffer, and curved upwards.

Native of the mountains of Central and S. Europe; cultivated in England for more than three centuries. Although the common silver fir refuses to grow in the hot, dry, lower Thames Valley, and does not thrive well in many low-lying parts of the south of England, it is, on the whole, much the finest of all silver firs in the British Isles. In the moist valleys of Scotland it reaches magnificent proportions. A tree at Drummond Castle, in Perthshire, blown down in November 1893, measured 6½ ft. in diameter of trunk, and there are numerous trees in the same county reaching 110 to 120 ft. in height. In the splendid state forests near Ischl, in Austria, I measured in 1908 a felled tree 150 ft. long, but Mr Elwes mentions trees nearly or quite 200 ft. high in the virgin forests of Bosnia. A generous rainfall and a situation reasonably free from late spring frosts appear to be necessary for its success. For under-planting the silver fir is invaluable, but it is the only species of *Abies* really patient of shade.

Var. *PENDULA* has very weeping branches; found wild in the Vosges.

Var. *PYRAMIDALIS*.—A striking fastigiate tree of spire-like form, tapering to a fine point. The finest tree I have seen is in the Segrez Arboretum, in France, which was 30 to 35 ft. high in 1904.

A. PINDROW, *Spach*. HIMALAYAN FIR.

(*A. Webbiana* var. *Pindrow*, *Brandis*.)

A lofty tree with a trunk 6 to 8 ft. in diameter; trees in this country of slender pyramidal form; young shoots smooth, shining, yellowish grey; winter buds globose, very resinous, bluish at the base. Leaves narrowly linear, 1½ to 2½ ins. long, ⅛ in. to ⅓ in. wide; divided at the apex into two sharp unequal points; bright green above, and with two faintly defined stomatic bands beneath. The leaves are arranged on all sides of the shoot except underneath, the side ones spreading horizontally, the uppermost ones pointing forwards. On young plants the leaves are sharply pointed and not divided at the apex. Cones 4½ to 6 ins. long, 2½ to 3 ins. wide, deep purple, then brown; bracts short and completely hidden.

Native of the Himalaya, where it has been found over 200 ft. high; introduced in 1837. There are numerous trees between 50 and 70 ft. high in this country, and some have produced cones. Although coming from a lower elevation than *A. Webbiana* and considered to be more tender, it has the advantage of starting into growth later, and thus more often escapes spring frosts. It is seen at its best in the milder, moister parts of the country, and is then extremely handsome. It has been associated as a variety with *A. Webbiana*, although two firs could scarcely be more distinct. The rough, downy shoots of *A. Webbiana*, its round-ended leaves vividly white beneath, and the more spreading habit, amply distinguish it.

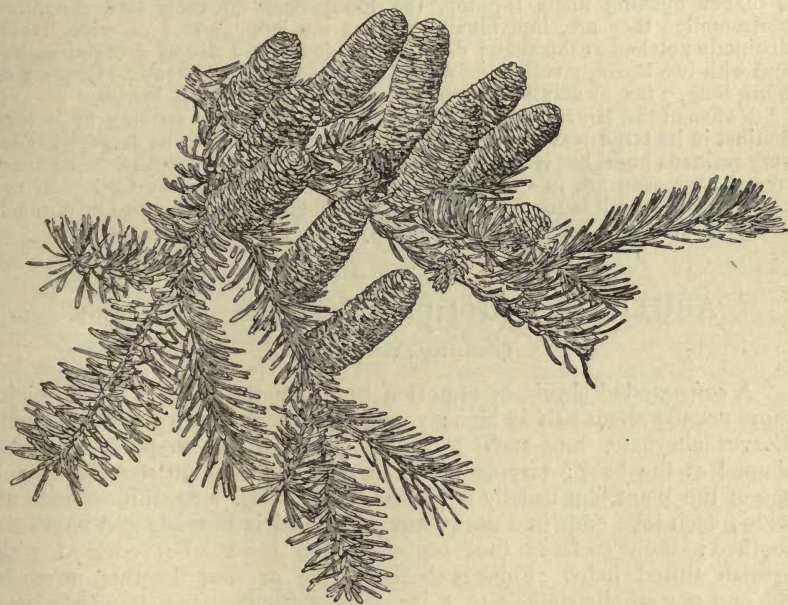
A. PINSAPO, *Boissier*. SPANISH FIR.

(Gardeners' Chronicle, 1885, ii., fig. 99.)

A tree up to 100 ft. high ; young shoots glabrous, brown ; buds reddish, resinous. Leaves densely arranged all round the branchlet (more equally than in any other fir, but still somewhat more densely above), and standing out stiffly from it at right angles ; they are $\frac{1}{2}$ to $\frac{3}{4}$ in. long, about $\frac{1}{12}$ in. broad ; thick, abruptly pointed or blunt at the apex, dark green with numerous faintly defined lines of stomata on both surfaces. Cones cylindric, with a tapered apex, 4 to 5 ins. long, about $1\frac{1}{2}$ ins. wide, purplish brown ; bract small and completely enclosed.

Native of S. Spain, on the mountains of Granada ; always on limestone. It was discovered in 1837, and introduced to England two years later. It succeeds admirably in this country, especially where the soil is of a limy nature. It is, perhaps, the most distinct and unmistakable of all the firs, especially in the short, blunt leaves being set about equally all round the branchlet. A very handsome and striking tree.

Var. GLAUCA has leaves of a glaucous tint.



ABIES VEITCHII.

A. VEITCHII, *Lindley*. VEITCH'S SILVER FIR.(Gardeners' Chronicle, 1880, i., fig. 50 ; A. Eichleri, *Lauche*.)

A tree 50 to 70 ft. high ; young shoots brown, furnished with a more or less scattered, minute down ; buds globose, very resinous, purplish. Leaves $\frac{1}{2}$ to $1\frac{1}{8}$ ins. long, $\frac{1}{16}$ in. wide, the base tapered, the apex cut off straight and notched ;

dark glossy green and grooved above, vividly white with stomatic lines beneath. All the leaves point forwards, and most of them curve more or less upwards; a few occur underneath the shoot, but most of them are above it or at the sides. On lateral shoots growing erect or nearly erect, the leaves are arranged about equally round the twig. Cones cylindrical, 2 to $2\frac{1}{2}$ ins. long, about 1 in. wide; blue-purple at first.

Discovered on Fuji-yama, Japan, by John Gould Veitch in 1860. Introduced by Maries in 1879. Among silver firs this species is very distinct, on account of the narrow truncate leaves, pointed forwards and curving upwards, and intensely blue-white beneath. The best tree I have seen is at Murthly, which in 1906 was just over 30 ft. high; it is a particularly handsome conifer in a small state, but appears inclined to develop a rather lanky habit with age.

A. WEBBIANA, *Lindley*. HIMALAYAN FIR.

(Bot. Mag., t. 8098—as “A. Mariesii.”)

A tree up to 150 ft. high in nature, with a trunk 6 or 7 ft. in diameter; young shoots very stout, rough, downy in the grooves between the leaf-bases; buds resinous. Leaves aggregated in two opposite sets so as to leave a V-shaped opening along the top, the lower ones on each side spreading horizontally; they are, individually, $1\frac{1}{4}$ to 2 ins. long, $\frac{1}{12}$ to $\frac{1}{8}$ in. wide, linear, distinctly notched at the apex; dark green, glossy, and deeply grooved above, and with two broad, vividly blue-white bands of stomata beneath. Cones 5 or 6 ins. long, 3 ins. in diameter, violet-purple at first, ultimately brown.

Native of the Himalaya; introduced about 1822. This striking fir is very distinct in its large leaves, so vividly white beneath, and in its large, globose, very resinous buds, but it is not a success in this country generally. The finest trees I have seen are in Cornwall, Scotland, and at Fota, near Cork. In the south of England it is too frequently injured by late spring frosts to be of much use; but seen at its best and comparatively young, it is a handsome tree.

ABUTILON VITIFOLIUM, *De Candolle*. MALVACEÆ.

(Bot. Reg., vol. 30, t. 57.)

A soft-wooded shrub, or almost a tree, sometimes 15 to 30 ft. high, more usually about half as high; young wood covered with a white down. Leaves alternate, long-stalked, three- or five-lobed, maple-like, heart-shaped at the base; varying much in size according to the vigour and age of the plant, but usually between 4 and 6 ins. long, three-fourths as wide; each lobe ends in a drawn-out point, and is coarsely and unevenly toothed; both surfaces (but especially the lower one) covered with greyish tufted hairs. Flowers borne, three or four together, towards the end of a woolly stalk, 3 to 5 ins. long, springing from the leaf-axils; each flower measures $2\frac{1}{2}$ to 3 ins. across, has five rounded petals of a beautiful pale, purplish blue, and is in form rather like the flower of a “single” hollyhock.

The flowers vary in colour, and in one form, to which the name ALBA has been given, they are snow-white. This usually comes true from seed, but occasionally the purplish flowered form appears amongst the seedlings, just as seeds of the purplish one will sometimes produce the white one.

Native of Chile ; first raised in Dublin in 1836 by Capt. Cottingham, an amateur gardener of the time, who had obtained seeds from that country. It is not hardy in the open at Kew, and is even uncertain against a wall there, but in the milder parts of the country few shrubs are more lovely during summer when it is in bloom. It is not a long-lived plant, and, as is not uncommon with soft-wooded shrubs that flower and bear seed so profusely, it is apt to die suddenly without apparent cause. Happily, its abundant seeds give a quick and easy means of renewing the stock. It is most fortunately placed in some sheltered corner, such as in the angle of two walls, where it will develop into a loose, graceful shrub. It may also be grown on a wall, but in the milder parts of the country will stand on the open lawn. A fine effect is made by this shrub at Chaddlewood, in Devon, where a walk 200 yards long is bordered with it.

A. MEGAPOTAMICUM, *St Hilaire* (A. vexillarium, Bot. Mag., t. 5717), a well-known pretty-foliaged greenhouse plant, is hardy in our warmest counties. The leaves are ovate with a cordate base, 2 to 4 ins. long, charmingly blotched and tessellated with bright yellow. Flowers cup-shaped, yellow, with a red calyx. Native of Brazil.

ACANTHOPANAX. ARALIACEÆ.

A genus of trees and shrubs, now including ELEUTHEROCOCCUS, allied to Aralia and Fatsia. They have pithy, sometimes prickly or bristly stems ; alternate leaves, consisting of three or five leaflets digitately arranged, or sometimes not completely divided, and only deeply lobed. Flowers in umbels, dull-coloured, followed by clusters of fruit very like those of the common ivy, being crowded in spherical clusters and inky black. In gardens, the members of this genus will be chiefly notable for their distinct and striking foliage—of a type very rare in hardy shrubs—and for their black fruits. The hardiness of some of the new Chinese species has not yet been put to the supreme test, but they promise to be well adapted for our climate. A light, warm, loamy soil suits them all, and they can be propagated by root-cuttings, sometimes by division or offsets. Some give seed freely.

The character which was relied on to distinguish Maximowicz's genus of Eleutherococcus from Acanthopanax, viz., the articulated (jointed) flower-stalk, is not really differentiative, and the two are now combined.

A. HENRYI, *Harms.*

(Bot. Mag., t. 8316 ; Eleutherococcus Henryi, *Oliver.*)

A sturdy bush, said to become 10 ft. high in a wild state, with rigid, pale brown branchlets, rough with minute bristles, and armed with broad sturdy spines, $\frac{1}{8}$ in. long, straight or slightly decurved. Leaves composed of five leaflets on a stalk $1\frac{1}{2}$ to 3 ins. long, rough to the touch. Leaflets obovate or oval, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide ; tapering nearly equally towards both ends, scarcely stalked ; the margins finely and simply toothed ; upper surface harsh, lower one more or less hairy. Flowers in a terminal cluster of umbels borne

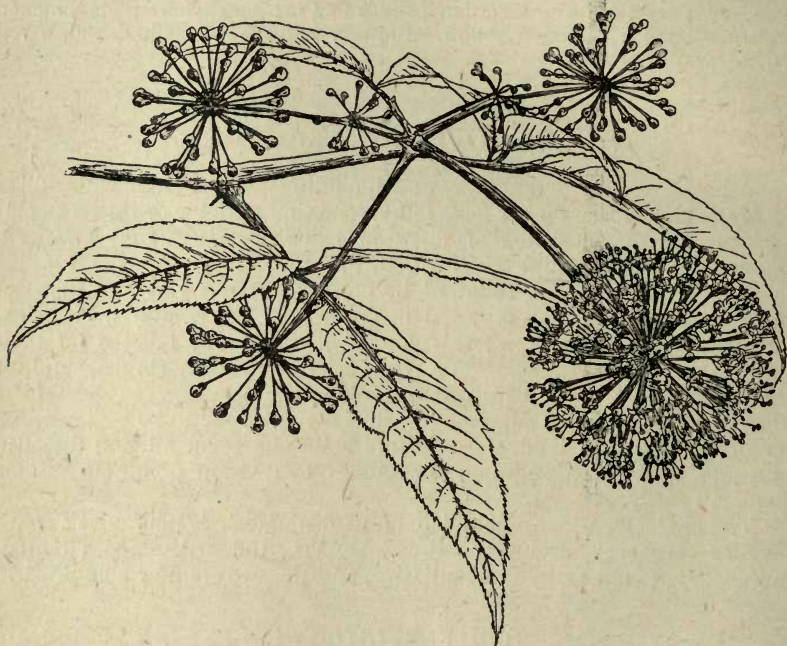
on a sturdy, slightly hairy stalk, 1 to 2 ins. long; the terminal umbel the largest and earliest. Fruits inky black, oblong, $\frac{3}{8}$ in. long, in globose umbels 2 ins. across.

Native of Central China; introduced by Wilson for Messrs Veitch in 1901, and first flowered at Coombe Wood four years later. It is an interesting but not showy shrub, although its foliage and spherical clusters of inky black fruit are striking; the latter remain long on the plants. It is a close ally of *A. Simoni*, but the very different tothing of the leaflets of that species, the more decurved and slender spines, and its smoother branches distinguish it readily from the present one.

A. LEUCORRHIZUM, *Harms.*

(*Eleutherococcus leucorrhizus*, *Oliver.*)

A deciduous shrub, probably 6 or 8 ft. high, entirely devoid of down, sometimes unarmed, sometimes with small, slender, downward-pointing prickles at the joints. Leaves composed of three or five leaflets borne on a stalk 1 to 3 ins.



ACANTHOPANAX LEUCORRHIZUM.

long; leaflets 2 to 4 ins. long, $\frac{5}{8}$ to $1\frac{1}{4}$ ins. wide, lanceolate, slender-pointed, doubly toothed, tapering at the base to a stalk $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Flowers produced in July in a terminal cluster of umbels, each umbel $1\frac{1}{2}$ to 2 ins. across, spherical, borne on a stalk 2 to 4 ins. long. Each flower is small, and on a slender stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Fruits black, roundish oval, $\frac{1}{4}$ in. long, crowded in umbels over 2 ins. across.

Native of Central China; discovered by A. Henry; introduced by Wilson in 1901. This is one of the handsomest species in this genus; its habit is not so

stiff as that of its near allies, and the large umbels of black fruit are striking. It has been confused with *A. Simoni* (*q.v.*), but differs in being glabrous and in the arrangement and shape of the prickles; from *A. Henryi* it differs in the same respects as well as in the toothings of the leaflets. The Chinese obtain a drug from the root.

A. PENTAPHYLLUM, *Marchal.*

(*A. spinosum*, *Hort.*, not *Miquel.*)

A deciduous shrub of loose habit, 8 to 10 ft. high, with erect stems and arching, slender branches, often armed with a spine at the base of each leaf-stalk or leaf-cluster; the whole plant without down. Leaves composed of three to (normally) five leaflets, borne on a slender common stalk $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long; leaflets stalkless, obovate, 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide, toothed except towards the tapering base. Flowers very small, greenish white, produced during June, and later on a spherical umbel $\frac{3}{4}$ to 1 in. diameter, terminating a slender stalk 2 to 4 ins. long. On the year-old wood the leaves are produced in clusters from the previous year's buds; it is from the centre of this cluster that the inflorescence is borne.

Native of China and Japan; introduced in 1874, but for long confined to cool greenhouses. It is quite hardy if given shelter from north and east, and a most elegant, handsome-foliaged shrub, although destitute of flower beauty. Still more pleasing is the

Var. *VARIEGATUM* (*Panax quinquefolium variegatum*, *Hort.*), whose leaflets are edged with a broad border of creamy white. This is one of the daintiest of variegated shrubs, hardy, but needing a sheltered position. Propagated by cuttings made of short, moderately firm shoots in heat; or of harder wood under a handlight.

A. RICINIFOLIUM, *Seeman.*

(*Aralia Maximowiczii*, *Van Houtt.*)

A large, deciduous tree, 80 to 90 ft. high in a wild state, with a trunk as much as 4 ft. in diameter. In cultivation it is as yet but a small and very elegant tree, the branches armed with stout, broad-based, yellowish prickles. Leaves palmate, measuring in young plants as much as 14 ins. in width, scarcely so much in length, deeply five- or seven-lobed, becoming smaller as the trees increase in age, and then from 7 to 10 ins. wide; the shallow lobes ovate-triangular, long-pointed, toothed, reaching about one-third or less towards the centre; upper surface dark shining green; lower one paler and covered with grey down when young, which falls away afterwards except from the vein-axils. Flowers not seen in this country, but described as white, and produced in numerous umbels forming a large, flattish inflorescence up to 2 ft. across.

Native of Japan; introduced to Europe by Maximowicz about 1865. It is one of the most remarkable of all cool temperate trees, and a full-grown specimen such as Sargent and others describe as existing in the woods of Japan would make a wonderful addition to the garden flora of Britain, for its foliage is of a type very sparsely represented in the open air, although plentiful enough in greenhouses and stoves. But I doubt if such trees will ever be seen here, for although it has been in cultivation in Europe for nearly fifty years, I know of no tree that suggests that term of years. It appears to be hardy, inasmuch as it will survive severe winters; but its shoots often decay back, and frequently the whole plant dies without any ostensible cause. It is most probable that our climate is not sunny enough to sufficiently ripen its wood. Of the two forms, or states, in cultivation, the one with deeply, the other with comparatively shallow-lobed leaves, the former has been distinguished as var. *MAXIMOWICZII*. (*Flore des Serres*, t. 2067.)

A. SENTICOSUM, *Harms.*(Eleutherococcus senticosus, *Maximowicz.*)

A deciduous shrub, usually 4 to 6 ft. high, but said to occasionally become twice or thrice that height. Stems erect, scarcely branched, covered with stiff bristles. Leaves composed of three to five leaflets borne on a slender, sometimes bristly stalk 3 to 5 ins. long. Leaflets oval, ovate, or slightly obovate, the side ones often oblique at the base; $2\frac{1}{2}$ to 5 ins. long, usually more than half as wide; finely toothed; upper surface dark glossy green, and furnished with stiff short hairs on the ribs and veins; paler underneath; stalk $\frac{1}{2}$ in. or less long. Flowers numerous, in one or more globular umbels terminating the shoot; each umbel $1\frac{1}{2}$ ins. diameter, on a smooth slender stalk 2 to 3 ins. long; flowers purplish yellow, very small, each on a stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; produced in July.

Native of China; introduced to Kew in 1893. It is an interesting shrub with handsome foliage, remarkable for its bristly (scarcely prickly) stems, which distinguish it from all other hardy Araliads.

A. SESSILIFLORUM, *Seeman.*(Panax sessiliflorum, *Ruprecht.*)

A deciduous shrub of vigorous habit, forming a large spreading bush 5 to 10 ft. or more high, and twice as much wide; stems stout, very pithy, grey, scarcely or not armed. Leaves composed of three, sometimes five, leaflets on a common stalk $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long; leaflets narrowly oval or obovate, 2 to 5 ins. long, about half as wide, the central one the largest; tapering at both ends, very short-stalked, irregularly toothed, almost quite smooth on both surfaces but somewhat hard to the touch. Flowers produced in July and August, at the end of the shoot, packed closely in a globose, almost stalkless cluster 1 in. across, brown-purple with yellowish protruding stamens. Fruits in a spherical head, 1 to $1\frac{1}{4}$ ins. across, inky black.

Native of Manchuria, China, and Japan; introduced to St Petersburg about 1860. It is one of the hardiest shrubs introduced from N. Asia, and one, fortunately, that is not enticed into premature growth by unseasonable winter warmth. Whilst its flowers have no beauty, the black fruits are rather striking, and the shrub itself is handsome. The finest specimen I have seen is in the Botanic Garden at Herrenhausen, Hanover; in 1908 this was 12 ft. high and 21 ft. in diameter—a broad-based pyramid of foliage. Propagated by seeds. Closely allied to *A. sessiliflorum* is

A. DIVARICATUM, *Seeman*, easily distinguished, however, by its more downy character. The young shoots are downy; the short stalk of the flower-head has a mossy appearance, and the leaves are quite downy beneath.

A. SETCHUENENSE, *Harms.*

A deciduous shrub or small tree, up to 10 ft. high, free from down in every part; stems with few or no prickles. Leaves composed of three leaflets borne on a stalk $1\frac{1}{2}$ to 4 ins. long. Leaflets dark green above, paler or slightly glaucous beneath; oblong to ovate, 2 to $5\frac{1}{2}$ ins. long, 1 to 2 ins. wide, the margins finely toothed or almost entire; stalks $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers in a panicle of about six spherical umbels borne at the end of the season's shoots during July; each umbel is 1 to $1\frac{1}{2}$ ins. across, the central terminal one the largest; they are borne on stalks of varying length ($\frac{3}{4}$ to 3 ins.), the whole panicle from 5 to 7 ins. high. Fruits black.

Native of W. China ; introduced by Wilson for Messrs Veitch about 1904. It appears to be quite hardy at Coombe Wood, where I have seen it in flower and fruit. The absence of down from all parts of the plant, and the trifoliolate leaves, render it distinct.

A. SIMONI, *C. K. Schneider.*

(*Eleutherococcus Simoni, Simon-Louis.*)

A deciduous shrub, 3 to 5 ft. high, bushy ; branches not downy, armed with stout, pale spines, pointing downwards. Leaves composed of five leaflets radiating from the end of a slender stalk 2 or 3 ins. long, and often armed with a few slender prickles. Leaflets of different sizes ; the terminal one the largest, sometimes 5 or 6 ins. long and $1\frac{1}{2}$ to 2 ins. wide ; the lower pair much smaller ; all lanceolate, long-pointed, tapering at the base to a short stalk ; sharply, somewhat coarsely toothed, the teeth set with one or two bristles ; dark green, and furnished with scattered bristly hairs above, paler and similarly bristly beneath. Flowers in a terminal cluster of umbels, each umbel on a stalk 1 to 2 ins. long. Fruit $\frac{1}{4}$ in. long, black, each on a slender smooth stalk $\frac{1}{2}$ in. long.

Native of China ; first appeared in Europe in the nursery of Messrs Simon-Louis, near Metz. It was also introduced by Wilson for Messrs Veitch in 1901. It is figured in the *Gardeners' Chronicle*, Dec. 9, 1905, p. 404, under the erroneous name of *Eleutherococcus leucorrhizus* (see *A. leucorrhizum*), which differs in having perfectly smooth leaves.

ACER. MAPLES. ACERACEÆ.

A large and important genus composed chiefly of deciduous trees, some being of the largest size, many middle-sized or small, a few shrubby. The hardy species are widely spread over the three northern continents, the finest trees being natives of N. America. A large number come from N.E. Asia, many of which, however, are small trees.

The most constant and distinctive characters of the genus are the opposite leaves and the form of the fruits. Each fruit consists normally of two sections, known as samaræ (commonly as "keys"), attached to each other by their bases, and each "key" consists of a nutlet, containing one, sometimes two, seeds, and a large, thin, membranous wing. These wings no doubt assist in the dispersion of the seed. Flowers sometimes unisexual. The typical maple leaf is broad and flat, with five palmate lobes. But there is a great diversity of shape in the genus: some species have as many as eleven or thirteen lobes to each leaf, many have but three lobes, and there is a distinct group with leaves not lobed at all. Finally comes the section of maples with compound leaves consisting of three or five distinct leaflets, sometimes kept generically separate as *Negundo*.

Most of the maples have tamely coloured flowers, varying from yellow to greenish white ; a few have purple flowers (like *A. circinatum*), and are very ornamental when in blossom ; whilst others, like *A. Opalus*, flower in early spring before the leaves expand, and although not highly coloured make, at that season especially, a pleasing display. Still, on the whole, the attractions of the maples generally are in the large or

handsomely cut foliage, and in the red or yellow tints many of them assume in autumn.

Few trees are more easily cultivated than these, their chief requirements being a rich moist soil and a moderately sunny, or at any rate not unduly shaded, position. Some of the smaller species, however, like *A. rufrinerve*, *A. capillipes*, and *A. argutum*, like their stems shaded. All the maples should, if possible, be raised from seeds; if grafting has to be resorted to, as for the numerous coloured-leaved and variously habited varieties, the scions should be worked on stocks of their own species.

The number of species of maple has so largely increased in recent years by the accession of newly discovered species in China, that no ordinary garden can accommodate them all. The following is a rough classification of the species (the most desirable for gardens marked *), which will enable the student at least to narrow down the problem of identifying his maples. But no perfect key can be based on the lobing of the leaves, owing to their variability in this respect.

I. LEAVES NOT LOBED.

- **carpinifolium*, leaves hornbeam-like.
- **Davidii*, branches white-lined.
- distylum*, leaves largest of this group.
- oblongum*, leaves normally entire.
- tataricum*, occasionally slightly lobed.
- tetramerum*, whitish hairs in leaf-axils.

II. LEAVES THREE-LOBED.

- Buergerianum*, leaves quite smooth.
- capillipes*, branches white-lined; racemes drooping.
- coriaceum*, leaves quite smooth.
- crataegifolium*, branches white-lined; racemes erect.
- **creticum*, shrubby, leaves often unlobed.
- Franchetii*, stalk of leaf about as long as blade.
- **Ginnala*, often shrubby.
- glabrum*, leaves thin and quite smooth, sometimes five lobed.
- grandidentatum*, branchlets and leaf-stalks reddish.
- latum* var. *tricaudatum*, leaf-stalks milky.
- leucoderme*, velvety down beneath the leaf; sometimes five-lobed.
- Miyabei*, leaf-stalk milky; leaves sometimes five-lobed. (See Group III.)
- **monspeulanum*, leaf-stalk not milky.
- **pennsylvanicum*, branches white-lined.
- rufrinerve*, branches white-lined; young shoot glaucous.
- spicatum*, racemes erect, densely flowered.
- tetramerum* var. *lobulatum*, whitish hairs in vein-axils.

III. LEAVES FIVE-LOBED, WITH MILKY STALKS.

- campestre*, green beneath.
- Dieckii*, three-, four-, or five-lobed.
- **latum*, five- or seven-lobed.
- **Lobelii*, habit columnar.
- **macrophyllum*, leaves up to 1 ft. across.
- Miyabei*, sometimes three-lobed.
- neglectum*, hybrid of *campestre*.
- pictum*, five- or seven-lobed.
- **platanoides*, shining green beneath.
- truncatum*, base of leaf truncate.

IV. LEAVES FIVE-LOBED ; STALKS NOT MILKY.

- argutum*, downy beneath, doubly toothed.
 **dasycarpum*, glaucous beneath.
diabolicum, margins ciliate ; flowers yellow.
 **Heldreichii*, veins downy beneath, lobes very deep.
hyrcanum, veins downy beneath, rather glaucous beneath.
insigne, flowers in erect panicles.
leucoderme, sometimes three-lobed, velvety beneath.
micranthum, downy only at base of blade.
Oliverianum, downy only along veins and in their axils.
 **Opalus*, lobes shallow ; flowers in March.
palmatum (type).
Pseudoplatanus, downy on veins, pale or glaucous beneath.
Pseudoplatanus var. *villosus*, downy all over beneath.
purpurascens, margins ciliate ; flowers purple.
 **rubrum*, glaucous beneath.
saccharum, down in vein-axils, sometimes all over, beneath.
sinense, downy only at base of blade.
Trautvetteri, downy in vein-axils, rather glaucous beneath.
Tschonoskii, downy on veins or in vein-axils, margins doubly toothed.
 **Volxemi*, downy on veins and in vein-axils.

V. LEAVES SEVEN- OR MORE THAN SEVEN-LOBED.

- **circinatum*, lobes up to nine ; flowers crimson and white.
 **japonicum*, lobes up to eleven ; flowers purple.
 **palmatum* (septemlobum), lobes seven ; flowers purple.
Sieboldianum, lobes seven or nine ; flowers yellow.

VI. LEAVES COMPOUND.

- **cissifolium*, leaflets three ; branchlets downy.
 **griseum*, leaflets three ; teeth large, blunt.
Henryi, leaflets three, without teeth.
mandshuricum, leaflets three ; racemes few-flowered.
 **Negundo*, leaflets three or five.
 **nikoense*, leaflets three, hairy beneath.
sutchuenense, leaflets three ; racemes many-flowered.

A. ARGUTUM, *Maximowicz*.

(Gardeners' Chronicle, 1881, i., f. 132.)

A small, deciduous tree as seen under cultivation, with erect branches ; young branchlets covered with fine down. Leaves 2 to 4 ins. long, as much wide, five-lobed, produced on long slender stalks, the lobes ovate, long-pointed, with margins prettily double-toothed ; lower surface downy, especially on the whitish veins. Flowers greenish yellow, produced in April before the leaves, in a cluster of slightly downy corymbs, each flower on a slender stalk. Fruits in pendulous racemes ; keys smooth, $\frac{3}{4}$ ins. long, $\frac{1}{4}$ in. wide, spreading horizontally.

Native of the mountain woods of Japan ; introduced to England in 1881, for Messrs Veitch, by Maries. It is a maple of elegant appearance, with pale green leaves as prettily lobed and toothed as those of *A. palmatum*. The stalk of the inflorescence and that of the individual flower lengthen considerably as the fruits develop. The branches acquire a purplish brown shade in winter. It is at present 14 ft. high at Kew ; but a better tree is in the fine collection of maples at Westonbirt (Sir George Holford's).

A. BUERGERIANUM, *Miquel*. BUERGER'S MAPLE.(A. trifidum, *Hooker*; A. trinerve, *Dippel*.)

A deciduous, small tree, with distinctly three-lobed leaves $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, and about the same from tip to tip of the side lobes, which point forward, and are triangular and pointed; the leaf is distinctly three-nerved, and tapers to the rounded base; margins irregularly, sometimes obscurely, toothed; upper surface bright dark green, lower one dull and slightly glaucous. Except for a loose floss on the lower surface when quite young, which soon falls away, the leaf is smooth; leaf-stalk slender, as long or longer than the blade. Flowers in a downy, umbel-like corymb, numerous, small. Fruit with keys $\frac{3}{4}$ to 1 in. long; the wings $\frac{1}{4}$ in. wide, parallel or connivent.

Native of China and Japan; introduced to Kew in 1896, where it thrives very well and grows quickly. It came as A. trinerve, and is also known as A. trifidum.

A. CAMPESTRE, *Linnaeus*. COMMON MAPLE.

A deciduous, round-headed tree, usually between 20 and 35 ft. in height, but occasionally over 70 ft. Leaves five-lobed, palmate, up to 4 ins. across (usually 2 to 3 ins.), somewhat less in length, downy beneath and at the edges; the stalk about as long as the blade, exuding a milky sap when broken. Flowers few, green, produced in small, and at first erect, corymbs. Fruits with horizontally spreading wings 1 in. or more long, $\frac{1}{3}$ in. wide, usually downy.

Native of Europe, including Britain, and a common hedgerow tree in the south of England, where two forms are distinguished by botanists: HEBECARPUM, *De Candolle*, the commoner one with downy fruits; LEIOCARPUM, *De Candolle* (syn. collinum), with smooth ones.

When well-grown the common maple is a rather handsome, neatly shaped, small tree, although often enough only a mere bush in English hedgerows. It makes a close, neat hedge, and although not much used in England is popular on the Continent for the purpose. The famous hedges in the Imperial Gardens at Schoenbrunn, near Vienna, are largely formed of this maple—perpendicular walls of verdure 50 ft. high. Mr Elwes describes the wood as one of the best of its class, having a fine grain, and hard. Besides the two varieties mentioned above as wild in Britain, there are also in cultivation the following:—

Var. COMPACTUM.—A dwarf bush of very close, compact growth, only a few feet high, and usually broader than it is high.

Var. POSTELENSE.—Leaves golden yellow; very effective in spring-time.

Var. PULVERULENTUM (syn. maculatum).—Leaves thickly specked and blotched with white.

Var. SCHWERINII.—Leaves purple on first expanding, afterwards turning green.

Var. VARIEGATUM.—Leaves margined with white.

A. CAPILLIPES, *Maximowicz*.

A deciduous tree, sometimes 30 to 35 ft. high, the branchlets erect when young and marked with whitish stripes running lengthwise; branchlets smooth. Leaves reddish when young, three-lobed; 3 to 5 ins. long, about three-fourths wide; smooth, doubly toothed, the terminal lobe triangular and larger than the side ones; veins and stalk usually red. Flowers greenish white, in drooping slender racemes $2\frac{1}{2}$ to 4 ins. long. Fruits smooth, numerous, in drooping racemes; keys $\frac{1}{2}$ to $\frac{3}{4}$ in. long; wings rounded at the end, $\frac{1}{8}$ in. wide, spreading at an angle of 120° to almost horizontal.

Native of Japan, introduced to cultivation by Prof. Sargent, who found fruiting trees in Japan in October 1892, and sent young trees to Kew a year or two later. It has proved hardy. It is one of the handsome group with striated branches including *A. pennsylvanicum* and *A. rufrinerve*, to both of which it is closely allied and bears much resemblance in shape of leaf, but is readily distinguished by the absence of down on leaf, young wood, and flower-stem.

A. CARPINIFOLIUM, *Siebold*. HORNBEAM MAPLE.

(Gardeners' Chronicle, 1881, i., f. 105.)

A deciduous tree, said to become 50 ft. high in Japan, but as yet represented only in this country by trees less than half that height; branchlets dark, smooth. Leaves oblong, usually from 3 to 4 ins. long, $1\frac{1}{2}$ to 2 ins. wide, not lobed, doubly toothed, densely covered when young, especially on the veins, with grey silky hairs, but becoming almost smooth by autumn; veins parallel as in the hornbeam, in about twenty pairs; stalks from $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers green, borne on long slender stalks in a short umbel or raceme. Fruit with wings about $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. wide, the wings decurved in the shape of a bow.

Native of Japan; introduced in 1879 by Messrs Veitch. The extraordinary resemblance the leaves bear to those of the hornbeam make this perhaps the most easily distinguished of maples. From the hornbeam their opposite arrangement, of course, at once distinguishes it even in the absence of fruit. This maple is quite hardy, and there is a fine specimen about 20 ft. high in the Coombe Wood nursery—the largest in Britain.

A. CIRCINATUM, *Pursh*. VINE MAPLE.

A low, deciduous tree, often scarcely more than a shrub, but sometimes over 30 ft. high; branchlets smooth. Leaves seven- or nine-lobed, almost circular in general outline, but heart-shaped at the base, 3 to 5 ins. wide, the lobes unequally or doubly toothed; lower surface hairy when young, but ultimately almost smooth; stalks stout, 1 to $1\frac{1}{2}$ ins. long. Flowers in small corymbose clusters, each flower $\frac{1}{2}$ in. across, the sepals reddish purple; petals smaller, dull white. Fruit with wings about $1\frac{1}{2}$ ins. long, $\frac{3}{8}$ in. wide, spreading almost horizontally, red when young (Fig., p. 138).

Native of Western N. America from British Columbia south to California; introduced by Douglas in 1826. This maple is very distinct, and one of the most ornamental in its flowers. In April, when well in bloom, the wine-coloured sepals contrasting with the whitish petals make a very pretty display, especially as they are associated with conspicuous crimson leaf-scales. Its leaves frequently die off in beautiful red and orange-coloured shades. If it is desirable that it should form a trunk, the lower branches should be pruned off as the tree grows in height until sufficient clean stem has been formed. But, allowed to grow in its natural way, it makes a low, wide-spreading bush of pleasing form, often with the lower branches laid on the ground and taking root there. Owing to this peculiarity it forms impenetrable thickets in a wild state. It is an admirable subject for a lawn in a small garden.

A. CISSIFOLIUM, *Koch*.

A deciduous tree of compact, rounded form, 30 ft. or more high; branchlets downy. Leaf consisting of three leaflets borne on a slender common stalk 2 to 3 ins. long, smooth except for a few hairs at the junction of the stalks of the leaflets. Leaflets 2 to $3\frac{1}{2}$ ins. long, obovate, oval or ovate, the terminal part of

each one coarsely and irregularly toothed ; they are smooth except for small tufts of down in the axils of the veins. Flowers minute, each on a stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long, produced in May with the leaves, on very slender racemes 2 to 4 ins. long, and downy. Fruit in long racemes ; keys 1 in. long, smooth ; the wings obliquely ovate, $\frac{1}{2}$ in. wide, diverging from each other at an angle of 60° or less.

Native of Japan. This interesting maple belongs to the same group as *A. nikoense*, but is easily distinguished by the smooth, slender leaf-stalks, the stalked basal leaflets, and the bright green under-surface and coarse toothing of the leaflets generally. There is a tree in Sir George Holford's grounds at Weston-birt 30 ft. high. In wild specimens the fruit racemes are 8 to 10 ins. long. The foliage turns red and yellow in autumn.



ACER CIRCINATUM.

A. CORIACEUM, *Tausch.*

A small deciduous tree with a rounded head of branches ; branchlets smooth. Leaves three-lobed, sometimes indistinctly five-lobed ; 2 to 3 ins. wide, somewhat less long, the stalk about as long as the blade ; smooth, deep glossy green, and rather leathery in texture, the base heart-shaped ; lobes shallow and rounded, the side ones with occasionally one to three large teeth on the outer margin. Flowers in small corymbs, yellowish green, produced in April. Fruits smooth ; keys 1 in. long ; wings $\frac{1}{2}$ in. wide, diverging at about 60° .

A hybrid between *A. Pseudoplatanus* and *A. monspessulanum*. The tree in general aspect and leaf more resembles the Montpellier Maple, but the influence

of *A. Pseudoplatanus* is evident in the larger leaf, and in the larger fruit with more divergent wings. It is neat and pleasing in habit, and retains its foliage until December.

A. CRATÆGIFOLIUM, Siebold. HAWTHORN MAPLE.

(*Flora Japonica*, t. 147.)

A slender, erect-habited, deciduous tree, 25 ft. high; branchlets smooth. Leaves of variable shape, ovate with a truncate or heart-shaped base; 2 to 4½ ins. long, about half as wide; irregularly toothed, often three- or even five-lobed, the lobes shallow. When quite young there are tufts of hairs in the axils of the veins; otherwise they are quite smooth. Flowers yellowish white, in erect, inconspicuous racemes 1½ to 2 ins. long, produced in April along with the young leaves. Fruit smooth; keys ¾ to 1 in. long; wings ¾ in. wide, spreading nearly horizontally.

Native of Japan; introduced in 1879 by Maries for Messrs Veitch. A small tree at Kew has beautiful bark striped with white lines, after the fashion of *A. pennsylvanicum*. The resemblance of the leaves to those of a hawthorn is a fanciful one. This maple is allied to *A. Davidii* and *A. distylum*, but differs in the shape of the leaves.

Var. *VEITCHII, Nicholson*.—Leaves handsomely marbled with rose colour and white.

A. CRETICUM, Linnaeus. CRETAN MAPLE.

(*A. heterophyllum, Willdenow.*)

A deciduous shrub or small tree, rarely 30 to 35 ft. high; most often a bush 8 to 15 ft. high; branches usually smooth, although in some wild Cretan specimens the young twigs are covered with a close down. Leaves of various shapes, sometimes ovate, sometimes three-lobed; ¾ to 2 ins. long, the lobes rounded and blunt, but often scarcely apparent; bright green and quite smooth on both surfaces; margins entire, or with shallow undulations, or occasionally with a few small teeth. Flowers in few-flowered corymbs less than 1 in. long, greenish yellow. Fruit with smooth wings ½ in. or rather more long, ultimately parallel or at an angle of about 60°. This maple frequently retains its leaves up to Christmas.

Native of the E. Mediterranean region; introduced in 1752. Probably the largest specimen in the British Isles is in the garden of Syon House, near Brentford. This is now somewhat decrepit, but in its prime was 32 ft. high, and nearly 50 ft. in spread of branches. Some years ago I saw a still finer example in the Jardin des Plantes at Paris, which was 35 ft. high. Usually it is a mere bush a few feet in height, and very slow in growth. It is allied to *A. monspessulanum*, but has no tuft of down in the axils of the leaf-veins. The late Mr G. Nicholson regarded *A. heterophyllum* as distinct from this species, but I have not been able to detect any reliable difference. *A. creticum* is a variable species in the shape of its leaves, and Pax differentiates half a dozen forms, founded probably on dried specimens. But as leaves of several shapes are to be found on the same tree, this is probably an over refinement. I am informed by Mr Lynch of Cambridge that the plant in the Botanic Gardens there (regarded as *A. heterophyllum*) is now 16 ft. high and 15 ft. through.

A. DASYCARPUM, Ehrhart. SILVER MAPLE.

(*A. eriocarpum, Michaux*; *A. saccharinum, Linnaeus.*)

A deciduous tree, 90 to 120 ft. high, with a trunk 9 to 12 ft. in girth in America, and reaching the lesser of these dimensions under cultivation in

Central Europe. The habit is extremely graceful, the tree forming a huge spreading, rounded head with the smaller branches and branchlets pendulous; bark light grey; branchlets smooth. Leaves five-lobed (the lobes sharp-pointed and irregularly toothed), heart-shaped at the base, 4 to 6 (occasionally 8) ins. long, about the same in width, smooth and light green on the upper surface, white and minutely downy beneath. Flowers greenish yellow, without petals, opening long in advance of the leaves and produced in short dense clusters from the joints of the previous year's wood. Fruit on slender, pendulous stalks $1\frac{1}{2}$ to 2 ins. long, the wings round-ended, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, spreading at a broad angle.

Native of Eastern N. America; introduced in 1725. This maple is the fastest-growing of the American species, and a tree of great beauty in habit and foliage. A little wind will set the long pendulous branches swaying, and by revealing the silvery under-surface of the leaves makes it one of the brightest of tree pictures. In mild seasons it will flower as early as the elm, and, perhaps in consequence, rarely develops seeds freely with us. In N. America the seeds are ripe by May, and falling to the ground, germinate at once and produce several pairs of leaves before autumn. In middle Europe it is more freely planted than in England, and is perhaps the most striking of all deciduous trees in N. Central Germany. Few trees there are better for planting in town squares and roomy streets. The leaves fade into yellow before falling. Raised from seeds, this maple produces many slightly different forms, several of which have received distinctive names. The following are the most important:—

Var. *CRISPUM*.—A close-growing variety with the leaves deeply lobed and the margins crinkled.

Var. *LACINIATUM*, *Pax*.—Leaves divided into deeper, narrower lobes than the type. Vars. *HETEROPHYLLUM* and *WIERI* are forms of the same character.

Var. *PENDULUM*.—In this the pendulous character of the branches is more marked than in the type.

Var. *TRIPARTITUM*.—Leaves lobed to the midrib.

Var. *VARIEGATUM*.—Leaves marked with white; poor, and apt to grow out of character.

A. *DAVIDII*, *Franchet*. DAVID'S MAPLE.

A deciduous tree, 30 to 50 ft. high, with the younger bark beautifully striped with white, as in *A. pennsylvanicum*. Leaves glossy green, ovate, slightly heart-shaped at the base, unevenly toothed, 3 to 7 ins. long, $1\frac{1}{2}$ to 4 ins. wide; veins prominent and parallel; covered with reddish down when young, each vein enlarging at the base where it joins the midrib and forming a minute pocket. Flowers yellowish, on slender, pendulous racemes $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, the female flowers on longer stalks and larger racemes than the males. Fruit smooth; keys $1\frac{1}{4}$ ins. long; wings $\frac{3}{8}$ in. wide, spreading almost horizontally.

Native of Central China; introduced by Maries for Messrs Veitch in 1879, and again by Wilson in 1902. This distinct maple has proved to be quite hardy, and its large undivided leaves and handsomely striated branches make it very distinct. The leaves are sometimes 8 ins. long, and of a reddish tinge on first unfolding; they are rather variable in the amount of reddish down beneath.

A. *DIABOLICUM*, *Blume*. HORNE MAPLE.

(Gardeners' Chronicle, 1881, i., fig. 100.)

A round-topped, deciduous tree, about 30 ft. high; branchlets covered with whitish hairs when young, becoming smooth later. Leaves 4 to 7 ins. wide

and long, five-lobed, heart-shaped or almost truncate at the base, the lobes broadly ovate and with a few large teeth. When young, both surfaces, the margins, and the leaf-stalk are thickly covered with whitish hairs; with age these mostly fall away, but remain on the stalk, ribs, and veins, and are scattered more or less over the lower surface. Flowers yellow, produced in April before the leaves in short pendulous corymbs from the joints of the previous year's wood; flower-stalk downy, 1 to $1\frac{1}{2}$ ins. long. Fruit with numerous whitish, stinging bristles on the nutlets and a few on the wings; keys $1\frac{1}{4}$ ins. long; wings oval, $\frac{2}{3}$ in. wide.

Native of Japan; introduced by Maries for Messrs Veitch in 1880. It is quite hardy, and is one of the biggest-leaved of hardy maples; but Prof. Sargent observes that it has no bright autumn colour, and is one of the least ornamental maples in Japan. The curious specific name is said to refer to the two horn-like, persistent styles attached to the inner side of the nutlets between the wings.

A. DIECKII, Pax. DIECK'S MAPLE.

(*A. platanoides* var. *integrilobum*, Zabel.)

A deciduous tree, probably 60 ft. high ultimately. Leaves three-, four-, or five-lobed, 3 to 7 ins. (sometimes as much as 10 ins.) wide; two-thirds as long, dark glossy green above, with tufts of brown hairs in the axils of the veins beneath; lobes broadly triangular, blunt-pointed, margins nearly always entire. Flowers yellow, in corymbs. Fruit smooth; the keys $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. long, spreading at a broad angle.

A hybrid, believed to have originated from *A. platanoides* and *A. lætum*; introduced from the Zoeschen nursery to Kew in 1887. It was first sent out under the synonym given above. The leaf-stalk exudes a milky sap when broken.

A. DISTYLUM, Siebold.

(Gardeners' Chronicle, 1881, i., fig. 93.)

A deciduous tree, probably 50 ft. high eventually. Leaves ovate, deeply heart-shaped at the base, 4 to $6\frac{1}{2}$ ins. long, about three-fourths as wide, slender-pointed, quite smooth except when young, the margin set with small teeth; leaf-stalk quite short, 1 to $1\frac{1}{2}$ ins. long. Flowers borne in a branching raceme; yellowish. Fruits smooth, in erect racemes or corymbs; keys $1\frac{1}{4}$ ins. long; wings $\frac{1}{2}$ in. wide, ultimately spreading at an angle of about 100°.

Native of Japan; introduced by Messrs Veitch in 1879. One of the original trees at Coombe Wood, now nearly 30 ft. high, produces fruit annually. The leaves in shape are similar to those of a lime. It has some resemblance to *A. Davidii*, but the leaves are broader in proportion to their length, more deeply notched at the base, and the erect racemes of fruit distinguish it.

A. DURETTI, Pax.

A deciduous tree, 40 ft., perhaps more, high, with smooth branchlets. Leaves 2 to 4 ins. across, 2 to 3 ins. long; bright green, and smooth above except for a tuft of hairs at the base, hairy along the veins beneath; there are always three large triangular lobes, and these are usually supplemented by two small ones at the base; the margins irregularly toothed. Flowers greenish yellow, produced in May on hairy-stalked corymbs, $1\frac{1}{2}$ to 3 ins. long.

A maple of unknown origin, but undoubtedly closely allied to *A. Pseudo-platanus*. It is believed to be a hybrid between that species and one of the campestre group, probably *A. monspessulanum*, as indicated by the frequently three-lobed leaves and the intermediate inflorescence.

A. FRANCHETII, *Pax*. FRANCHET'S MAPLE.

A deciduous tree, 20 ft. high, with smooth branchlets. Leaves three-lobed or occasionally with two additional basal lobes; 3 to 6 ins. long, and as much wide, the base slightly heart-shaped; lobes pointing forward, triangular, coarsely toothed; leaf-stalk often about as long as the blade. There are tufts of down in the vein-axils. Flowers yellowish green, in racemes 1 to 2 ins. long from the joints of the previous season's wood; stalks downy. Fruit with slightly hairy nutlets; keys 2 ins. long; wings $\frac{3}{8}$ to $\frac{1}{2}$ in. wide, spreading at nearly right angles.

Native of Central China; introduced in 1901 for Messrs Veitch by Wilson.

A. GINNALA, *Maximowicz*.

(A. tataricum var. Ginnala, *Maximowicz*.)

A small tree, or large shrub of bushy habit; branchlets smooth. Leaves up to $3\frac{1}{2}$ ins. long, $2\frac{1}{2}$ ins. wide, three-lobed, slightly heart-shaped or truncate at the base, margins angularly toothed; nearly, or quite smooth on both surfaces, bright dark green above; the lobes are ovate, with the middle one much the longest; leaf-stalk and midrib reddish. Flowers yellowish white, in small panicles, very fragrant, appearing in May. Fruit smooth; keys 1 in. long; wings $\frac{1}{2}$ in. wide, nearly parallel.

Native of China, Manchuria, and Japan; first introduced by way of St Petersburg. This maple is nearly allied to A. tataricum, but differs markedly in the shape of the leaf. The foliage turns a beautiful red before falling, the species being one of the best for autumnal colour.

Var. SEMENOWI, *Pax*, is a geographical form found farther to the west, in Turkestan. Its leaves are smaller, sometimes five-lobed, and the wings of the fruit are more divergent.

A. GLABRUM, *Torrey*. ROCK MAPLE.

A deciduous shrub or small tree, occasionally 30 to 40 ft. high in a wild state; branches erect; branchlets quite smooth. Leaves of very variable shapes, usually three- but sometimes five-lobed; the lobes so deep sometimes that the leaf becomes trifoliate, at other times quite shallow; 3 to 5 ins. long and broad, coarsely toothed, quite smooth on both surfaces; dark shining green above, pale beneath; stalk reddish, $1\frac{1}{2}$ to 3 ins. long. Flowers few, produced towards the end of April in clusters 1 to 2 ins. long, greenish yellow, $\frac{1}{4}$ in. across. Fruit with incurved wings, each $\frac{3}{4}$ in. long, $\frac{3}{8}$ to $\frac{1}{2}$ in. wide, reddish when young.

Native of Western N. America; long known to botanists but introduced about thirty years ago. It is very distinct because of its thin lustrous leaves, quite devoid of any down. At Kew it is thriving well, young trees 20 ft. high flowering and bearing seed; they are well marked by their upright, almost fastigate branches.

A. GRANDIDENTATUM, *Nuttall*.

A deciduous tree, occasionally 30 to 40 ft. high, usually much less; branchlets reddish and smooth. Leaves three-lobed (or five-lobed with the basal pair of lobes much reduced), 2 to 4 ins. across, heart-shaped at the base; lobes triangular or oblong, entire or with three secondary lobes; downy beneath, especially along the ribs; stalks reddish, smooth. Flowers yellow, borne in drooping short-stalked clusters, appearing with the leaves. Fruit smooth; keys 1 to $1\frac{1}{4}$ ins. long; wings $\frac{1}{2}$ in. wide, diverging at about 60°.

Native of Western N. America ; originally discovered by Thos. Nuttall on the head-waters of the Columbia River in N. Montana, whence it extends southwards to Arizona and New Mexico. It is represented in the Kew collection by plants received from Prof. Sargent in 1885, which was probably its first introduction to England. It is allied to the Sugar Maple (*A. saccharum*), and represents that species on the western side of N. America.

A. GRISEUM, Pax.

A deciduous tree, up to 40 ft. high, with peeling bark ; branchlets woolly. Leaves composed of three leaflets borne on a downy stalk ; terminal leaflet 2 to $2\frac{1}{2}$ ins. long, half as wide, oval-lanceolate, with three to five pairs of coarse teeth ; short-stalked ; side leaflets smaller, oblique at the base, stalkless. Flowers few or solitary, on pendulous downy stalks 1 in. long. Fruit with very downy nutlets and wings ; each key $1\frac{1}{4}$ ins. long ; wings $\frac{1}{2}$ in. wide, the pairs forming an angle of 60° to 90° .

Native of Central China ; introduced by Wilson for Messrs Veitch in 1901. Among the trifoliolate group of maples this is very distinct, because of the large blunt teeth on the leaflets. Its nearest ally is *A. nikoense*, but in this the leaflets are twice as large and scarcely toothed. Mr Wilson informs me that it is the most striking of the trifoliolate maples, especially on account of its peeling bark, which hangs on the stem in large loose flakes, revealing the orange-coloured newer bark within ; also for the fine autumnal red or orange of its leaves.

A. HELDREICHII, Orphanides. HELDREICH'S MAPLE.

A deciduous tree, of medium height ; branchlets smooth, dark, marked with pale oblong lenticels. Leaves 4 to 7 ins. wide, not quite so long, five-lobed, the three terminal lobes reaching nearly to the base, the basal pair not so deep or sometimes absent ; lobes oblong-lanceolate, coarsely toothed ; there is a tuft of hairs at the base on the upper side, and brown wool along the principal veins beneath ; otherwise the leaves are smooth ; rather glaucous beneath. Flowers yellow, produced at the end of May in short, broad corymbs. Fruits smooth ; the keys $1\frac{1}{2}$ to 2 ins. long ; wings $\frac{3}{8}$ in. wide, spreading at about 60° .

Native of the Balkan States and Greece ; introduced about 1879. It is very distinct and striking in foliage, on account of the deep, comparatively narrow lobes. The leaves suggest a Virginian creeper, and are unlike any other of the large-leaved European maples. In depth of lobing they resemble *A. platanoide* var. *palmatum* (*A. Lorbergii*), but the lobes themselves are quite differently shaped. A handsome maple.

A. HENRYI, Pax. HENRY'S MAPLE.

A deciduous tree, 30 ft. high ; branchlets downy at first, soon becoming smooth. Leaves composed of three leaflets borne on a slender common stalk 2 to 4 ins. long ; leaflets $2\frac{1}{2}$ to 4 ins. long, 1 to $1\frac{1}{2}$ ins. wide, oval, with a long drawn-out point, wedge-shaped at the base, not toothed ; green on both surfaces and downy on the veins, especially beneath. Flowers in slender downy spikes, produced in May before the leaves from the naked joints of the previous year's wood. Fruits red when young, in racemes 6 to 9 ins. long, each fruit very short-stalked, smooth ; keys $\frac{3}{4}$ to 1 in. long ; wings divergent at a small angle.

Native of Central China ; discovered by Henry, and introduced by Wilson in 1903 for Messrs Veitch. It belongs to the same group as *nikoense* and *cissifolium*, but differs from them and all other trifoliolate maples in the entire margins of the leaflets and in the stalkless flowers. Young trees in the Coombe Wood nursery are 12 to 14 ft. high.

A. HYBRIDUM, Spach.

A tree ultimately 60 to 70 ft. high ; young shoots not downy, but with many pale warts. Leaves three-lobed, the lobes pointing forward, with rarely two additional, obscurely developed lobes at the base ; 2 to 4½ ins. wide, scarcely so long ; dark dullish green and smooth above, pale dull green beneath, with down only along the chief veins ; irregularly and sparsely toothed ; stalk not milky, smooth, mostly shorter than the blade. Flowers yellowish, produced in May along with, or after, the leaves, in panicles or racemes 3 to 5 ins. long. Fruit with keys $\frac{3}{4}$ to 1 in. long ; the wings nearly parallel.

A hybrid of doubtful origin, but usually ascribed to *A. Pseudoplatanus* crossed with *A. Opalus*.

A. HYRCANUM, Fischer.

A deciduous tree, 20 to 30 ft. high, of compact habit. Leaves five-lobed, 2 to 4 ins. across, bright green above, paler, rather glaucous and smooth beneath, except for a patch of down at the base and along the chief veins ; stalk about as long as the blade. The terminal lobes are rectangularly cut, and each has several large, angular, blunt teeth ; basal pair of lobes ovate. Flowers greenish yellow, produced during April in short-stalked corymbs. Fruit smooth ; keys $\frac{3}{4}$ to 1 in. long ; wings nearly parallel, $\frac{1}{4}$ in. wide.

Native of the Balkan States and other parts of S.E. Europe. It is allied to *A. Opalus*, but differs in the deeper and more angular lobing of the leaf. A slow-growing tree of neat shape.

A. INSIGNE, Boissier.

A large deciduous tree with smooth branchlets. Leaves three- or five-lobed, 3 to 6 ins. wide, and the same or rather more long ; truncate or slightly heart-shaped at the base, downy beneath, especially in the axils and along the veins ; margins coarsely and irregularly toothed, the teeth often rounded or blunt. Flowers in erect corymbose panicles, 3 to 4 ins. long, appearing towards the end of May. Fruit ultimately smooth ; keys 1½ to 1¾ ins. long ; wings $\frac{1}{3}$ to $\frac{2}{3}$ in. wide, the pair forming an angle at 90° to 120°.

Var. *VELUTINUM, Boissier*, which is the commonest form of *A. insigne* in cultivation, is distinguished from the type by the dense covering of pale brown, velvety down all over the leaf beneath, and by the down on the nutlets and wings. It comes from the same regions as *A. insigne* itself, and is, no doubt, connected with it by intermediate forms.

Native of the Caucasus and the mountains of N. Persia ; introduced to cultivation by Mr Jean Van Volxem, along with *A. Trautvetteri* and *A. Volxemi*. All three have been much confused with each other. *A. Volxemi* differs in its larger leaves, usually as long or longer than they are wide, and in the down being restricted to the sides and axils of the veins. *A. Trautvetteri* resembles *A. Volxemi* in the distribution of down on the under-surface of the leaves, but the wings of the fruits are parallel or even touching. At Kew, *A. insigne* var. *velutinum* is about the latest of all trees to break into growth.

A. JAPONICUM, Thunberg.

(*Flora Japonica*, t. 144.)

A small, bushy, deciduous tree, 20 to 30 ft. (rarely 40 to 50 ft.) in height ; branchlets smooth. Leaves 2 to 5 ins. long and wide, roundish in the main, but seven- to eleven-lobed, the lobes ovate or lanceolate, long-pointed, sharply

and irregularly toothed; there is a tuft of whitish hairs at the end of the downy leaf-stalk on the upper side, and the under-surface is furnished with whitish hairs on the ribs and in their axils. Flowers purplish red, produced in early April before the leaves in long-stalked clusters. Fruits at first hairy, then smooth; keys $\frac{3}{4}$ to 1 in. long; wings $\frac{1}{2}$ in. wide, spreading nearly or quite horizontally.

Native of Japan. The Japanese have long cultivated this maple, and have produced several handsome varieties. The most popular of these is

Var. AUREUM, whose leaf is wholly of a pale golden yellow, and very effective during the whole of the summer.

Var. FILICIFOLIUM, has the lobes reaching to within $\frac{1}{2}$ or $\frac{1}{4}$ in. of the end of the leaf-stalk, each lobe being again divided and sharply toothed.

The typical *A. japonicum* often turns rich crimson in autumn. The combination of characters which distinguishes it from other maples are, the numerous leaf-lobes, the downy leaf-stalk, and the glabrous young shoots.

A. LÆTUM, *C. A. Meyer.*

(*A. cappadocicum*, *Gleditsch*; *A. pictum* var. *colchicum*, *Hort.*)

A deciduous tree, the bark of the branchlets smooth, green. Leaves green on opening, five- or seven-lobed, heart-shaped at the base, 3 to 6 ins. across, smooth except for tufts of hairs in the axils of the veins; the lobes broadly triangular, but drawn out to a long tail-like point; leaf-stalk milky when broken. Flowers in corymbs about 2 ins. long, yellow. Fruits with wings $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. long (twice to four times as long as the nutlets), spreading at a wide angle.

Native of the Caucasus and Asia Minor. There is much confusion between this maple and *A. pictum*, and it is doubtful if they are really specifically distinct—most of the so-called *pictum* in cultivation are really this tree. (In *A. pictum* the wings of the fruit are only one and a half times as long as the nutlet, and the branchlets are striped with grey-white lines and fissured the second year.) The form of *A. lætum* most common in gardens is

Var. RUBRUM, commonly called "*colchicum rubrum*," the expanding young leaves of which are red. This form was introduced to England in 1846, and there are now examples 50 ft. high in gardens. It grows wild, along with the green-leaved type, in Daghestan, near Kuba, on the western shores of the Caspian Sea, where, according to the late Mr Jean Van Volxem, the type and this form grow "promiscuously, with all shades of difference between the two extremes." A much more distinct tree is

Var. TRICAUDATUM, *Rehder*, whose leaves are trilobed, rounded at the base, $1\frac{1}{2}$ to 4 ins. long, smooth on both sides except for tufts of hairs in the axils of all the chief veins beneath; the lobes are ovate, narrower than in the type, but with the same long drawn-out points. Wings of the keys four times as long as the nutlet, and horizontally spreading. This very distinct variety was introduced by Wilson from Western Hupeh, China, in 1901, and there are vigorous young trees in the Coombe Wood nursery.

Var. CULTRATUM (*A. cultratum*, *Wallich*).—Native of the Himalaya, where it has long been known, but also native of China, where it was found by Henry in Yunan and introduced for Messrs Veitch by Wilson in 1901. Leaves five-lobed, rounded, scarcely heart-shaped at the base, stouter in texture; fruits with reddish wings spreading out in an almost straight line.

A. LEUCODERME, *Small*.

A deciduous tree, usually 20 to 25 feet (sometimes nearly twice as) high, forming a compact, rounded head. Branchlets slender, smooth. Leaves three- or five-lobed, 2 to $3\frac{1}{2}$ ins. long and wide, the lobes triangular, with usually two large teeth; the base truncate or slightly heart-shaped; lower surface covered with whitish velvety down, especially where the five main ribs meet the leaf-stalk, which is smooth. Flowers yellow, produced a few together in a short corymb, each flower on a slender stalk 1 in. or more long. Fruit hairy, except when ripe; keys $\frac{3}{4}$ in. long, diverging at 120° .

Native of the S.E. United States, and sent by Prof. Sargent to Kew in 1902, where a young tree 12 ft. high is thriving. It has neither flowered nor fruited in this country. It is an ally of the Sugar Maple, but is found wild farther to the south.

A. LOBELII, *Tenore*. LOBEL'S MAPLE.

A deciduous tree, ultimately 50 to 60 ft. high, whose erect branches give it a narrow columnar form; young shoots smooth, bluish grey. Leaves palmate, five-lobed, 4 to 7 ins. wide, rather less in length (smaller leaves are often three-lobed); heart-shaped or truncate at the base, smooth and dark green above, paler beneath, with tufts of hair in the axils of the veins; lobes ovate, ending in a long drawn-out point. Flowers in corymbs, yellow. Fruit smooth, with keys 1 to $1\frac{1}{4}$ ins. long; wings $\frac{1}{2}$ in. wide, wide-spreading but not quite horizontal.

Native of S. Italy; said to have been introduced in 1683. This maple is closely allied to the Norway Maple, and by some authorities is made a variety of it. It has the same inflorescence, fruits, and milky sap in the leaf-stalks. The erect narrow habit, however, at once distinguishes it, the cleft at the base of the leaves is not so deep, and the terminal lobes have not the few large teeth so frequent in the Norway Maple; the young bark also is markedly striped. It is a handsome, well-marked, and vigorous tree.

A. MACROPHYLLUM, *Pursh*. OREGON MAPLE.

A tree occasionally over 100 ft. high, with a trunk 3 or 4 ft. in diameter. In young trees the branches are erect, but become more spreading in older ones, forming eventually a compact, rounded head. Branchlets smooth. Leaves probably the largest among maples, usually from 6 to 12 ins. across, and cut more than half-way to the base into three or usually five lobes, each one being again cut into large, triangular minor lobes; upper surface dark lustrous green, lower one paler, with tufts of white hairs in the axils of the veins; leaf-stalk containing milky sap. Flowers yellow, scented, produced in April on dense pendulous racemes 4 to 6 ins. long, each flower $\frac{1}{2}$ in. across. Fruits covered with long, pale brown bristles; the wings nearly smooth, $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. wide, diverging at about 90° .

Native of the coast regions of Western N. America from S. Alaska to California. It was introduced by Douglas for the Horticultural Society in 1826 or 1827, but had been discovered by Archibald Menzies more than thirty years before. In many respects it is the noblest of maples, and it thrives well in many parts of the British Isles. Owing to the late growth of young trees during mild autumns, they are apt to be cut back in hard winters; but otherwise it is absolutely hardy at Kew, where there are several good specimens. On young trees the leaves are larger, but not so deeply lobed. It flowers and bears seed in great quantities some seasons, and the keys are very frequently in threes instead of the usual pairs. Owing to their hairiness and the great size of the wings, the fruits are particularly striking. The timber is highly

valued in N.W. America for furniture and indoor work—more so than that of any other tree of those regions except conifers. It would seem to be worth trying in the milder parts of the British Isles under forest conditions.



ACER MACROPHYLLUM.

A. MANDSHURICUM, *Maximowicz*. MANCHURIAN MAPLE.

A small, deciduous tree, sometimes a shrub. Leaves composed of three leaflets, on a stalk up to 4 ins. long. Terminal leaflet 2 to $3\frac{1}{2}$ ins. long, 1 to $1\frac{1}{4}$ ins. wide, lanceolate, pointed, saw-toothed, smooth when mature except for hairs along the midrib; the side leaflets are rather smaller and shorter-stalked than the terminal one; main leaf-stalk often longer than the largest leaflet. Flowers greenish yellow, often produced in threes; stamens not protruding. Fruit smooth, purplish when young; keys $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. long; wings $\frac{1}{2}$ in. wide, the pair forming an angle of about 90° .

Native of E. Siberia and Manchuria; small trees in cultivation at Kew were received from St Petersburg in 1904. This maple is closely allied to *A. nikoense* and *A. sutchuenense*; the former differs in its hairy young leaves and flower-stalks, the latter in its many-flowered inflorescence and protruding stamens. It is very liable to injury by late spring frost.

A. MICRANTHUM, *Siebold.*

(Flora Japonica, t. 80.)

A small, deciduous tree, sometimes a shrub. Leaves five-lobed, 2 to 3½ ins. long and wide, smooth except for a tuft of hairs at the base, where the ribs join the stalk; lobes ovate with a long drawn-out point, deeply and handsomely toothed; base heart-shaped; leaf-stalk downy. Flowers greenish white, numerous, on slender racemes 1½ to 3 ins. long, small (about ½ in. across). Fruits smooth; keys ½ to 1 in. long; wings ¼ in. wide, rounded at the end, spreading at a wide angle.

Native of Japan; introduced about 1879. The foliage turns a bright red in autumn, and, on young trees at any rate, is very prettily cut. It belongs to the same group of maples as *A. rufrinerve* and *A. capillipes*, with doubly toothed leaves and flowers in racemes, but differs in the more numerous lobed leaves.

A. MIYABEI, *Maximowicz*, MIYABE'S MAPLE.

(Garden and Forest, 1893, p. 143.)

A deciduous tree, 30 to 40 ft. high, with a trunk 12 to 18 ins. in diameter, of rounded habit; branchlets at first minutely downy. Leaves 4 to 6 ins. wide, not quite so long, deeply three-lobed, the lower pair of lobes usually again divided into two, but not deeply so; lobes ovate, with a long blunt apex, the margins cut into several large rounded teeth; stalks downy, as are also both surfaces, especially on the ribs and chief veins. On young trees the leaves are deeply notched at the base, but on older ones they are frequently truncate. Flowers yellow, downy, produced a few together each on a slender stalk in corymbs 2 to 3 ins. long. Fruit with downy nutlets; keys ¾ to 1 in. long; wings ½ in. wide, slightly reflexed beyond the horizontal position.

Native of Japan; sent to Kew in 1895 by Prof. Sargent, who had discovered this rare tree in September 1892, in a new locality in Yezo. He records the incident in the *Forest Flora of Japan*, p. 29:—

"We stopped quite by accident at Iwanigawa, a railroad junction in Yezo some 40 or 50 miles from Sapporo, and, having a few minutes on our hands, strolled out of the town to a small grove of trees. In this grove, occupying a piece of low ground on the borders of a small stream, and chiefly composed of *Acer pictum*, was *A. Miyabei* covered with fruit. The find was a lucky one, for Iwanigawa is a long way from the station where this maple had been discovered, and mature fruit had not been seen before. From these trees I obtained later a supply of seeds, enough to make this maple common in the gardens of America and Europe."

It is thriving well at Kew, and is evidently well adapted for the English climate. Of European maples *A. platanoides* is most closely related to it, and it has, like that species, milky juice in the leaf-stalks.

A. MONSPESSULANUM, *Linnaeus*. MONTPELIER MAPLE.

A deciduous tree of dense, rounded habit, occasionally more than 50 ft. (usually 20 to 30 ft.) high, sometimes scarcely more than a shrub; branchlets smooth. Leaves three-lobed, with a heart-shaped base; 1½ to 2½ ins. wide, less in length; dark green and glossy above, paler below, soon quite smooth on both surfaces, except for a tuft of down where the three prominent veins join the stalk, which is 1 to 2 ins. long and has no milky sap. Flowers greenish yellow, borne on drooping slender stalks ¾ to over 1 in. long, in few-flowered corymbs or loose racemes. Fruit reddish, often very abundant, with wings ¾ to 1 in. long, ¼ to ½ in. wide, and pointing downwards, so that the inner edges nearly meet or even overlap.

Native of S. Europe and N. Africa; introduced, according to Aiton, in 1739. In general appearance this maple bears much resemblance to our native *A. campestre*, but is easily distinguished by its smooth three-lobed leaves, without milky juice in the stalks. It is a small tree of neat and pleasing appearance, very suitable as an isolated specimen in a small garden. There are several fine examples at Kew, the largest 46 ft. high and nearly 6 ft. in girth of trunk. The largest specimen I have seen is in the Jardin des Plantes at Paris, which in 1904 was about 60 ft. high and 8 ft. in girth of trunk. This maple is used as a hedge plant in the south of Europe.

A. NEGLECTUM, Lange.

(*A. ætense, Hort.*; *A. zoeschense, Pax.*)

A deciduous tree, which will probably ultimately attain a height of 50 ft. and upwards; young branchlets minutely downy. Leaves 3 to $5\frac{1}{2}$ ins. wide, about three-fourths as long, five-lobed, heart-shaped at the base, dark green and shining above, paler and downy beneath, becoming smooth later except for tufts in the axils of the veins; lobes ovate, with a long apex. Flowers in erect, corymbose panicles, 2 to 4 ins. long. Fruits downy; keys $1\frac{1}{4}$ in. long; wings $\frac{1}{2}$ in. wide, almost horizontal.

A maple of garden origin with an obvious affinity to *A. campestre*, especially in the five-lobed leaf having milky sap in the stalk and in the downy horizontally-spreading keys. The leaves, however, are larger, and the lobes more angular. It is probably a hybrid between that species and *A. lætum*.

A. NEGUNDO, Linnæus. BOX ELDER.

(*Negundo aceroides, Moench*; *N. fraxinifolium, Nuttall.*)

A deciduous tree, 40 to 70 ft. high, with a trunk 2 to 3 ft. in diameter, forming a wide-spreading head of branches; branchlets smooth. Leaves long-stalked, pinnate, 6 to 10 ins. long, consisting of three or five leaflets. Leaflets ovate, 2 to 4 ins. long, pointed, coarsely toothed towards the end; upper side bright green, smooth; lower one slightly downy or eventually smooth; the terminal leaflet often three-lobed or even trifoliate. Flowers (male and female on separate trees) yellow-green, without petals, the male ones crowded in dense clusters on the previous year's shoots, each flower on a slender hairy stalk, 1 to $1\frac{1}{2}$ ins. long; the females in slender, drooping racemes. Fruit in pendent racemes, 4 to 8 ins. long; each key 1 to $1\frac{1}{2}$ ins. long, with a wing $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, the pair forming an angle of 60° or less.

Native of N. America, where it is widely spread. According to Sargent it is most common in the Mississippi Valley, but reaches as far north as New York State, and as far west as the inland slopes of the Rocky Mountains. It was cultivated by Bishop Compton at Fulham in 1688. Although the typical form is by no means common, it is a handsome tree, especially when isolated on a lawn. It is one of the maples that yield sugar in America. There is a tree over 40 ft. high at Kew, but the largest specimen I have seen is in Mr Spath's nursery, near Berlin, which is over 60 ft. high, and 6 ft. 6 ins. in girth of trunk. The most popular of variegated trees is the

Var. *VARIEGATUM*, now so largely used in town gardens, and grown in pots for the decoration of halls and large rooms. The leaflets have an irregular border of white, or are sometimes wholly white. In consequence, the tree makes a conspicuous object in the garden, and is frequently over-planted. It first appeared as a "sport" on the green-leaved type in a nursery at Toulouse in 1845, but trees of large size appear to be very uncommon. It is female, and the fruits are variegated like the leaves. Other varieties are:—

Var. AUREO-MARGINATUM.—Leaflets marked as in the common variegated box-elder, but with yellow instead of white.

Var. AUREUM (syn. *odessanum*).—Leaflets wholly yellow; this variety is one of the best of golden-coloured trees, and retains its colour until autumn.

Var. CALIFORNICUM, *Wesmael*.—Judging by young trees at Kew, this variety appears to be a much faster grower, with larger leaflets, than the type. The chief botanical difference is furnished by the dense covering of grey down beneath the leaves, and by the downy branchlets and fruits, although this is not so apparent in cultivated as in native specimens. Native of California. Forms intermediate between this variety and the type are said to occur in Arizona, Texas, Missouri, etc.

Var. CRISPUM, *Don*.—Leaflets curled, often deformed; shrubby.

Var. LACINIATUM (syn. *heterophyllum*).—Leaflets reduced to a linear or lanceolate shape, and with more or less deeply cut margins.

Var. VIOLACEUM, *Kirchner*.—Young shoots covered with a purplish bloom.

A. NIKOËNSE, *Maximowicz*. NIKKO MAPLE.

(Garden and Forest, 1893, fig. 26.)

A deciduous tree, up to 40 or 50 ft. high in a wild state, with a trunk 12 to 18 ins. in diameter and a round-topped habit; branchlets hairy. Leaves composed of three leaflets on a stout, very hairy main stalk; terminal leaflet short-stalked, oval; 3 to 5 ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; the side ones obliquely ovate, stalkless, and somewhat smaller; all are either entire at the margins or shallowly and sparsely toothed, and more or less hairy beneath. Flowers yellow, $\frac{1}{2}$ in. diameter, produced usually three together on drooping hairy stalks $\frac{3}{4}$ in. long. Fruit with thick, brown-felted nutlets; keys $1\frac{1}{2}$ to 2 ins. long; wings $\frac{3}{4}$ in. broad, rounded, nearly parallel to each other, or diverging to 60° (in cultivation often not so large).

Native of Japan, where, according to Sargent, it is widely distributed, but not common; also of Central China. Introduced by Messrs Veitch in 1881, in whose nursery at Coombe Wood is one of the first trees raised from Maries' seeds, now 25 to 30 ft. high. Compared with many maples this is not a quick grower, which in small gardens may be counted an advantage, especially as the tree has a most interesting and distinct appearance at all times, and is very beautiful in autumn when the foliage turns rich red. The winter buds are long and pyramid-shaped, with overlapping scales. In wild specimens collected by Henry in Central China the leaflets are 7 ins. long and 3 ins. wide.

A. OBLONGUM, *Wallich*.

A sub-evergreen or deciduous tree, found both in the Himalaya and China. In the Himalaya it grows 50 ft. in height, but plants from that region are too tender for our climate. In China it is quite common in various parts, especially in Hupeh, whence the plants now in cultivation were introduced by Wilson; there it appears to be most frequently 20 to 25 ft. high. The plants raised from Wilson's seeds in 1901 seem likely to prove hardy, both at Coombe Wood and Kew. It is a tree without down; the leaves hard and leathery in texture, normally oblong or oblong-ovate, 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; pointed, tapered or rounded at the base, neither lobed nor toothed; distinctly glaucous beneath. (They are considerably larger in the Himalayan form.) But although the entire-margined, unlobed leaves distinguish this maple in its normal state from all other cultivated species, the young tree at Kew has very distinctly three-lobed, sharply toothed leaves as well as the normal ones; in these the lobes are near the base, the apex is much drawn out, and they are sometimes over 2 ins. across. Henry has noted the occurrence of these trilobed leaves on

wild trees. The fruits are smooth ; keys about 1 in. long ; the wings $\frac{1}{4}$ in. wide.

Var. CONCOLOR, *Pax*.—Leaves green on both sides.

Var. LATIALATUM, *Pax*.—Wings of fruit broad, $\frac{1}{2}$ in. wide, and almost semi-circular.

A. OLIVERIANUM, *Pax*. OLIVER'S MAPLE.

A deciduous tree, from 12 to 25 ft. high ; branchlets smooth and often purplish. Leaves five-lobed, $2\frac{1}{2}$ to 4 ins. wide, scarcely so long, truncate or slightly heart-shaped at the base ; the lobes ovate, long-pointed, minutely, regularly and sharply toothed ; smooth except for down along the veins and in their axils. Flowers borne at the end of a slender-stalked corymb, 2 ins. long. Fruit smooth ; keys 1 in. long ; wings $\frac{2}{3}$ in. wide, spreading nearly horizontally.

Native of Central China ; discovered by Henry, and introduced by Wilson for Messrs Veitch in 1901, and now succeeding well in their Coombe Wood nursery. It is allied to the *A. sinense* described below, but differs in the smaller more finely and evenly toothed leaves, and in the short corymbose inflorescence. The flowers develop at the same time as the leaves.

A. OPALUS, *Miller*. ITALIAN MAPLE.

(Garden, 1872, p. 443 ; *A. opulifolium*, *Villars*.)

A tree 30 to 50 ft. high, of rounded habit, sometimes much smaller or even bushy ; branchlets smooth. Leaves $2\frac{1}{2}$ to $4\frac{1}{2}$ ins. wide, somewhat less in length, shallowly five-lobed, heart-shaped at the base, irregularly toothed ;



ACER OPALUS.

dark green, glossy and smooth above, paler and more or less downy beneath, especially along the chief veins and in their axils, occasionally quite smooth ; lobes angular. Flowers yellow, appearing in March, numerous crowded in short-stalked corymbs ; each flower on a slender, smooth, pendent stalk, 1 to $1\frac{1}{2}$ ins. long. Fruit smooth ; keys 1 to $1\frac{1}{2}$ ins. long ; wings $\frac{2}{3}$ in. wide, varying considerably in divergence.

Native of S. and Central Europe ; introduced in 1752. It is one of the

most ornamental of early-flowering trees, producing its blossoms regularly and in great abundance in March and April; they are of a clearer and more pronounced yellow than in most maples. There are several good specimens at Kew, the largest nearly 50 ft. high and 5 ft. in girth of trunk. There is much confusion in the nomenclature of this maple. It is very variable, and some authorities separate the two following varieties from it as distinct species:—

Var. NEAPOLITANUM (*A. neapolitanum*, *Tenore*; *A. obtusatum* var. *neapolitanum*, *Pax*).—Leaves up to 6 or 7 ins. wide, covered with a pale felt beneath, the lobes quite shallow, especially the basal ones. Flower-stalks hairy, remaining so until the fruits ripen. Native of the country about Naples, where, like the type farther north in Italy, it is largely employed in vineyards as a support on which to train the vines.

Var. OBTUSATUM (*A. obtusatum*, *Kitaibel*).—Leaves on the whole larger than in the type, and up to $5\frac{1}{2}$ ins. wide, the lobes more rounded and the whole under-surface covered with a close down; flower-stalks hairy; fruit-wings not so large as in var. *neapolitanum*. Native of Central and E. Europe.

A. PALMATUM, *Thunberg*. JAPANESE MAPLE.

(*A. polymorphum*, *Siebold*.)

A deciduous tree of rounded form, rarely seen more than 20 ft. high in cultivation, but more than twice as high in a wild state; habit rounded, often wider than high; branchlets smooth. Leaves usually seven- sometimes five-lobed in the typical form, 2 to $3\frac{1}{2}$ ins. long and wide; the lobes ovate-lanceolate, cleft two-thirds of the way to the base of the blade, sharply double-toothed, smooth on both surfaces except in the axils of the ribs beneath; green at first, becoming bronzed or purplish in autumn. Flowers in somewhat erect, smooth, stalked umbels; small and purple. Fruit smooth; keys about $\frac{1}{2}$ in. long; wings $\frac{1}{8}$ in. wide, much incurved, the pair forming a broad arch.

Native of Japan; whence it was introduced to England in 1820, but since found by Wilson in Central China. Having long been cultivated by the Japanese, it has produced an extraordinary number and variety of forms differing in colour and form of leaf. Many of these continue to be imported from Japan, and to many of them unwieldy Latin names have been given. No attempt can be made here to do more than describe the most distinct and representative of them. The four following groups are arbitrarily made, and some forms perhaps may as reasonably be put in one as the other:—

1. PALMATUM.—Leaves five-lobed, as described above.

AUREUM.—Leaves yellow when young, becoming golden later.

LINEARILOBUM.—Lobes of leaf narrow, reaching almost to the base, green.

There is also a purple-leaved form of this.

RIBESIFOLIUM.—Green; lobes of leaf cleft to the base and deeply and irregularly jagged at the edges.

ROSEO-MARGINATUM.—Leaves rosy at the edges.

2. SEPTEMLOBUM.—In the typical form of this variety the leaves are seven-lobed, larger than in *palmatum*, suffused with red when young, afterwards green, finally turning brilliant red before falling.

ATROPURPUREUM.—Leaves rich purple.

BICOLOR.—Leaves of two colours; carmine, and red as in *sanguineum*. Sometimes the carmine is laid on in blotches; sometimes one-half the lobe or one-half the leaf is of that colour.

ELEGANS.—Leaves up to 5 ins. long, green, the lobes deeply and prettily toothed. There is a purple-leaved form of this.

RETICULATUM.—Veins of leaf green; the interspaces yellow, white, and pale green.

SANGUINEUM.—Leaves as in the type, but purplish red.

3. DISSECTUM.—In the typical form of this group the lobes are seven, nine, or eleven in number, reaching to the leaf-stalk, again deeply and finely cut to the midrib of each lobe, then sharply toothed; green.

ROSEO-MARGINATUM.—Leaves marked as in *palmatum roseo-marginatum*, but with the cutting of *dissectum*.

ORNATUM.—Leaf-cutting as in ordinary *dissectum*, but deep red.

4. SESSILIFOLIUM.—Once thought to be a distinct species. Leaf shortly stalked, green, often with three or more distinctly stalked leaflets. This is the *Acer sessilifolium* of some authors, its true origin not being suspected until it was found as a sport growing on ordinary *A. palmatum*.

The typical *A. palmatum* and most of the green and purple varieties are quite hardy in the south of England. Yet they are not very frequently seen in good condition. They undoubtedly like a sunny position sheltered on the north and east sides, and a good loamy or peaty soil. Perhaps the greatest drawback is their susceptibility to late spring frosts; it is not unusual to see the young growths cut back once or twice in spring, and whilst the vigorous green, purple, and red varieties recover, that is fatal to the permanent success of the more delicate forms with the most exquisite colouring and cutting. Another source of failure is due to their being grafted on strong, ill-fitting stocks by the Japanese. Several forms, hitherto failures, have been found to succeed on their own roots. Seedlings, of course, are best; but the varieties do not come true from seed, although forms superior to the parent may often be obtained. There seems to be a promising field for raisers of good forms from seed in the milder parts of this country. Japanese maples were very successfully grown in the Tunbridge Wells nursery of Messrs Cripps before its dispersion.

A. PENNSYLVANICUM, *Linnaeus*. SNAKE-BARK MAPLE.

(*A. striatum*, *Du Roi*.)

A deciduous tree, sometimes 30 or more ft. high, usually 15 to 20 ft., with rather erect branches. Young wood at first green, becoming, when two or more years old, beautifully striped with white jagged lines. Leaves up to 7 ins. long, a little less wide, with three conspicuous, tapering, forward-pointing lobes at the terminal part; margins finely and sharply double-toothed; lower surface covered with minute reddish down when young, which mostly wears off towards the end of the season; stalks $1\frac{1}{2}$ to 2 ins. long, the enlarged bases of each pair clasping the shoot. Flowers yellow, produced in May on slender, pendulous racemes 4 to 6 ins. long, not densely; each flower is $\frac{1}{3}$ in. diameter, and borne on a stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit in pendent racemes, smooth; wings $\frac{3}{4}$ in. long, each pair forming a crescent $1\frac{1}{2}$ to 2 ins. across.

Native of Eastern N. America; introduced in 1755. This maple is remarkable chiefly for the exceedingly handsome striping of its younger branches and stem. For a long time it was the only species known in cultivation with this character, but in late years several species have been brought from N.E. Asia showing the same colouring [see *A. Davidii*, *capillipes*, *crataegifolium*, *rufinerve*]. The leaves, large and handsome at maturity, have a pinkish tinge on opening, and usually turn yellow in autumn. It is one of the most distinct and desirable of maples; sometimes called "Moose-wood."

Var. ERYTHROCLADUM, *Spath*.—In this variety the young shoot turns a bright crimson after the fall of the leaf. This, added to the other attractions of the species, make this variety one of the most attractive of all small hardy trees. Put into commerce by Mr Spath of Berlin in 1904.

A. PICTUM, *Thunberg*.

A deciduous tree, up to 60 ft. in height, young shoots not downy, becoming grey and slightly fissured the second year. Leaves five- or seven-lobed, 3 to 6

ins. across, and rather more in length, the lobes ovate-triangular, ending in a long, narrow apex, the lowest pair spreading outwards; the base of the leaf is heart-shaped, the margins not toothed; the stalk has a milky sap, and both surfaces are green and smooth except for tufts of hairs in the vein-axils beneath. Flowers appearing in April or early May with the first leaves, greenish yellow, in corymbose racemes 2 to 3 ins. long. Fruit with smooth wings, about $1\frac{1}{2}$ times as long as the nutlets, the pairs parallel, and almost connivent; each key $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long.

Native of Japan; introduced in 1881. There is much similarity between this maple and *A. lætum*, the chief distinguishing feature of the latter being the larger wings of the fruit as compared with the nutlet, and the smooth, unfissured two-year-old stems. Even eliminating *A. lætum* as a probable variety, the present species is a variable one, the most distinct form in cultivation being

Var. MONO (*A. Mono*, *Maximowicz*), in which the fruits stand out horizontally, and at right angles to the stalk. Native of Japan, Manchuria, N. and Central China; introduced by Wilson for Messrs Veitch in 1901. A year or two previously, however, it had reached cultivation in Europe by way of St Petersburg.

Var. TOMENTULOSUM, *Rehder*.—Leaves covered beneath with a dense whitish down.

All the forms of *A. pictum* are handsome, but no very large trees appear to exist in this country. It is probable that the three following colour varieties, when they bear fruit, may prove to belong to *A. lætum* :—

Var. AUREUM.—Leaves entirely yellow.

Var. MARMORATUM.—Leaves powdered over with white dots and stains, some being more white than green.

Var. VARIEGATUM (tricolor).—Leaves marked with large irregular blotches of creamy white; occasionally all one side the midrib is of this colour.

A. PLATANOIDES, *Linnaeus*. NORWAY MAPLE.

A deciduous tree from 60 to 70, occasionally over 90, ft. high, with smooth branchlets. Leaves 5-lobed, heart-shaped at the base, 4 to 7 ins. wide and about three-fourths as long in adult trees (in young vigorous specimens they are considerably larger); bright green on both surfaces, smooth except for a tuft of hairs in the axils of the veins; stalks exuding a milky sap when broken. Flowers greenish yellow, $\frac{1}{3}$ in. diameter, produced in April before the leaves in erect, branching corymbs. Fruit pendulous, on stalks 2 to 3 ins. long; keys $1\frac{1}{2}$ to 2 ins. long, smooth; the wings wide-spreading but not quite horizontal, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide. Timber white, and fairly close and hard in grain.

Native of continental Europe, where it is widely spread in a wild state from Norway southwards; cultivated in England for centuries, but not a native. The Norway maple is one of the handsomest, hardiest, and most vigorous of introduced trees. Its leaves are thinner and brighter than those of common sycamore or of the plane, which they somewhat resemble. It is also more ornamental when in flower than most maples, and its leaves fade in autumn into various shades of red, brown, and yellow. It thrives in almost any soil, and even in the poor sandy soil at Kew grows rapidly. For forming a screen quickly it is preferable in many places to black Italian poplar, for although it does not grow so fast nor so big, it is a tree of better form and more interesting character. Easily increased by seeds, which are produced abundantly. Few large trees have produced more varieties under cultivation. More than twenty have been named, and of them the following are the more distinct :—

Var. AUREO-MARGINATUM.—Leaves often three-lobed; lobes deep and long-pointed, margined with yellow.

Var. COLUMNARE, *Carrière*.—Leaves smaller and shallower-lobed than in

the type ; branches erect ; habit columnar. Raised in the nursery of Messrs Simon-Louis at Plantières, near Metz, in 1855.

Var. CUCULLATUM.—Leaves long-stalked, fan-shaped, with seven or nine prominent veins instead of the usual five ; base of leaf wedge-shaped or truncate, not heart-shaped. Of the same type as var. laciniatum, but with the lobes not so long-pointed.

Var. GLOBOSUM.—A dwarf form ; head of foliage wide-spreading, dense, and mop-headed.

Var. LACINIATUM. EAGLE'S CLAW MAPLE.—A smaller and more twiggy tree than the type, of more erect, narrow habit. Leaves tapering and wedge-shaped at the base, the lobes ending in long, often curved, claw-like points. The oldest of named varieties, and figured in an Austrian work in 1792.

Var. MACULATUM.—Leaves blotched with white, more thickly towards the edges. Of no great merit.

Var. NANUM.—Of dwarf, pyramidal shape.

Var. PALMATUM.—(A. Lorbergii, *Hort.*).—Leaves slit back to the stalk into three lobes, the basal pair often cut again almost as deeply, and all the lobes divided into secondary lobes with long drawn-out handsome points. Introduced from Belgium in 1845.

Var. REITENBACHII.—Leaves green during the summer, changing to rich red as autumn approaches, and very beautiful then. Raised at Reitenbach's nursery at Plicken, in Prussia.

Var. SCHWEDLERII.—Leaves of a bright red when young, becoming green as they mature. A popular variety, beautiful in late April and May.

Var. STOLLII, *Simon-Louis*.—Leaves very large, up to 9 ins. in diameter ; lobes not deep and often entire.

Var. WALDERSEEL.—Leaves densely speckled with white dots, so as to give them a delicate grey appearance. I saw trees of this variety in Messrs Spath's nursery near Berlin, in June 1908, which were very pretty at that season.

A. PSEUDOPLATANUS, *Linnaeus*. SYCAMORE ("PLANE" in Scotland).

A deciduous tree of the largest size, reaching at its best a height of over 100 ft. and a girth of trunk of 20 ft. Bark of the trunk pale, greyish, and peeling off in large flakes ; branchlets smooth. Leaves usually five-lobed (small ones on fruiting twigs often three-lobed), 4 to 7 ins. across in adult trees (larger in young ones), heart-shaped at the base ; the lobes ovate, coarsely toothed, dark green and smooth above, paler and dull glaucous beneath, with pale brown hairs in the axils of the veins or, sometimes, along the whole length of the chief ones. Flowers in large drooping racemes, often branching at the base, yellowish green. Fruit on long, pendulous racemes ; keys $1\frac{1}{4}$ to 2 ins. long ; wings smooth, the two forming an angle of about 60°.

Native of Europe, but not considered to be a true native of Britain, where, however, it has existed many centuries and has thoroughly established itself. Judging by the way seedlings spring up in the wilder parts of Kew Gardens, it would seem that in course of time the place, if left to run wild, would become a forest of common sycamore. It is a peculiarly hardy tree, and one of the few that will stand the full force of salt-laden winds in exposed places near the sea. One may see it in many of the gardens on the sea-fronts of English watering-places, battered and stunted in growth, yet helping largely to form that first line of defence against the winds, the establishment of which is really the most important item in the seaside planting. When fully grown it is a magnificent tree of stately proportions, thriving better perhaps in the north of England and in Scotland than in the warmer south. In the grounds of Scone Palace, near Perth, I was shown a few years ago an ancient tree, reputed to have been planted by Mary Queen of Scots. Although still alive, most of its

upper growth had gone, but its trunk was more than 6 ft. through. Among English trees, Mr Elwes gives the palm to one at Studley Park, in Yorkshire, the seat of the Marquis of Ripon. This tree is 104 ft. high and 17½ ft. in girth. The foliage of the sycamore has no autumn beauty, decaying a dingy brown; it is, moreover, frequently attacked by a fungus, *Rhytisma acerinum*, which causes yellow or pale green spots to appear on the leaf-blade in June that turn black towards the fall of the leaf. The timber is white, and easily worked.

The sycamore has produced very many varieties and forms under cultivation, some as seedling variations, others as branch sports. It is not necessary to enumerate more than the most distinct of them.

Var. ALBO-VARIEGATUM.—Leaves blotched and striped with white.

Var. AUCUBÆFOLIUM.—Leaves blotched with yellow like the common aucuba. It appeared amongst some seedlings in the nursery of Messrs Little & Ballantyne at Carlisle, about 1876.

Var. BRILLIANTISSIMUM.—A very handsome variety with leaves of a beautiful pinkish hue on unfolding.

Var. CORSTORPHINENSE, *Schwerin* (flavo-variegatum, *Loudon*); CORSTORPHINE PLANE.—Leaves pale yellow when young, golden in summer. The original tree grows in a garden at Corstorphine, near Edinburgh. James Baillie, second Lord Forrester, is said to have been murdered by his sister-in-law at the foot of this tree, 26th August 1679 (see *Garden and Forest*, 1893, p. 202).

Var. ERYTHROCARPUM.—Fruits red; said to be wild in the Alps of Bavaria; very handsome from June onwards. The Pilrig "plane" has similarly coloured fruits, but they are smaller and on larger racemes than in erythrocarpum.

Var. EUCHLORUM.—A vigorous form with large leaves and fruit; I have measured keys 2½ ins. long, with wings nearly 1 in. wide.

Var. LEOPOLDII.—Leaves stained with yellowish pink and purple. Originated in Belgium about 1860. There are several forms of the same character, such as vars. "Simon-Louis Frères," TRICOLOR, and WEBBIANUM.

Var. PRINZ HANDJERY.—Leaves suffused with yellow above, purple beneath. Very pretty when the leaves are quite young. This variety, var. NIZETII, and var. PURPUREO-VARIEGATUM are all variants from the following one:—

Var. PURPUREUM.—Leaves rich purple beneath; originated in a nursery in Jersey, in 1828. Var. ATROPURPUREUM is the same, with the purple of a deeper shade.

Var. VILLOSUM, *Parlatore*.—A natural variety found in Sicily, S. Italy, and Dalmatia. Leaves covered with down beneath; the margins more coarsely toothed. Cultivated in the grounds of Arley Castle, near Bewdley.

Var. WORLEI.—Leaves rich yellow. A superior form of the Corstorphine sycamore; leaf-stalks reddish.

A. PURPURASCENS, *Franchet*.

A deciduous tree, with five-lobed leaves similar to those of *A. diabolicum*; very downy beneath when young, and fringed with hairs on the margin. Flowers purplish; males in short-stalked corymbs; stalks hairy when young, becoming smooth at the fruiting stage; females in few-flowered racemes. Keys 1½ ins. long, the nutlet covered with whitish bristles; wings ¾ in. wide, parallel.

Native of middle Japan; very nearly allied to *A. diabolicum*, but at once distinguishable when in bloom by the purple flowers; the wings of the fruit also appear to be more closely brought together. It is a very rare plant in cultivation, and is, apparently, not common in a wild state. The nutlets have the same persistent, horn-like styles as are seen in *A. diabolicum*.

A. ROTUNDILOBUM, *Schwerin*.

A hybrid of uncertain origin, although cultivated in Europe for more than half a century. It is probably a cross between *A. monspessulanum* and *A. Opalus* var. *obtusatum*, being intermediate in its various characters between those two maples. Leaves three-lobed, sometimes with two additional, indistinct lobes at the base; $2\frac{1}{2}$ to 4 ins. long and broad, reddish when young, smooth except for a little down at the base beneath; pale beneath, dark green above; lobes shallow, rounded; leaf-stalk not milky.

A. RUBRUM, *Linnaeus*. RED MAPLE.

A deciduous tree, occasionally over 100 ft. high in America, with a trunk up to 13 ft. in girth; and over 80 ft. high in England, forming a rounded head of branches; bark greyish; branchlets smooth, except when quite young. Leaves three- or five-lobed (the lobes pointed and somewhat triangular, the middle one usually the longest), from 2 to 5 ins. wide, and often longer than broad, coarsely and unevenly toothed; upper surface dark green, smooth, lower one blue-white and more or less downy, especially along the veins. Flowers appearing in March and early April in dense clusters before the leaves, at the joints of the previous year's wood, or on short spurs of still older wood, rich red, each flower on a reddish stalk at first quite short, but lengthening as the flower and fruit develop. Fruits on slender drooping stalks 2 to 3 ins. long; wings about $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. wide, dark dull red spreading at about 60° .

Native of Eastern N. America, and already in cultivation in England by the middle of the seventeenth century. It is a handsome and fairly common tree, the largest in the country, according to Elwes, being in Bagshot Park and over 80 ft. high, with a trunk $9\frac{1}{2}$ ft. in girth. There is a considerable resemblance between this tree and *A. dasycarpum*, and they are frequently confused. *A. rubrum*, however, is more compact and of slower growth; the leaves are not so much or so deeply cut, and the fruits are less than half as large. In the United States this maple produces most beautiful colour effects in autumn, the leaves turning scarlet and yellow. In this country it is not so good, but sometimes the leaves change to bright yellow, or dark brownish red, or occasionally red. It should be planted in a moist position.

Var. *DRUMMONDII*.—Differs in the downy character of the young shoots, leaf-stalks, and under-surface of the leaves. Fruit and flowers bright scarlet, the former larger than in ordinary *rubrum*. Native of Arkansas, Texas, and Louisiana.

Var. *SANGUINEUM* (*A. sanguineum*, *Spach*).—The original tree of this variety grew in the Jardin des Plantes at Paris. Its leaves are more downy than in the type, the flowers brilliant red, and the leaves richer red in autumn.

A pyramidal variety is figured in *Garden and Forest*, 1894, p. 65, growing in private grounds at Flushing, New York, which was then 80 ft. high. (The figure is erroneously described as of a form of sugar maple.)

A. RUFINERVE, *Siebold*.

A small, deciduous tree, with smooth blue-white young shoots. Leaves $2\frac{1}{2}$ to 5 ins. long, three-lobed or obscurely five-lobed, truncate or heart-shaped at the base; terminal lobe triangular, larger than the side ones, margins finely and irregularly toothed; upper surface dark green, smooth; lower one paler, with reddish down along the veins, conspicuous when the leaf is young, but largely falling away by autumn. Flowers in erect racemes about 3 ins. long, each one on a stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; the common stalk covered with

reddish down. Keys $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the nutlets at first covered with reddish down, afterwards smooth; wings diverging at from 90° to 120° .

Native of Japan; introduced for Messrs Veitch by Maries, about 1879, and very nearly allied to *A. pennsylvanicum*, resembling it in shape of leaf, and in the handsome markings of the branches; but differing in the glaucous young shoots, and in the more conspicuous reddish down beneath the leaves. The foliage sometimes dies off a rich crimson. The young foliage, the leaf-stalk, and midrib are often red. Altogether an attractive maple.

Var. *ALBO-LIMBATUM*, *Hooker* (Bot. Mag., t. 5793).—A singularly beautiful variety, whose leaves have a broad margin (or sometimes the whole surface) entirely covered with spots of white. It was introduced by Mr Standish of Ascot, some years before the type, and was first exhibited by him in 1869.

A. SACCHARUM, *Marshall*. SUGAR MAPLE.

(*A. saccharinum*, *Wangenheim*, not *Linnaeus*.)

A deciduous tree, over 100 ft. high in a wild state, with a trunk 9 to 12 ft. in girth, forming a shapely rounded head of branches; branchlets smooth. Leaves palmate, usually five-lobed, heart-shaped at the base, 4 to 6 ins. wide; always downy in the axils of the chief veins beneath, but varying in different trees from smooth to downy in other parts. Flowers without petals, greenish yellow, produced in clusters, each flower on a thread-like, hairy stalk more than 2 ins. long. Fruit smooth; wings 1 in. long, $\frac{3}{8}$ in. wide.

Native of Eastern N. America; introduced, according to Aiton, in 1735, but not many fine specimens are to be found in this country. In the arboretum of Arley Castle, near Bewdley, there are two of the best in the country; their measurements, according to *Hortus Arleyensis*, are: 65 ft. by 3 ft. in girth, and 64 ft. by 4 ft. 8 ins. in girth. In leaf, the sugar maple, especially in its more glabrous form, bears some resemblance to the Norway maple; but the sap of the sugar maple is watery, not milky as in the other.

The famous maple sugar of N. America is obtained almost solely from the sap of this tree. The State of Massachusetts alone used to supply more than half a million pounds annually. It is obtained by tapping the trees and collecting the juice, which is afterwards evaporated. As an ornamental tree in England this maple never seems to have been a great success, and although it appears to be quite hardy, does not grow quickly. In the streets, and as an isolated tree in the meadows of New England it is magnificent, and forms one of the chief elements in the glorious colour effects of autumn there, its leaves dying off into various shades of orange, gold, scarlet, and crimson, each tree, according to Emerson, retaining year after year its particular shades.

Var. *NIGRUM*, *Britton*. BLACK MAPLE (*A. nigrum*, *Michaux*).—In this variety the leaves are downy all over the under-surface, and usually remain so till they fall; they are three-lobed oftener than five-lobed, with the auricles of the heart-shaped base overlapping. According to Sargent, the black maple is easily distinguished in summer by its heavy, drooping leaves, and at all seasons by the orange-coloured branchlets. It has a more western distribution in N. America than the type, and was introduced in 1812.

Var. *MONUMENTALE*, *Temple*, is a form of black maple with a narrow columnar habit. Very striking.

Var. *RUGELII*, *Rehder*.—A large tree with thin, three-lobed leaves; the lobes usually entire, triangular, pointed; lower surface rather glaucous and downy. Found wild from N. Carolina and Georgia to Missouri, being the common form of sugar maple in that region. The lower branches often bear leaves identical with those of the type. Introduced to Kew in 1908.

A. SIEBOLDIANUM, *Miquel*. SIEBOLD'S MAPLE.

(Gardeners' Chronicle, 1881, i., fig. 113.)

A small tree or shrub, native of Japan, and very similar to *A. japonicum*, from which, however, it is easily distinguished by the yellow (not purple-red) flowers, and by the branchlets being densely covered with short down. Leaves 2 to 3 ins. wide; seven- or nine-lobed; leaf-stalks downy. Flowers in a long-stalked, umbel-like corymb. Fruit somewhat downy; keys $\frac{3}{4}$ in. long.

A. SINENSE, *Pax*.

A deciduous tree, from 12 to 30 ft. high; young shoots smooth. Leaves 3 to 6 ins. long and wide, five-lobed, slightly heart-shaped or truncate at the base; lobes ovate, with long drawn-out points, irregularly and sparsely toothed. Occasionally the leaves are quite smooth at maturity, but often they have tufts of yellowish hairs in the axils of the veins. Flowers numerous, in panicles 2 to 4 ins. long, greenish white. Fruits smooth, in pendulous panicles; keys $1\frac{1}{4}$ ins. long; wings $\frac{3}{8}$ in. wide, the pair forming an angle of about 120°.

Var. CONCOLOR, *Pax*.—This differs in the wings of the fruit spreading horizontally, and, perhaps, in the leaf being somewhat larger.

Native of Central China, and represented in the Coombe Wood nursery by plants of the variety concolor, raised from seed introduced in 1901, by Wilson. The leaves are handsome, being of a reddish shade when young, afterwards turning a dark lustrous green.

A. SPICATUM, *Lamarck*. MOUNTAIN MAPLE.

A deciduous, tall shrub, or small tree of bushy appearance, occasionally 25 ft. high, with a short trunk; young shoots covered with grey down when young. Leaves three-lobed or sometimes five-lobed, 3 to 5 ins. long, about the same wide, more or less heart-shaped at the base, coarsely toothed, covered with grey down beneath; lobes long-pointed. Flowers very small, produced in June on slender, erect racemes 3 to 6 ins. long, greenish yellow, each flower on a slender stalk about $\frac{1}{2}$ in. long. Fruit with wings about $\frac{1}{2}$ in. long, $\frac{3}{8}$ in. wide, each pair somewhat horse-shoe shaped, smooth, red.

Native of the E. United States and Canada; introduced by Archibald, Duke of Argyll, in 1750. This maple, handsome in its slender racemes of bright red fruits, and red and yellow autumn tints, is not now common. Its most distinctive characters are its densely flowered, erect, slender racemes, and coarsely toothed, three-lobed leaves.

An interesting maple, found wild in Japan, Manchuria, and China, is sometimes regarded as a geographical variety of the mountain maple, and called *A. SPICATUM* var. *UKURUNDUENSE*, *Maximowicz*. Its leaves are more deeply heart-shaped than in the American type, and are five- or seven-lobed.

A. SUTCHUENENSE, *Franchet*.

A deciduous tree, 20 ft. high, with smooth young shoots. Leaves composed of three leaflets borne on a slender stalk $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, with a conspicuous tuft of yellowish hairs at the base of the blades; leaflets shortly stalked, elliptic oblong, with a long tapering point; 2 to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; dull green, and smooth above, rather glaucous, and with scattered hairs beneath; the margins irregularly and bluntly toothed. Flowers numerous, yellowish, produced in a corymb-like raceme, $1\frac{1}{2}$ ins. long and wide. Fruits in erect racemes; keys 1 in. long; wings $\frac{1}{4}$ in. wide, curved, but about parallel with each other.

Native of Central China. Among cultivated species it is most closely allied to *A. mandshuricum*, differing in its more numerous flowered inflorescence and protruding stamens. *A. Henryi*, with which it has been confused, differs in having untoothed leaflets and downy young shoots.

A. TATARICUM, *Linnaeus*. TARTARIAN MAPLE.

A deciduous shrub of bushy habit, or a small, wide-spreading tree up to 30 ft. high; branchlets smooth. Leaves in adult trees not lobed, or occasionally slightly so; broadly ovate, rounded or slightly heart-shaped at the base, from 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; smooth above, more or less downy on the veins beneath, the margin doubly and irregularly toothed. Flowers in erect panicles 2 to 3 ins. long, greenish white, produced in May and June. Fruit with keys $\frac{3}{4}$ to more than 1 in. long; the wings $\frac{1}{4}$ in. wide, almost parallel, red in autumn.

Native of S.E. Europe, Asia Minor, etc.; introduced, according to Aiton, in 1759. This interesting maple is very distinct in foliage, the shape of the leaves suggesting *Spiraea discolor* rather than the typical maple. This, however, only applies to the plant in its adult state; young, vigorous trees show a distinct tendency to the palmate three- or five-lobed shape. It bears its fruits quite abundantly, and, being red in autumn, they often give a pleasing effect. The leaves expand early, and die off in yellow, or reddish brown tints. The finest example I have seen is at Arley Castle, near Bewdley. According to Mr Woodward, this tree was planted about 1820, and is now 30 ft. high.

A. TETRAMERUM, *Pax*.

A deciduous tree, 20 to 30 ft. high, with quite smooth young shoots. Leaves ovate, coarsely toothed, 2 to $3\frac{1}{2}$ ins. long, two-thirds as wide, the apex long-pointed, the base tapering, covered with fine down beneath, and with tufts of whitish hairs in the vein-axils. Flowers yellow, the males three or five together in short corymbs, the females in short slender racemes, appearing with the leaves. Fruit smooth; keys 1 to $1\frac{1}{2}$ ins. long; wings $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, diverging at an angle of about 60°.

Var. *LOBULATUM*, *Rehder*.—This variety is distinguished by its leaves being three-lobed, broader in proportion to their length, heart-shaped at the base, and deeply triangular toothed; they are dark green and almost smooth above, paler beneath and downy, especially on and about the veins.

Native of Hupeh, China; discovered by Henry. The var. *lobulatum* was introduced by Wilson for Messrs Veitch in 1901, and is growing luxuriantly at Coombe Wood, being now a graceful tree over 20 ft. high, and making shoots $1\frac{1}{2}$ to 2 ft. long in a season. The young wood is covered with a purplish bloom. Typical *A. tetramerum* does not appear to be in cultivation at present.

A. TRAUTVETTERI, *Medwedjeff*. TRAUTVETTER'S MAPLE.

(Bot. Mag., t. 6697—as *A. insigne*.)

A tree up to 50 ft. in height, and 6 ft. in girth of trunk; branchlets smooth, dark red at the fall of the leaf. Leaves deeply five-lobed, 4 to 8 ins. wide, about three-fourths as long, base heart-shaped; dark lustrous green and smooth above, pale beneath and slightly glaucous, with tufts of down in the axils of the chief veins, especially at the base where they meet the leaf-stalk; margins coarsely and angularly toothed. Flowers following the leaves, and produced in smooth, erect corymbs. Fruits downy on the nutlets when young, becoming smooth; wings $1\frac{3}{4}$ to 2 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, parallel, or almost connivent, sometimes overlapping.

Native of the Caucasus and Persia ; introduced to Van Volxem's nursery in 1866. It is a handsome-foliaged tree, and is distinguished in spring by its brilliant crimson bud-scales. It has been much confused with *A. insigne*, but is distinguished by the wings of the fruit not spreading, by the restricted pubescence beneath the leaves, and by the marginal teeth not pointing forwards.

A. TRUNCATUM, *Bunge.*

A small, deciduous tree, up to 25 ft. in height ; branchlets smooth, often tinged with purple when young. Leaves five- occasionally seven-lobed, $2\frac{1}{2}$ to $4\frac{1}{2}$ ins. wide, less in length, dark green above, paler below ; smooth on both surfaces ; truncate or somewhat heart-shaped at the base ; the lobes triangular ; the two basal ones out-spreading, the three terminal ones often furnished with two large teeth ; leaf-stalk containing milky juice. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. across, greenish yellow, each on a slender stalk $\frac{1}{2}$ in. long, borne in erect, branching corymbs 3 ins. wide. Fruits smooth ; wings $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, about half as long again as the nutlet, the pair forming an angle of about 90° .

Native of N. China, whence seeds collected in the autumn of 1881 were sent by the late Dr Bretschneider to Kew, and germinated in the spring of the following year. It is allied to *A. pictum*, but differs in the truncate base of the leaf, and the larger flowers. It grows well and is quite hardy at Kew. Another close ally of this maple is *A. AMBIGUUM*, *Dippel*, with leaves similarly lobed, but hairy beneath.

A. TSCHONOSKII, *Maximowicz.*

A small, deciduous tree, 15 to 20 ft. high, or a shrub ; young shoots smooth ; winter buds stalked. Leaves 2 to 4 ins. long and wide, deeply five-lobed, heart-shaped at the base, margins sharply double-toothed ; lobes triangular, long-pointed ; leaf-stalk half as long as the blade ; bright green and smooth above, paler beneath, with reddish hairs along the main veins when young, reduced to their axils when mature. Flowers on smooth, short stalks, produced along with the leaves, six to ten together, in short racemes. Fruits pale brown ; keys 1 to $1\frac{1}{4}$ ins. long ; wings $\frac{3}{4}$ in. wide, incurved, and spreading at a wide angle.

Native of Japan, where, according to Prof. Sargent, it is very abundant in the woods of Hondo at from 2000 to 3000 ft. elevation, the dying leaves turning a beautiful canary yellow. It is allied to *A. micranthum*, from which it differs in its usually longer keys. Introduced in 1902.

A. VOLXEMI, *Masters.* VAN VOLXEM'S MAPLE.

A tall, deciduous tree ; branchlets smooth except at the joints and leaf-scars. Leaves palmate, five-lobed, 4 to 8 ins. or even more wide, and nearly as much long, with a heart-shaped base ; pale green above, whitish beneath, and smooth except in the axils and along the sides of the chief veins ; the lobes coarsely saw-toothed. Flowers in erect corymbs, 3 to 4 ins. long. Fruit smooth ; keys $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. long ; wings at an angle of about 120° .

Native of the Caucasus, where it was discovered and introduced to cultivation by the late Mr Jean Van Volxem, who sent it to Kew about 1873. Another tree sent to Dr Masters in 1877 was planted by him in his garden at Ealing, where it grew luxuriantly, and flowered in 1894. Some doubt had previously existed as to its affinity with *A. Pseudoplatanus*, but its short, erect corymb at once showed its distinctness. By several authorities it is considered a less downy variety of *A. insigne*. Henry suggests that it may be a hybrid between that maple and *A. Trautvetteri*. It differs from the latter in the wide-spreading

wings of the fruit and in the saw-toothed leaves; and from insigne in the larger leaves (sometimes 1 ft. across), not so white beneath, with the down confined to the chief veins.

ACTINIDIA. TERNSTROMIACEÆ.

A genus of vigorous climbers inhabiting N. India, China, and Japan. They have simple, alternate leaves, and often unisexual flowers. The fruit is a fleshy berry. Given a good soil they are easily cultivated, and can be grown in the various situations suitable for vigorous climbers, such as on walls, pergolas, on rough poles, or, better than all for the more vigorous ones, on a worn-out tree, if such can be given up to them, which they can cover with tangled growth. All the species can be propagated by cuttings of moderately ripened wood placed in gentle heat.

A. ARGUTA, *Planchon.*

(Bot. Mag., t. 7497—as *A. polygama.*)

An exceptionally vigorous climber, reaching in its native haunts the tops of large trees. Leaves dark lustrous green, 3 to 5 ins. long, sometimes nearly as wide; broadly ovate or ovate-oblong, edged with unequal bristle-like teeth, the base rounded or sometimes heart-shaped; almost smooth except for down on the veins and in their axils; stalk rose-coloured, sometimes bristly, $1\frac{1}{2}$ to 3 ins. long. Flower hermaphrodite, fragrant, produced in the leaf-axils, usually in clusters of three; each flower $\frac{3}{4}$ in. across, its stalk slender, and $\frac{1}{2}$ to $\frac{3}{4}$ in. long; sepals green, ovate-oblong, blunt; petals orbicular, white tinged with green, very concave and incurved, giving the flower a rather globular shape; stamens numerous, with dark purple anthers; stigmas (of female flower) radiating. Fruit an oblong, many-seeded, fleshy, greenish yellow berry, nearly 1 in. long, with an insipid flavour, but eaten by the Japanese.

Native of China, Japan, and the Amur region. One of the strongest growing of the Actinidias, this is also one of the hardiest. It flowers very well out-of-doors in numerous gardens in the south and west, and is hardy at Kew, flowering there in June and July.

Var. *CORDIFOLIA*, *Dunn.*—Leaves ovate with a conspicuously heart-shaped base, more hairy than in the type; leaf-stalk purple. This, as well as the type, is sometimes grown in gardens as *A. volubilis*.

A. CHINENSIS, *Planchon.*

(Gardeners' Chronicle, 1909, ii., p. 7); Bot. Mag., t. 8538.)

A unisexual or hermaphrodite climber of vigorous growth, the sterile branchlets densely covered with shaggy reddish hairs; flowering shoots more downy. Leaves of the sterile shoots heart-shaped, pointed, from 5 to 8 ins. long, and from 4 to 7 ins. wide; margins set with stiff hairs; upper surface dark green, slightly hairy; lower surface densely clothed with greyish tufted hairs, the midrib, veins, and stalk having larger reddish hairs like those of the young shoots. On the flowering shoots the leaves are shorter and proportionately broader, 2 to 4 ins. long, 3 to 5 ins. wide, somewhat orbicular, but deeply notched at the top and bottom. Flowers $1\frac{1}{2}$ ins. across, at first white, then buff-yellow; produced on short branches from the year-old wood; calyx with five roundish woolly lobes; petals obovate; stamens very numerous. Fruit

of the size and shape of a walnut, covered more or less with reddish brown hairs, and of a very agreeable flavour.

This remarkably handsome climber was first brought to the notice of Europeans by Robert Fortune in 1847, when he was travelling in China on behalf of the Royal Horticultural Society. It was later seen by Maries in Japan, but did not reach cultivation until 1900, when seeds were sent from China by Wilson, who had collected it in Hupeh. It is evidently hardy, and flowered for the first time in England in June 1909.

A. HENRYI, *Dunn.*

A tall climber with slightly ribbed young shoots, covered with stout, curly, reddish bristles. Leaves ovate or ovate-oblong, heart-shaped or rounded at the base, taper-pointed, minutely toothed, 3 to 5 ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; glaucous beneath, with a little down on the midrib and veins. The year-old wood smooth. Leaf-stalk $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, bristly when young. Flowers white, nearly $\frac{1}{2}$ in. diameter, produced in the leaf-axils in short, rounded racemes, the stout main-stalk reddish bristly, the slender individual flower-stalks downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruits cylindrical, $\frac{3}{4}$ to 1 in. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide.

Native of Yunnan, in mountain forests at 5000 to 6000 ft.; discovered by Henry; introduced by Wilson for the Arnold Arboretum, and sent thence to Kew in 1910. Of perhaps doubtful hardiness.

A. KOLOMIKTA, *Maximowicz.*

A slender climber, growing a few feet high. Leaves ovate-oblong, heart-shaped or sometimes rounded at the base, 3 to 6 ins. long, the largest 3 to 4 ins. wide; only slightly bristly above and beneath when quite young, the margins set with teeth of unequal size. The foliage is purplish when young, and later in the season is usually more or less variegated, sometimes the apex, sometimes half the leaf, and occasionally the whole leaf being white or pink. Flowers fragrant, produced one to three together, each $\frac{1}{2}$ in. across; petals white, anthers yellow, stigmas sessile. Fruit not beaked. The chief merit of this climber is in its curious and often very striking leaf-colouring. It is, perhaps, the weakest grower of all the Actinidias, and supports about 6 ft. high are sufficient. The pith is brown and chambered (lamellate). Native of Manchuria, China, and Japan, flowering in June. Its veins beneath and the leaf-stalk are slightly downy, but not so conspicuously bristly as in *A. polygama* (*q.v.*).

A. POLYGAMA, *Miquel.*

A slender climber, forming in a wild state a large tangle of entwined stems 15 to 20 ft. high. Leaves elliptical or ovate-oblong, pointed, 3 to 5 ins. long, bristly toothed on the margin, and bristly on the veins, usually wedge-shaped, sometimes somewhat heart-shaped at the base; stalks bristly. Flowers fragrant, usually in threes (sometimes single or in pairs), $\frac{3}{4}$ in. diameter, white. Fruit beaked, $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. broad in the middle, narrowing at either end, canary yellow, translucent, soft and juicy, with a disagreeable flavour.

Native of Central Japan, and plentiful in the mountains there. As in *A. Kolomikta*, sometimes the entire leaf, sometimes its terminal half, is white or yellowish, but it is a stronger grower. It is not, however, a tall climber like *A. arguta* and *A. chinensis*, but may be grown as a sort of thicket, if support be given at first. It is confused often with *A. Kolomikta*, but differs in the usually tapered or rounded (instead of cordate) base of the leaf, in its white, solid (not chambered) pith, and in having the stigma on a short thick style. The plant, like several other species, has an extraordinary attraction for cats.

ADELIA. OLEACEÆ.

A group of New World shrubs, of which two species are occasionally cultivated in botanical collections. They have some affinity with the olive. Leaves deciduous, opposite; flowers small, greenish, without petals, unisexual; the sexes often on separate plants. The fruit, which is oblong or egg-shaped and pulpy, I have never seen produced in this country, and the flowers but rarely. Even in their absence the two species described below are easily distinguished from each other by the short-stalked, downy leaves of *ligustrina*; and the long, narrow, much tapered, smooth leaves of *acuminata*. They grow in any ordinary soil, and are easily propagated by late summer cuttings. The genus is, perhaps, better known by Poiret's name, *FORESTIERA*.

A. ACUMINATA, *Michaux*. SWAMP PRIVET.

(*Forestiera acuminata*, *Poiret*; *Borya acuminata*, *Willdenow*.)

A deciduous shrub, usually 4 to 8 ft. high, or a small tree, sometimes 20 to 30 ft. high in a wild state, of spreading habit; branches slender, the short ones occasionally spine-tipped. Leaves lanceolate or oval-lanceolate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide at the middle, tapering gradually to both ends; shallowly toothed from the middle to the apex; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Male flowers clustered in small stalkless tufts; female ones on branched stalks; both minute, greenish, and of no beauty. Fruit cylindrical, pointed, $\frac{1}{2}$ in. long, purple.

Native of the S.E. United States; introduced in 1812. A shrub of botanical interest only, and privet-like appearance.

A. LIGUSTRINA, *Michaux*.

(*Forestiera ligustrina*, *Poiret*; *Borya ligustrina*, *Willdenow*.)

A deciduous shrub, up to 10 ft. in height, forming a wide bush with slender branches, downy when young, often becoming spine-tipped. Leaves oval or slightly obovate, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; tapered at both ends, shallowly toothed all round except near the base; dull green and smooth above, paler and downy beneath; stalks $\frac{1}{4}$ in. or less long. Flowers green, inconspicuous, produced from the twigs of the preceding year; the males in dense stalkless clusters; females fewer, on short spurs. Fruit $\frac{1}{4}$ in. long, egg-shaped, blue-black.

Native of the S.E. United States; introduced in 1812.

ADENOCARPUS DECORTICANS, *Boissier*. LEGUMINOSÆ.

(Garden, Nov. 27, 1886.)

A deciduous shrub of rather gaunt habit, sending out long horizontal branches, and reaching 8 to 10 ft. in height in this country. Leaves trifoliate, very crowded, 1 in. or less long; stalk very slender and downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Leaflets $\frac{1}{2}$ to $\frac{3}{4}$ in. in length, $\frac{1}{16}$ in. wide, the margins usually rolled inwards. Flowers golden yellow, about the size and shape

of common gorse, produced on the upper side of the branches in short, erect racemes, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long. Seed-pods $1\frac{1}{2}$ to 2 ins. long, $\frac{1}{8}$ in. wide, pale, covered with conspicuous viscid glands.

Native of Spain, and only hardy in the milder parts of Great Britain. At Kew it needs wall protection, but in the garden at Grayswood Hill, near Haslemere (perhaps 300 ft. above sea-level), it thrives splendidly. I have seen shrubs there in May and early June 6 to 8 ft. high, laden with golden blossom from end to end of their branches, and making most gorgeous pictures. Like so many of its race, this shrub is not long-lived, and care should be taken to sow a few seeds occasionally (it produces them in great abundance), to renew the stock if needed. It should have the sunniest position available, and is suitable for a hot bank in gardens where it can thrive in the open. For colder localities a place on a south wall is necessary.

ÆGLE SEPIARIA, *De Candolle*. RUTACEÆ.

(*Citrus trifoliata*, *Linnaeus*, Bot. Mag., t. 6513; *Limonia trifoliata*, *Hort.*)

A deciduous, very spiny shrub, 8 to 12 ft. high, often as much wide, with smooth, green, crooked, angular branchlets. The spines are from 1 to 2 ins. long, very stiff, straight, and sharply pointed. Leaves of three, sometimes five leaflets, which are obovate, the middle one $1\frac{1}{2}$ to 2 ins. long, the side ones half as large; leaf-stalk winged. Flowers sweetly scented, produced from the axils of the spines before the leaves, pure white, $1\frac{1}{2}$ to 2 ins. across, with four or five concave, obovate petals. Stamens pink, disunited. Fruit like a small orange in colour and shape, about $1\frac{1}{2}$ ins. across, covered with down.

Native of Japan and China. The genus *Ægle* is very nearly allied to *Citrus* (orange, lemon, etc.), differing chiefly in the stamens not being united. This species is one of the most striking Japanese plants ever introduced. It is perfectly hardy at Kew, having survived 30° of frost without injury; and although it does not ripen fruit there, it flowers freely and regularly during May every year. Its foliage is often scanty, but that enables its formidable armature to be the better seen. Were it common enough, it would make a good hedge plant: there is a hedge in the Public Garden of Milan 100 yds. long, which, being only 3 ft. high, is too small for so vigorous a shrub as this, but which shows that it stands clipping well. In the western counties it fruits freely, and in Canon Ellacombe's garden at Bitton, near Bristol, there is a tree that has borne fruit for twenty years past. It is a plant every garden should contain for its beauty and distinction, its perfect hardiness, and its interest as a very close ally of the lemon and orange. The fruits are too bitter and acrid to be eaten raw, but they have been made into a conserve by boiling in sugar. It should be given a sunny position and a deep, moderately rich, loamy soil. English ripened fruits produce good seed, from which I have raised young plants. It is also said that cuttings of half-ripened wood put in a close frame will take root.

There is a hybrid between this and the orange, raised in France, probably hardy in many parts. It has been named the "Citrange."

ÆSCULUS. HORSE-CHESTNUT, BUCKEYE. SAPINDACEÆ.

Deciduous trees and large shrubs found in all the three northern continents. Leaves opposite, composed normally of five or seven leaflets (occasionally three or nine) radiating from the end of a long, slender stalk. Flowers borne in often large panicles at the end of the current season's growth; petals four or five. Fruits sometimes prickly, sometimes smooth, containing one or two large seeds. Several of the following species are commonly known under the generic name of *PAVIA*, the distinguishing characters being smooth fruits and four petals, as contrasted with the prickly fruits and five petals of true *ÆSCULUS*. As in neither case are the characters invariably coexistent, the name *Pavia* has been dropped.

Few groups of woody plants are at once so well-marked and so handsome as this. They all thrive well in the southern half of England, and most are hardy enough to succeed in any part of the country. All of them like a good deep soil, well-drained but moist, and are easy to cultivate and transplant. For the multiplication of the species seeds are decidedly the best, but the hybrids and varieties of garden origin have to be propagated by budding. The common horse-chestnut is commonly used as a stock for all the species, even such a small one as *Æ. Pavia*, the result of which is an ungainly union of stock and scion and frequent ill-health. It may be used for *Æ. carnea* (although that comes largely true from seed), and for its own numerous varieties, but for the other and smaller hybrids *Æ. flava* or *Æ. glabra* should be used as a stock. It should be mentioned that the buds selected are not those in the axils of the leaves, but the small, crowded buds at the base of the shoot nearest the old wood, which in ordinary circumstances remain dormant. Seeds of all the species should be planted as soon as they fall, and it is necessary to cover them only with about their own depth of soil. Kept dry in the ordinary seed-room during the winter, they lose much or sometimes all of their vitality.

Æ. AUSTRINA, Small. SOUTHERN BUCKEYE.

A shrub 10 to 12 ft. high, the young shoots clothed with a fine down. Leaves three-, five-, or seven-foliolate; leaflets 2 to 3½ ins. long, 1 to 1½ ins. wide; oval or obovate, toothed, tapered at the base, narrowed rather abruptly at the apex to a short, slender point (lateral leaflets oblique at the base); rich lustrous green above, covered beneath with a thick pale down; stalk downy, about 3 ins. long. Flowers about 1 in. long, red, produced in a panicle 6 to 8 ins. long, 2 to 3 ins. wide; calyx tubular, ½ in. long, with rounded teeth; petals slightly glandular.

Native of the S.E. United States; probably long in cultivation as *Æ. Pavia* (*g.v.*), which it resembles and to which it is allied, but from which, nevertheless, it is very distinct in the white down covering the leaf beneath, and in the usually shorter calyx. The seeds also, Prof. Sargent informs me, are distinct from those of any other species, but I have not seen them. (One of the *Pavia* group.)

Æ. CALIFORNICA, *Nuttall*. CALIFORNIAN BUCKEYE.(Bot. Mag., t. 5077 ; *Pavia californica*, *Hartweg*.)

A tree with a short trunk and a low, spreading, rounded head of branches, considerably more in diameter than it is in height, or a large shrub ; bark smooth ; winter buds resinous. Leaves among the smallest in the genus,



ÆSCULUS CALIFORNICA.

consisting usually of five (sometimes seven) narrowly oblong or oval, pointed, shallowly round-toothed, stalked leaflets, 2 to 4 ins. long, downy when quite young, of a pale greyish green. Flowers fragrant, borne in dense, erect, cylindrical, downy panicles up to 6 or 8 ins. long and 2 to 3 ins. wide, white or faintly tinged with rose, the stamens protruding $\frac{1}{2}$ in. beyond the petals. Fruit somewhat fig-shaped, swollen on one side, 2 to 3 ins. long, ending in a point, the surface rough but not spiny.

Native of California, where it is occasionally found from 30 to 40 ft. high, but more often as a bush 10 to 15 ft. high. It is perfectly hardy as a small tree

at Kew, and thrives admirably there. The tree is very distinct on account of its habit, and its abundant foliage with a rather metallic hue. It flowers from June to August, and often shows the curious habit of developing a single flower at the top of the panicle first, which has formed a small fruit whilst the flowers immediately below it are still in bud. Introduced by W. Lobb about 1850, it first flowered in Messrs Veitch's Exeter nursery in 1858. Mr Elwes mentions a tree 30 ft. high, at Hutley Towers, near Ryde. It also flowers well and bears fruit, in the Victoria Park at Bath.

Æ. CARNEA, *Hayne*. RED HORSE-CHESTNUT.

(*Æ. rubicunda*, *Loiseleur*.)

A tree of rounded form, 30 to 50 ft. high in this country, but 60 to 80 ft. high on the Continent; winter buds slightly resinous. Leaves composed of five or seven leaflets, which are very like those of the common horse-chestnut, but smaller, darker green, and usually with a very short stalk. Flowers deep red on a panicle 6 to 8 ins. high, 4 ins. diameter; stamens slightly protruding. Fruit globose, slightly prickly, $1\frac{1}{2}$ ins. diameter.

Of the origin of this tree nothing certain is known. There is little doubt, however, that it is a hybrid between the common horse-chestnut and *Æ. Pavia*, having the habit and foliage of the former, with the colour of the flowers and glandular-edged petals of the latter. It probably originated as a chance hybrid made by insects quite early in the nineteenth century, and had attained a considerable size before its distinctness was noticed. In regard to its flowers, it is the most ornamental of the genus. Some half a dozen plants were raised from seed at Kew, about 1896, which are now 20 ft. high, and have flowered for several years past. They do not differ in any respect from ordinary *Æ. carnea*, or from each other, except in the depth of colour in the flowers. This is rather unusual in the progeny of a hybrid. The trunk of this tree frequently becomes diseased when over 1 ft. in diameter, and covered with ugly eruptions which ultimately decay and disintegrate into a sort of powder. According to Mr Massee, there is no parasitic organism, animal or fungoid, present to cause this disease, which appears to be solely due to the abnormal development and ultimate rupture and death of the cells.

Var. *BRIOTII*.—Raised from seed at Trianon in 1858; is practically identical with the type, except that it has larger and more finely coloured panicles. Several named varieties are in cultivation besides *Briotii*, but none so good. One with yellow-margined leaves is called *AUREO-MARGINATA*; another, *FOLIIS MARGINATIS*, is a variegated form with a dark green border to the leaf then an irregular band of yellow, the centre being pale green. Var. *PENDULA* is described as having pendulous branches—a character common in some degree to most old trees.

Æ. CHINENSIS, *Bunge*. CHINESE HORSE-CHESTNUT.

A tree 80 to 90 ft. high; young shoots smooth or minutely downy; winter buds resinous. Leaves composed of sometimes five, usually seven, leaflets, which are narrow-oblong or obovate, 5 to 8 ins. long, about one-third as much wide, tapering to a fine point, shallowly and evenly toothed, the stalk $\frac{1}{2}$ to $\frac{3}{8}$ in. long. Panicle 8 to 14 ins. long, and 2 to 4 ins. wide at the base, narrowing gradually to the top, the basal one-fifth naked. Flowers on smooth stalks, white, $\frac{1}{2}$ to $\frac{3}{4}$ in. across; petals four; stamens rather longer than the petals. Fruit truncate or slightly indented at the top, sub-globose, 2 ins. in diameter, rough, but not spiny.

Native of N. China, and although known to botanists for over seventy years was only introduced in 1912. It was collected near Pekin by Purdom,

and from seeds sent by him to the Arnold Arboretum plants were raised and distributed. It has not yet flowered in England. For many years *Æ. turbinata* was grown on the Continent as *Æ. chinensis*, and even figured under that name, but the true plant is absolutely different.

There has recently been described (*Planta Wilsoniana*, i., p. 498) as a new species, the horse-chestnut introduced by Wilson in 1908 from Szechuen and Hupeh, China. It is named *Æ. WILSONII*, Rehder. This tree was at first considered to be *Æ. chinensis*, to which indeed it is very closely allied. It may be distinguished from *Æ. chinensis* as follows: Leaflets longer stalked, not generally so tapered at the base, but rounded or even slightly heart-shaped there; more downy at first beneath (but in both species becoming glabrous); veins more numerous (up to twenty-two pairs), forming at their junction with the midrib a more obtuse angle than in *Æ. chinensis*. Flower-stalks more downy. Fruit ovoid to pear-shaped, with a mucro at the apex, and, according to Rehder, with the husk only half as thick as in *Æ. chinensis*. Seed larger, with the scar (hilum) covering about one-third (one-half in *Æ. chinensis*). *Æ. Wilsonii* has a more southern distribution. Racemes up to 16 ins. long.

These two chestnuts, with *Æ. indica*, belong to a distinct section of the genus (*CALOTHYRSUS*, Koch), but *Æ. indica* has broader panicles with less crowded, more erect branches, larger flowers, and broader petals.

Æ. GLABRA, Willdenow. OHIO BUCKEYE.

A tree up to 70 ft. high in America, with a trunk over 6 ft. in girth, but usually about half as high; bark of the trunk rough, and much fissured. Leaves usually composed of five leaflets, which are 3 to 6 ins. long, about one-third as wide; obovate or oval, with a long, tapering point, sharply toothed; downy when young, but becoming smooth with age, except along the midrib and chief veins. Flowers about 1 in. long, greenish yellow, in erect panicles 4 to 7 ins. long, 2 to 3 ins. wide; petals four; stamens $\frac{1}{2}$ in. longer than the petals. Fruit 1 to 2 ins. long, broadly ovate, distinguished from other American buckeyes by prickles resembling those of common horse-chestnut, but much less prominent.

Native of the S.E. and Central United States. This tree is of handsome shape and foliage, but is the least attractive of the genus in its flowers. Often confused with *Æ. octandra*, it is readily distinguished by its rougher bark, the less downy leaves, the longer outstanding stamens, and the prickly surfaced fruit. It flowers at the end of May and the beginning of June. There are several healthy, small trees at Kew, but none of great size. The largest tree recorded in this country grew until recently at Devonhurst, Chiswick; it was 60 ft. high, and 6 ft. in girth of trunk.

Var. *BUCKLEYI*, Sargent (*Æ. ARGUTA*, Buckley), is a form with six or seven leaflets, also distinct in their longer, drawn-out points and their double-toothed margins. It does not reach so far east as the typical *Æ. glabra*, and is found in Kansas, Texas, etc.

Æ. HIPPOCASTANUM, Linnaeus. HORSE-CHESTNUT.

A tree reaching over 100 ft. in height, with a rounded, spreading head as much in diameter, and a trunk 15 ft. or more in girth; winter buds very resinous. Leaves composed of five to seven leaflets, which are obovate, from 5 to 12 ins. long, 2 to 5 ins. wide, irregularly toothed, the terminal one the largest; the upper surface is smooth, the lower one has patches of brown hairs in the axils of the veins, and short hairs thinly scattered over it. Panicles up to 12 ins. high, and 4 ins. through. Flowers with four or five petals, white with a patch of colour at the base, which is at first yellow, then red; stamens rather

longer than the petals. Fruit spiny, $2\frac{1}{2}$ ins. across, containing one, sometimes two, of the well-known lustrous brown nuts.

The horse-chestnut is at once the best-known and the most beautiful of flowering trees of the largest size. The stately, spreading form of fully grown trees is appropriately accompanied by noble proportions and handsome shape of leaf, and by large, striking flower-clusters. An English park can afford no finer sight than a group of horse-chestnuts towards the end of May, when every branchlet carries its erect cone of white flowers. The history of the horse-chestnut is interesting. It reached Western Europe by way of Constantinople in 1576, when seeds were sent to the botanist Clusius at Vienna, and it had spread westwards to France and England early in the seventeenth century. For more than two hundred and fifty years its real native country was unknown. N. India was long regarded as its most probable home, and Loudon, as late as 1837, suggested N. America. Its real wild habitat is now definitely established as being much nearer home; namely, in the mountainous, uninhabited wilds of Northern Greece and Albania, where several observers have found it to be undoubtedly indigenous.

The economic value of the horse-chestnut is not great. The timber is soft and lacking in strength, and is chiefly employed in the manufacture of kitchen utensils, toys, and other articles for which durability is not of great importance. The nuts are abundantly produced, and are eaten by some animals, notably deer. I have noticed the deer in Bushey Park, at the time the nuts are falling, race eagerly for them as they drop to the ground. Loudon and others suggest various uses for them, but so far as I can learn there is no systematic demand for them. They have such an extraordinary fascination for boys in furnishing the material for the game of "conkers" (conquerors), that the value of the species as a communal tree is in some districts seriously diminished by their efforts with sticks and stones to bring down the nuts before they naturally fall.

The species has produced various forms under cultivation, the best of which is

Var. FLORE PLENO, with double flowers. This variety, according to Mr A. N. Baumann, was noticed by him as a sport on a tree of the ordinary type growing in the garden of a Mons. Duval, near Geneva, during the years 1819 to 1822. He sent grafts to his father's famous nursery at Bollwiller, in Alsace, whence it spread into cultivation. Its flowers last longer than those of the type, and as no nuts are formed, the tree escapes the danger of injury just alluded to. For public places it is strongly to be recommended. Other varieties are:—

Var. CRISPUM.—A tree of compact, rather pyramidal habit, with short, broad leaflets.

Var. FOLIIS AUREIS VARIEGATIS.—Leaves blotched with yellow; a variety to be avoided.

Var. LACINIATA (*Æ. asplenifolia*, *Hort.*).—An extraordinary curiosity of little beauty, whose leaflets are sometimes nine in number, but often reduced to the mere midrib with jagged remains of blade attached.

Var. DIGITATA.—Leaflets short, narrow, often reduced to three, of linear shape; the main-stalk frequently very markedly winged.

Var. MEMMINGERI.—Leaves pale greenish or greyish, yellow when they first expand. Of no merit.

Var. PRÆCOX.—A form which breaks into leaf and flower ten to fourteen days in advance of the ordinary form. Where late spring frosts frequently cause damage, this form is to be avoided. There are two large trees at Kew.

Var. PYRAMIDALIS.—Branches growing upwards at an angle of 45° to the main stem. This would probably be useful as a street tree, and avoid to a large extent the drastic pruning so often practised to keep the ordinary form within bounds.

Var. UMBRACULIFERA forms a low, dense, rounded head of branches. A fine example is in the nursery of Messrs Simon-Louis at Metz.

Æ. INDICA, *Colebrooke*. INDIAN HORSE-CHESTNUT.(Bot. Mag., t. 5117; *Pavia indica*, *Wallich*.)

A tree attaining a height of over 100 ft. in N. India, often with a short, enormously thick trunk, the bark in old specimens peeling off in long strips;



ÆSCULUS INDICA.

winter buds resinous. Leaves composed of usually seven leaflets, which are smooth on both surfaces, shining dark green above; obovate to lanceolate, the central ones much the largest, sometimes 12 ins. long, and 4 ins. wide; toothed.

Panicles erect, cylindrical, up to 12 or even 16 ins. long, and 4 or 5 ins. wide. Flowers 1 in. long, white; petals four, the upper and longer pair with a blotch of yellow and red at the base, the shorter pair flushed with pale rose; stamens standing out $\frac{3}{4}$ in. beyond the petals. Fruit rough, but not spiny, 2 to 3 ins. long.

Native of the N.W. Himalaya. One of the most magnificent of all temperate trees, and equalling the common horse-chestnut in size and beauty, it is remarkable that this species is so little known in English gardens and parks. Judging by the young trees at Kew, which survived the winter of 1894-95 without injury, and the fine example at Barton in Suffolk, now about 70 ft. high, which has lived there since it was introduced by Colonel H. Bunbury in 1851, the species is perfectly hardy. It is, no doubt, a lover of much moisture and good treatment at the root. Lord Ducie informs me that at Tortworth he tried some young trees in sunny positions, which lived but did not thrive. He then shifted them to a shady valley, where they "grew like willows." At Kew they stand in full sunshine, so their vigour is doubtless due to good conditions at the root. Many seeds have been sent to Kew from N. India, but scarcely any have germinated, owing to their rapid loss of vitality if kept dry. They should be packed in boxes of moderately moist soil. Good seeds, however, have been produced at Kew, and plants raised from them. This chestnut flowers in June and July, and is, therefore, at least one month later than the common one—a great point in its favour.

Æ. OCTANDRA, *Marshall*. SWEET BUCKEYE.

(Æ. flava, *Aiton*.)

A tree sometimes 90 ft. high in N. America, with dark brown bark and non-resinous winter buds. Leaflets five or seven to each leaf, obovate or oval, 3 to 7 ins. long, 1 to 3 ins. wide, finely toothed, downy on the veins above and much more so over the whole under-surface; the down is frequently reddish brown. Flowers in an erect panicle up to 7 ins. long, 2 to 3 ins. wide, yellow; petals four; stamens shorter than and hidden by the petals. Fruit roundish oblique, 2 to 2½ ins. long, smooth, carrying usually two seeds. It flowers in May and June.

Native of the S.E. United States; introduced in 1764. It thrives very well in the south of England, making a handsome round-headed tree. There are several examples in the country 50 to 60 ft. high, and the largest, now nearly 70 ft. high, appears to be at Syon, Middlesex; still it is usually seen under 40 ft.

Var. PURPURASCENS, *A. Gray* (var. hybrida, *Sargent*), has more downy leaves and purple or red flowers, and is found wild in the Allegheny Mountains. To it and its seedlings belong many of the numerous reddish or purplish chestnuts found in gardens. It is perhaps a natural hybrid between Æ. octandra and Æ. pavia; and as so often happens with hybrids, the seedlings raised from it are very variable in colour, vigour, etc. Many of these have been raised and distributed without their origin being put on record. Some are exceedingly beautiful small trees, the flowers being of various shades of purple, red, pink, and yellow. I have seen the following under the name and colour given, but whether they all represent the forms as originally named is doubtful:—

Æ. LYONI, yellow, suffused with pink.

Æ. MACROCARPA, red and yellow.

Æ. NEGLECTA, yellowish, veined with red, especially inside.

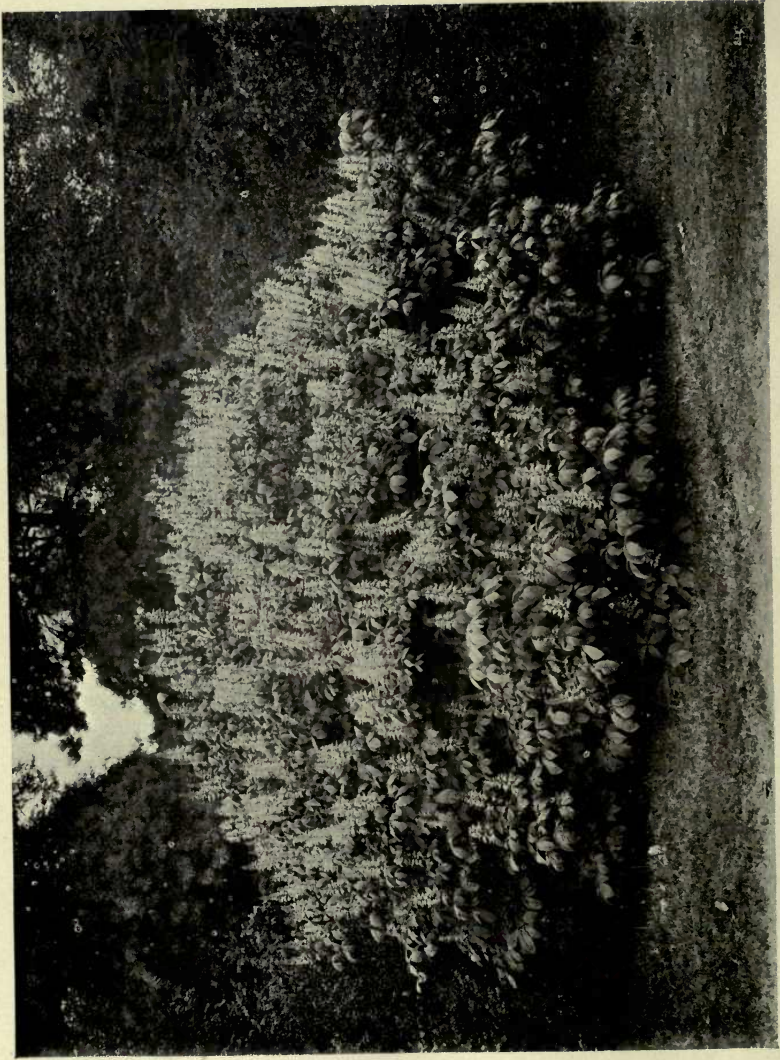
Æ. PALLIDA BICOLOR, yellow, with faint pink veins.

Æ. ROSEA, deep rose.

Æ. SANGUINEA, scarlet.

Æ. VERSICOLOR, yellowish, shaded with red.

Æ. WHITLEYI, rosy outside, deeper red within.



DWARF BUCKEYE, *Esculus parviflora*.

Æ. PARVIFLORA, *Walter*. SHRUBBY PAVIA. DWARF BUCKEYE.

(*Æ. macrostachya*, *Michaux*, Bot. Mag., t. 2118; *Pavia macrost.*, *Loiseleur*.)

A shrub 8 to 12 ft. high, usually broader than it is high, consisting of a crowd of slender stems, and spreading by means of sucker-growths at the base. Rarely it forms a single trunk, and thus becomes a small tree. Leaves usually consisting of five, but sometimes seven, leaflets; each leaflet from 3 to 9 ins. long, and $1\frac{1}{2}$ to 4 ins. wide, obovate, tapering towards both ends, shallowly round-toothed, covered densely beneath with greyish down. Panicles cylindrical, erect, 8 to 12 ins. long, 4 ins. wide from the tips of the stamens. Flowers white; petals normally four, $\frac{1}{2}$ in. long, the stamens thread-like and pinkish white, standing out fully an inch beyond them; anthers red. Fruit smooth.

Native of the S.E. United States; introduced by John Fraser in 1785. There are few shrubs about which more could be said in favour than this. It flowers freely in late July and August, at a time when few shrubs are in flower. It is of neat, yet graceful habit, and it has a hardy, vigorous constitution. No better plant could be recommended as a lawn shrub, especially for places that are visited in August—such as many pleasure resorts. It rarely ripens seed in this country—only during such a season as that of 1911—but can be propagated by division.

Æ. PAVIA, *Linnæus*. RED BUCKEYE.

(*Pavia rubra*, *Poiret*; *Æ. humilis*, *Loddiges*, Bot. Reg., t. 1018.)

A shrub 8 to 12 ft. or more high, with smooth branches and non-resinous buds. Leaves composed of five leaflets, which are 2 to 5 ins. long, lanceolate, obovate or narrowly oblong, slightly downy beneath, especially in the vein-axils; irregularly, sharply, often doubly toothed. Flowers in panicles 3 to 6 ins. long; each flower $1\frac{1}{2}$ ins. long, with the four petals glandular at the margins, which scarcely expand at all; stamens about the length of the petals. Fruit smooth. Blossoms in early June.

Native of the southern United States; introduced, according to Aiton, in 1711. It is one of the rarest of the genus in gardens, the plants met with under the name being usually hybrids between this species and *Æ. octandra*, var. *purpurascens*. Nor do I remember ever to have seen it on its own roots; it is usually grafted as a standard on some other species, when it forms a round-headed, small tree, with its lower branches pendulous. In this state it is sometimes called "*Pavia pendula*." Its flowers are richly coloured, but owing to the petals keeping closed, do not make so striking a display as they otherwise would. It is less ornamental than some of the hybrid forms discussed under *Æ. octandra*.

Æ. PLANTIERENSIS, *E. André*.

A hybrid raised in the nursery of Messrs Simon-Louis frères, at Plantières, near Metz, its parents no doubt *Æ. Hippocastanum* and *Æ. carnea*. The seed came from the former, so that it is (if the generally accepted parentage of *Æ. carnea* be correct) three-fourths common horse-chestnut and one part the red buckeye (*Æ. Pavia*). It shows the characters of both its parents in the leaf; the leaflets being stalkless, as in *Æ. Hippocastanum*, yet showing the more strongly ridged and uneven surface of *Æ. carnea*. In shape and size the panicle is like that of *Æ. Hippocastanum*, but the whole flower is suffused with a charming shade of soft pink, which it inherits from the other parent. In habit and general appearance it is intermediate. It has flowered at Kew for several years past, and I consider is a very beautiful and desirable acquisition.

It has developed no fruit at Kew, and I understand from Mr Jouin, of Plantières, that it does not bear seed in the nursery. For public places this is an advantage.

Æ. TURBINATA, *Blume*. JAPANESE HORSE-CHESTNUT.

A tree 80 to 100 ft. high in Japan, and said to have a trunk 20 ft. in girth; winter buds very resinous. Leaves like those of *Æ. Hippocastanum*, consisting of five to seven stalkless leaflets, but more regularly toothed and tapering more gradually at the apex. On the small plants at Kew they are obovate, and as much as 16 ins. long and 6 ins. wide, the whole leaf with its stalk 27 ins. long. Panicles erect, 4 to 8 ins. high, with a stalk half as long. Flowers $\frac{3}{4}$ in. across, creamy white, produced two or three weeks later than those of common horse-chestnut. Fruit without spines, but rough; broadly pear-shaped, 2 ins. wide near the top, tapering to a short, warted stalk.

Native of Japan up to 5500 ft. altitude on the main island, also in Yezo. The largest tree in this country, now 25 ft. high, is in the Coombe Wood nursery. It flowered in 1901, which is the only recorded blossoming of the species in England. It is very similar in general appearance to *Æ. Hippocastanum*, but hitherto has grown much more slowly. It is distinguishable by the different toothedness of the leaf, still more so, of course, by the Pavia-like fruits. Mr Elwes says that the timber of this tree, although lacking strength, often shows a wavy figure, and is used in Japan for house fittings and articles of domestic use. Little can be said of the value of the tree for gardens and parks, but it would seem to be inferior to the common horse-chestnut in all respects except in size of leaf. In that respect it is certainly the most striking of all. Young trees are curiously stiff and sturdy in habit.

AILANTHUS. SIMARUBACEÆ.

A group of tall trees with alternate, pinnate leaves, found in temperate and tropical Asia. The flowers have no beauty, but the samaroid fruits are often richly coloured, and add much to the attractiveness of trees already very attractive in their fine, handsomely divided foliage. The two species in cultivation thrive best in a rich, deep soil, and can be propagated by suckers from the root, by root-suckers, and by grafting.

A. GLANDULOSA, *Desfontaines*. TREE OF HEAVEN.

A large, deciduous, often unisexual tree, frequently 50 to 70 ft., rarely 100 ft. high, with a trunk 2 to 3 ft. in diameter, and a rounded head of branches. The older bark is marked with numerous grey fissures. Leaves pinnate, from 1 to $1\frac{1}{2}$ ft. long on adult trees (often twice as large on young ones), composed of fifteen to over thirty leaflets, unpleasant smelling. Leaflets usually 3 to 6 ins. long, ovate, pointed, often slightly heart-shaped at the base; the margin entire except for one to three teeth on both sides near the base, each marked with a conspicuous gland; stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers in terminal panicles, with male and female flowers as a rule on separate trees (but not always); greenish, the male ones evil-smelling. The fruit consists of one to three, sometimes five, keys like those of the ash, several hundreds of which are borne on large branching panicles 9 to 12 ins. high and through. Each key (samara) is about $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. wide, flat, thin, narrow-oblong, tapering towards both ends, with one seed in the centre. The keys are reddish brown, and a tree in full fruit is handsome. They have a peculiar twist at each end, which causes them to

revolve with great rapidity as they fall. They are thus much longer reaching the ground, and in even a slight movement of the air will be carried a considerable distance. This is no doubt a provision to help in the dissemination of the seeds.

Native of N. China ; introduced by Peter Collinson in 1751. It is hardy over most parts of the British Isles, but apparently succeeds best in the south of England. Few trees thrive so well in towns, but for planting there female trees should alone be used, owing to the objectionable odour of the male when in flower. For this purpose, the tree should be increased by root-cuttings taken from a female tree, as the sex of seedling plants cannot be determined until they are too big to transplant. Among pinnate-leaved trees of similar character, the *Ailanthus* is easily recognised by the glandular teeth near the base of the leaflets. The generic name is derived from "*Ailanto*," the native name for *A. moluccana*, signifying a tree tall enough to reach the skies. Hence also the popular name of "*Tree of Heaven*." It is very effectively used as a fine-foliaged plant in summer by cutting young trees back to the ground in spring, and reducing the young shoots to one. Treated in this way, and given good soil, leaves 4 ft. long are produced. The only variety worth mentioning is

Var. *PENDULIFOLIA* (not "*pendula*"). This has its branches as erect as the type, but the leaves, which are more than ordinarily long, hang downwards, rather than stand out horizontally as in the type.

A. VILMORINIANA, *Dode*.

A tree probably of the same dimensions and general aspect as *A. glandulosa*, but distinguished by the numerous soft spines which clothe the young branchlets. Leaves pinnate, as large, or probably larger, than those of the previous species, and very downy; the main stalk often of a rich red, and occasionally spiny like the branchlet. The inflorescence is sometimes 12 ins. or more across, and the keys 2 ins. long, with the twist resembling the propellers of an aeroplane even more marked. From this description it will be seen that this species, although similar to *A. glandulosa* in many respects (it has the same glandular teeth at the base of the leaflets), is on the whole quite distinct, especially in the spiny branchlets and very downy leaflets.

Native of Szechuen, W. China, whence seeds were sent to Mr Maurice de Vilmorin by Père Farges, the missionary, in 1897. The parent tree of all those in Europe is in Mr de Vilmorin's grounds at Les Barres, in France, where, when I saw it ten years ago, it had the spiny character of the branches well marked, but during a recent visit I noticed the young shoots were becoming less spiny. It has been propagated by grafting on *A. glandulosa*.

AKEBIA. BERBERIDACEÆ.

A small genus of climbing shrubs belonging to the *Lardizabaleæ* section of the *Barberry* family. They produce male and female flowers on the same raceme; the former small, numerous; the latter few, large, and confined to the base. Neither is showy, for petals are absent, and the attractive part is three large sepals. The fruit is large and highly coloured, but not regularly produced in the British Isles. The two hardy species are attractive for their free growth and elegant foliage, and are useful for clothing pergolas, pillars, summer-houses, or for rambling over other shrubs or trees. They need but little training or tying, and the

stems will fix themselves by twining round any wire, small branch, etc., with which they may come in contact. Their chief need in cultivation, after the provision of a suitable support, is a good loamy soil. They can be propagated by layers and by cuttings of the stems and roots. Layering is the least troublesome. Cuttings should be made from wood just getting firm, and placed in gentle heat. "Akebia" is an adaptation of the Japanese name for these shrubs.

A. LOBATA, *Decaisne*.

(Bot. Mag., t. 7485.)

A deciduous, twining shrub of vigorous habit. Leaves smooth, composed of three stalked leaflets, the stalk of the terminal one thrice the length of those of the lateral ones. Leaflets broadly ovate, $1\frac{1}{2}$ to 4 ins. long, the margins irregularly and shallowly lobed, the apex notched. Male and female flowers are borne on the same raceme, which is more or less pendulous and 3 to 5 ins. long. Male flowers small, very numerous, $\frac{1}{8}$ in. diameter, pale purple, and confined to the terminal part of the raceme. Female flowers basal and much larger, usually two in number, each about $\frac{3}{4}$ in. in diameter, the three concave sepals being dark lurid purple. Fruit at first is a sausage-shaped body, 3 ins. long and $1\frac{1}{2}$ ins. wide, pale violet; but when ripe it splits open from the base, revealing rows of black seeds imbedded in white pulp.

This remarkable and interesting climber was introduced to Kew in 1897, being a native of China and Japan. It has proved to be perfectly hardy and a luxuriant grower, but flowering as it does early in April, its blossoms are often destroyed by frost, and its remarkable and highly coloured fruits in consequence not often seen out-of-doors.

A. QUINATA, *Decaisne*.

(Bot. Mag., t. 4864.)

A twining shrub, 30 to 40 ft. in length, evergreen in mild winters and in warm localities, but losing its leaves where the conditions are more severe. Leaves with slender stalks 3 to 5 ins. long, carrying normally five (sometimes three or four) radially arranged leaflets. Leaflets smooth, oblong or obovate, distinctly notched at the apex, $1\frac{1}{2}$ to 3 ins. long, with stalks about $\frac{1}{2}$ in. long. Flowers produced on slender, pendent racemes, very fragrant; males $\frac{1}{4}$ in. across, with pale purple, reflexed sepals, and occupying the terminal part of the raceme; females (usually two) 1 to $1\frac{1}{2}$ ins. across, dark chocolate purple, the sepals broadly elliptical and concave. Fruit $2\frac{1}{2}$ to 3 ins. long, in shape like a thick sausage, greyish violet or purplish in colour, containing numerous seeds immersed in white pulp.

First introduced in 1845 from the Island of Chusan by Robt. Fortune, this climber has since been found to be native also of Japan, China, and Corea. It is perfectly hardy in a sheltered dell at Kew, but does not develop its handsome fruit out-of-doors. In the south-western counties it succeeds admirably, and is valued for the charming, spicy fragrance of its flowers, at times perceptible yards away from the plant, although even there the fruit is never abundantly borne. It has been produced in the garden of the late Mr Pember, Vicars Hill, Lymington, among other places. The plant is extremely luxuriant in gardens at Pallanza, on the shores of Lake Maggiore.

ALANGIUM PLATANIFOLIUM, *Harms.* ALANGIACEÆ.(Marlea platanifolia, *Siebold.*)

A deciduous shrub, 6 ft. or more high, with erect, zigzagged, but not much branched stems; branches very pithy and slightly downy; winter buds hairy. Leaves alternate, roundish, or broadly ovate in main outline, 4 to 8 ins. long, nearly as wide, with two to seven (usually three or five) large pointed lobes towards the apex; upper surface dark green, and smooth except for scattered hairs; lower surface covered with pale down; stalk 1 to 3 ins. long. Flowers white, the petals linear, forming a slender tube 1 to $1\frac{1}{4}$ ins. long; produced during June and July in a one- to four-flowered cyme from the leaf-axils of the current year's shoots; flower-stalks 1 to 2 ins. long. Fruit thin-shelled, ovate, $\frac{1}{4}$ in. long, with the calyx persisting at the top.

Native of Japan, whence it was introduced by Maries for Messrs Veitch about 1879. It is also a native of China, where it was found in Hupeh by Henry. This shrub must be regarded more as a curiosity than as an ornament in gardens, although the large maple-like leaves are handsome. It is hardy at Kew, although its soft pithy shoots are sometimes cut back by severe winter cold. Although allied to *Cornus*, it has a very different aspect, and is, indeed, quite distinct from any other hardy shrub we cultivate. Its old generic name of *Marlea* is an adaptation of a native name for an Indian species, but it has recently been removed from that genus and the natural order *Cornaceæ*, and given the name here adopted.

ALBIZZIA JULIBRISSIN, *Durrazo.* PINK SIRIS.

LEGUMINOSÆ.

(Acacia Julibrissin, *Willdenow.*)

A deciduous tree 30 to 40 ft. high, with smooth branchlets. Leaves doubly pinnate, with from six to twelve pairs of main divisions (pinnæ), each of which consists of twenty to thirty pairs of leaflets; the entire leaf being 9 to 18 ins. long, half as wide. Each leaflet is $\frac{1}{3}$ to $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide, oblong, with a curious one-sided appearance, due to the blade developing only on the lower side of the midrib. Flowers in a terminal cluster of dense heads each terminating a stalk 1 to 2 ins. long, the chief feature of the flower being the numerous thread-like rosy purple stamens, 1 in. or more long, which give the flower-head the appearance of a brush. Pod about 5 ins. long, $\frac{3}{4}$ in. wide, constricted between the seeds.

Native of the Orient, whence it was introduced in 1745; also common, cultivated or wild, in China and many other countries. It is now very well known in gardens in its juvenile state as an ornamental plant for sub-tropical bedding. For this purpose seeds are sown in heat in spring in pots, and the plants gradually hardened off by the end of May, then planted out in good soil. When the frosts come they are either destroyed, or potted up and housed in a cool greenhouse until the following spring.

The species is not hardy at Kew in the open, but grows very well on a lofty wall, where its large, beautifully divided leaves give a very pleasing effect in the height of summer. In such a spot it is well to plant some other climber, preferably evergreen, to grow over the lower part of the wall beneath the Albizzia, which grows quickly in its younger stages and leaves its base naked.

ALNUS. ALDERS. BETULACEÆ.

The alders are deciduous trees and shrubs closely allied to, and only likely to be confounded with, the birches (*Betula*). Leaves with stipules, alternate, more or less toothed in all the cultivated species. Winter buds nearly always stalked. Male and female flowers borne on the same tree but on separate catkins. Male catkins long and slender, usually in clusters of two to six; the flowers small, with a four-lobed calyx, no petals, and usually four (sometimes one to three) stamens. Female catkins shorter, clustered, or rarely solitary, developing into woody, cone-like fruits, known as strobiles, $\frac{1}{3}$ to over 1 in. long. The seed is a minute, flattened nutlet, often with thin membranous wings at the sides. With the exception of two species—*A. maritima* and *A. nitida*—which flower in autumn, the cultivated alders form their catkins in the late summer and autumn; these expand the following spring, either very early before the leaf-buds begin to grow, or along with the leaves; the fruits develop during the summer and persist until the succeeding spring. From the alders the birches are distinguished by the fruits being longer, not woody, and falling to pieces (those of the alders falling whole), and the flowers of birches have never more than two stamens.

In gardens and parks the alders are chiefly valuable for growing in wet situations unsuited to the majority of trees. Some, however, such as *A. japonica*, *nitida*, and *firma*, succeed quite well in ordinary good soil. All are best propagated by seed except the garden varieties, which may be grafted on their respective types, or, better still, rooted from cuttings made as soon as the leaves fall, and put in sandy soil, as willow or poplar cuttings are—compared with which, however, they do not strike root so readily. The following is a selection of the best worth growing, irrespective of their use in damp places:—*Cordifolia*, *firma*, *nitida*, *oregona*; *glutinosa* var. *imperialis* and var. *incisa*; *incana* var. *incisa* and var. *ramulis coccineis*.

A. BARBATA, *C. A. Meyer*.

(*A. glutinosa* var. *barbata*, *Ledebour*.)

A tree nearly related to *A. glutinosa*, and with the same general aspect, but quite distinct in the very downy shoots. Leaves oval or ovate, rounded at the base and either rounded or pointed at the apex, doubly toothed; 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; dark glossy green above, downy beneath, especially on the veins and midrib; veins in eight to ten pairs; stalks $\frac{1}{3}$ to $\frac{3}{4}$ in. long, downy.

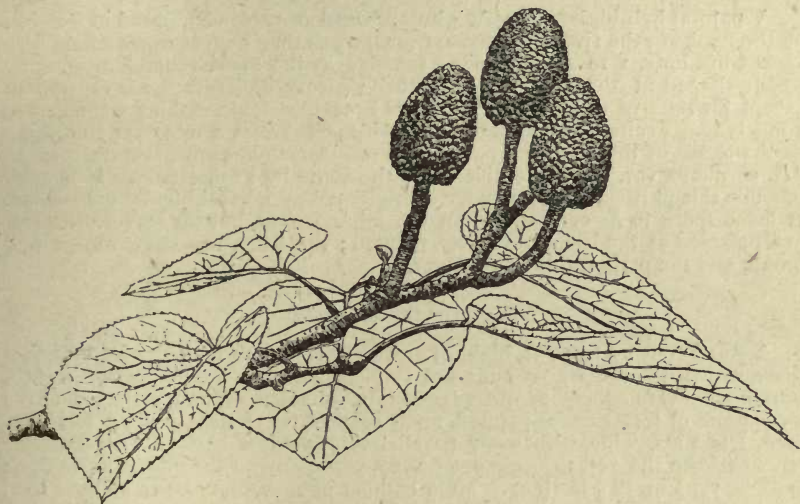
Native of the Caucasus, uncommon in cultivation, but represented by a tree on the east side of the lake at Kew, now 20 ft. high. It is sometimes

regarded as a variety of *A. glutinosa*, differing chiefly in the hairy shoots and leaves, and in the often pointed apex of the latter. Flowers and fruit the same.

A. CORDIFOLIA, *Tenore*. ITALIAN ALDER.

(*A. cordata*, *Desfontaines*.)

A tree 80 ft. high, of pyramidal habit; young shoots smooth, angled; winter buds stalked. Leaves roundish to broadly ovate, usually deeply notched at the base, shortly and abruptly pointed or rounded at the apex, $1\frac{1}{2}$ to 4 ins. long, from three-fourths to as much wide; finely and simply toothed; upper surface smooth, dark lustrous green; lower one paler and also smooth, except for tufts of brownish down in the vein-axils; leaf-stalk slender, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, smooth. Male catkins three to six, in a terminal zigzag raceme, each catkin 2 to 3 ins. long, expanding in March. Fruit erect, egg-shaped, 1 to $1\frac{1}{4}$ ins. long and $\frac{3}{8}$ to $\frac{1}{2}$ in. wide, mostly in threes.



ALNUS CORDIFOLIA.

Native of Corsica and S. Italy; said to have been introduced in 1820. Undoubtedly one of the handsomest of the alders, this tree is not planted enough. Although it thrives on poor and dryish soil it is more at home near water, as a fine pyramidal tree over 70 ft. high on the banks of the pond at Kew shows. Its deeply heart-shaped, glistening leaves and large fruits (larger than those of any other species in cultivation) make it very distinct. From *A. subcordata* it is distinguished by its shorter male catkins, and by several other points mentioned under that species.

A. CREMASTOGYNE, *Burkill*.

A tree 40 to 80 ft. high, according to Wilson; young shoots soon becoming smooth. Leaves usually distinctly obovate, sometimes nearly oval, tapered or somewhat rounded at the base, and shortly and abruptly pointed; margins set with small teeth; $2\frac{1}{2}$ to $5\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to 3 ins. wide; dark lustrous green, and smooth above, paler beneath, with tufts of brown hairs in the vein-axils; veins

in nine or ten pairs; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Male catkins not yet seen. Fruits solitary, on axillary stalks $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long; oval, about $\frac{1}{4}$ in. long, $\frac{1}{8}$ in. wide; seed with a broad thin wing.

Native of W. China; discovered by Henry in Szechuen, in 1899; introduced by Wilson in 1907. This species is very distinct from all other cultivated alders except *A. lanata* in its solitary, long-stalked fruits. The foliage, too, is distinct in its large size and dark, smooth, glossy green appearance. We know little of its garden value or real hardiness as yet, but it grows at 4000 ft. altitude.

A. LANATA, *Duthie*, is another alder found in W. China by Wilson, also with solitary fruits. It may be no more than a form of *A. cremastogyne*, but is easily recognised, especially when the foliage is young, by the dense brown woolly covering of the under-surface of the leaves, leaf-stalks, flower-stalks, and young shoots. Male catkins 2 to 3 ins. long. Fruits as in *A. cremastogyne*.

A. ELLIPTICA, *Requien*. HYBRID ALDER.

A natural hybrid, between *A. glutinosa* and *A. cordifolia*, found in Corsica, on the banks of the river Salenzana, near its mouth. Leaves oval to roundish, $1\frac{1}{2}$ to 3 ins. long, 1 to $2\frac{1}{2}$ ins. wide; rounded at the apex, rounded or broadly wedge-shaped at the base, finely toothed; glossy dark green above, smooth except for tufts of down in the vein-axils beneath. Male catkins slender, 3 to 4 ins. long. Fruits $\frac{3}{4}$ to 1 in. long, $\frac{1}{2}$ in. wide. There is a tree over 70 ft. high on the banks of the lake at Kew, but its origin is unknown. It was grown as "*A. cordifolia* var." until identified with the above by Prof. Henry. It is quite possible this particular tree may have originated as a hybrid under cultivation. It leans more to *A. cordifolia* than the other parent, but the leaves are never heart-shaped at the base, and rarely pointed; the fruits are not so large and broad, and the male catkins are longer.

A. FIRMA, *Siebold*.

A small tree, up to 30 ft. high, of graceful habit, with long slender branches downy when young; winter buds not stalked. Leaves resembling those of a hornbeam, ovate-oblong to ovate-lanceolate, rounded or wedge-shaped at the base, more or less slender-pointed, finely toothed (often doubly so), 2 to $4\frac{1}{2}$ ins. long, 1 to 2 ins. wide, with many parallel veins; upper surface with flattened hairs between the veins, lower one downy, especially on the midrib and veins; stalk hairy, $\frac{1}{8}$ in. to $\frac{5}{8}$ in. long. Male catkins often solitary or in pairs, 2 to 3 ins. long, opening in March and April. Stalk of female inflorescence glandular-hairy. Fruits $\frac{1}{2}$ to 1 in. long, oval.

Native of Japan; probably introduced by John Gould Veitch about 1862. Remarkably distinct from all other alders in the numerous, closely set, conspicuous nerves, this is a very graceful tree as well. It appears to be common in Japan, where, Sargent observes, it is largely planted on the margins of the rice fields of Tokyo to afford "support for the poles on which the freshly cut rice is hung to dry." Although well marked from other species, it varies in itself, and three forms are distinguished, which by some authorities are regarded as distinct species. They are as follows:—

Var. *MULTINERVIS*, *Regel* (*A. multinervis*, *C. K. Schneider*).—Leaves long, with eighteen to twenty-four pairs of veins, conspicuously double-toothed; stalks short, $\frac{1}{8}$ to $\frac{1}{4}$ in. long; fruits small, pendulous, little more than $\frac{1}{2}$ in. long. This is the form originally introduced to Britain.

Var. *YASHA*, *Winkler* (*A. Yasha*, *Matsumura*).—Leaves shorter, simple-toothed or not conspicuously double-toothed; veins in ten to sixteen pairs; stalks $\frac{1}{4}$ to $\frac{5}{8}$ in. long. Fruits larger, $\frac{3}{4}$ in. long, and broader in proportion. This was introduced to Kew in 1893.

Var. *SIEBOLDIANA*, *Winkler* (*A. Sieboldiana*, *Matsumura*).—This, which is not in cultivation, has smooth young shoots, and large solitary fruits 1 in. long.

A. GLUTINOSA, *Gaertner*. COMMON ALDER.

A tree 50 to 90 ft. in height, with a trunk 5 to 12 ft. in girth, of narrow, pyramidal habit; young shoots covered with minute glands, glutinous, not downy. Leaves broadly obovate, sometimes almost round, the base always more or less tapered, the apex rounded, and thus giving the leaf a pear-shaped outline; $1\frac{1}{2}$ to 4 ins. long, two-thirds to about as much wide; irregularly toothed except near the base; dark lustrous green, smooth and glutinous above; pale green and with tufts of down in the vein-axils beneath; veins in six to eight pairs; stalk $\frac{1}{2}$ to 1 in. long. Male catkins opening in March, usually three to five together, each 2 to 4 ins. long. Fruit egg-shaped, $\frac{1}{3}$ to $\frac{2}{3}$ in. long, rather numerous in the cluster.

Native of Europe (including Britain), W. Asia, and N. Africa. The common alder has not much to recommend its being brought into the garden. It is abundant in a wild state, and the genus can be more effectively represented in gardens by selected varieties and such species as *A. cordifolia* and *A. nitida*. It is, at the same time, a very useful tree for planting in boggy places where few trees would thrive. The timber is chiefly employed in the manufacture of the clogs so commonly used in the Lancashire mill towns. An ancient and humble, but honourable form of woodcraft is carried on where alders abound, especially in the north, by men who travel from place to place, purchase the alder trees standing, fell them, then cut up the timber and roughly shape it on the spot for clog-making. But, some years ago, in the south-west of Scotland, I was told by one of these itinerant workers, that the supply of alder scarcely kept pace with the demand, and that birch was now largely being used.

Var. *AUREA*, *Dippel*.—Leaves golden yellow. Raised in Vervaeke's nursery, Ledeberg-les-Gand, about 1860. Not so vigorous as the type.

Var. *IMPERIALIS*, *Petzold*.—Leaves deeply and pinnately lobed, the lobes lanceolate, slender, pointed, not toothed, reaching more than half-way to the midrib; stalks 1 to $1\frac{1}{2}$ ins. long. Often a thin, rather ungainly tree, never of great size.

Var. *INCISA*, *Willdenow* (var. *oxyacanthæfolia*, *Loddiges*). Thorn-leaved Alder.—A curious and interesting form, the leaves being small, usually less than 1 in. long, reflexed, deeply cut into several broad, toothed lobes, or even right to the midrib at the base. As a rule this grows slowly, and long remains a dwarf, compact bush; but Messrs Elwes and Henry mention one at Barton, near Bury St Edmunds, 44 ft. high and 2 ft. 8 ins. in girth.

Var. *LACINIATA*, *Willdenow*.—Similar to *imperialis*, but not so deeply and narrowly lobed; lobes not toothed. There is a fine specimen at Syon, mentioned by Loudon over seventy years ago, now over 70 ft. high, and 11 ft. in girth.

Var. *PYRAMIDALIS*, *Dippel*.—Branches erect.

Var. *QUERCIFOLIA*, *Willdenow*.—Upper part of the leaf with triangular, toothed lobes, the deepest not reaching more than one-third of the way to the midrib.

Var. *RUBRINERVIA*, *Dippel*.—Leaves with red veins and stalks.

Var. *SORBIFOLIA*, *Dippel*.—Leaves oblong or oval, deeply cut into about six pairs of lobes, which are oblong and coarsely round-toothed, the sinuses often widest at the base. One of the most distinct of the cut-leaved sorts. The tree itself is not a strong grower, and is of rather lax habit.

A. PUBESCENS, *Tausch*, is a hybrid between *A. glutinosa* and *A. incana*, with leaves oval, obovate or ovate, rounded or tapering at the base, and pointed or blunt at the apex; margins doubly toothed; the upper surface is at first downy, the lower one permanently and more downy. Flower-stalks and

young shoots downy. This hybrid (also known as *A. badensis* and *A. spuria*) is intermediate between the parents. Probably of more than one independent origin, being found wild in several parts of Europe.

A. INCANA, Moench. GREY ALDER.

A tree 60 to 70 ft. high, with a trunk occasionally 6 ft. in girth; young shoots covered with a short, grey down. Leaves ovate, oval, or occasionally obovate, rounded or wedge-shaped at the base, and with short, abrupt points; 2 to 4 ins. long, $1\frac{1}{4}$ to $2\frac{1}{4}$ ins. wide; the margins with six or more coarse teeth about the middle, these again being sharply toothed, the base entire; upper surface dull green covered with flattened down when young, lower surface grey with a close down; veins in nine to twelve pairs; stalk $\frac{1}{2}$ to $\frac{7}{8}$ in. long, covered with minute down. Male catkins 2 to 4 ins. long, usually three or four in a cluster, opening in February. Fruits ovoid, numerous, and rather densely clustered, $\frac{1}{2}$ to $\frac{5}{8}$ in. long.

Native of Europe and the Caucasus, not of Britain, but introduced in 1780; also found in Eastern N. America. This alder is an exceptionally hardy tree, and useful for planting in cold, wet places. With the exception of *A. glutinosa*, it is the commonest of alders, but is more frequently represented in gardens by the various cut-leaved and coloured forms than by the type. From *A. glutinosa* in all its forms it is most obviously distinguished by the grey downy leaves and young shoots. The typical *A. glutinosa* is, of course, very distinct in the obovate, round-ended leaves, green, and almost smooth beneath.

The North American form of *A. incana*, known there as the "speckled alder," is a shrub or small tree under 20 ft. in height, its leaves glaucous to rusty red beneath.

Var. *AUREA, Schelle*.—Young shoots and leaves yellow, the colour lasting through the summer.

Var. *GLAUCA, Regel*.—Leaves blue-green beneath, becoming almost smooth there as the season advances.

Var. *INCISA*.—The handsomest of cut-leaved alders, the blade being pinnately divided into six to eight pairs of narrow, lanceolate, toothed lobes, reaching two-thirds or more of the way to the midrib. Sold in nurseries as "var. *laciniata*" and "var. *pinnatifida*."

Var. *MONSTROSA* is a bushy-headed, small tree, with broad, flattened, fasciated growths. Merely a curiosity.

Var. *ORBICULARIS, Callier*.—Leaves round-oval, under 2 ins. in length; veins in about five pairs. Native of Silesia.

Var. *PENDULA*.—Branches weeping.

Var. *RAMULIS COCCINEIS*.—A pretty tree in early spring, the twigs being reddish, the bud and catkin scales distinctly red.

A. JAPONICA, Siebold. JAPANESE ALDER.

A pyramidal tree, from 60 to 80 ft. high; young shoots smooth, or downy towards the base; buds stalked. Leaves lanceolate to narrowly ovate or oval, tapered at both ends, usually more slenderly at the apex; 2 to 5 ins. long, $\frac{3}{4}$ to 2 ins. wide, finely toothed, smooth, dark glossy green; stalks downy, $\frac{1}{2}$ to 1 in. long. Male catkins opening in February or March, according to the warmth of the season, and produced in a terminal cluster of four to eight; each catkin erect, 2 to $3\frac{1}{2}$ ins. long. Fruits oval, $\frac{3}{4}$ in. long.

Native of Japan, the true date of whose introduction is not recorded. Plants obtained from Lee's nursery had already reached the fruiting state at Kew in 1880. It is considered to have some relationship with the North American *A. maritima*, and has been regarded as a variety of it, but in the field it is quite distinct. It grows more than twice as high, has narrower,

long-pointed leaves; and more than all, its habit of flowering in spring distinguishes it.

A. SPETHII, *Callier*, is a hybrid between japonica and subcordata, and was sent out by Spath of Berlin in 1908.

A. MARITIMA, *Nuttall*. SEASIDE ALDER.

A small tree, occasionally up to 30 ft. high, with a trunk 1 to 1½ ft. in girth, but, according to Sargent, more often a shrub; young shoots at first downy, becoming smooth later. Leaves obovate, sometimes oval or ovate, 2 to 4 ins. long, 1½ to 2½ ins. wide; wedge-shaped at the base, with short, broad points, the margins set with small, gland-tipped teeth; upper surface dark glossy green, smooth; lower one dull, smooth, or with tufts of down in the vein-axils; stalks slightly downy, ½ to ¾ in. long. Male flowers expanding in autumn on rough-stalked catkins 1½ to 2½ ins. long, formed the same summer in the uppermost leaf-axils. Female catkins about ½ in. long at the time of fertilisation, expanding and ripening the following year into egg-shaped fruits ⅝ to ¾ in. long.

Native of Delaware and Maryland; usually found near water. It was raised from seed sent by Prof. Sargent to Kew in 1878, and a tree by the lake side succeeded well until 1895, when it succumbed—apparently to the great frosts of February of that year, the effect of which, no doubt, had been heightened by the low, wet situation in which it grew. Reintroduced in 1899, and already producing fruit freely. Its habit of flowering in autumn distinguishes this species from all other cultivated alders except *A. nitida*—a very different tree in other respects.

A. NITIDA, *Endlicher*. HIMALAYAN ALDER.

(Bot. Mag., t. 7654.)

A tall tree, said to become 100 ft. high in its native place, with a trunk 10 to 15 ft. in girth; bark of trunk blackish and ultimately scaling; young twigs with a little loose down at first, soon quite smooth. Leaves thin-textured, ovate to oval, 3 to 6 ins. long, 2 to 3 ins. wide, rounded or broadly wedge-shaped at the base, slender-pointed, coarsely toothed to almost entire; shining-green above, pale beneath, and smooth except for tufts of down in the vein-axils; stalks ½ to 1 in. long, slightly downy. Male catkins opening in September, and produced as many as five together in a raceme, each catkin 4 to 6 ins. long, ¼ in. in diameter, and pendulous. Fruits three to five together, erect, oblong, ¼ to 1¼ ins. long.

Native of the N.W. Himalaya; introduced thence to Kew in 1882 through seed sent by Mr R. E. Ellis. The trees then raised have succeeded very well, and are now 40 to 50 ft. high, with trunks about 3 ft. in girth. Judging by these, it would appear desirable to introduce this tree in quantity and try it under forest conditions for moist places. It is at once distinguished from all other alders except *maritima* (*q.v.*) by flowering in autumn, and from that species by its large, handsome, shining leaves. The quadrangular scales on the bark are not developed on young trees.

A. OREGONA, *Nuttall*. OREGON ALDER.

(*A. rubra*, *Bongard*.)

A tree usually 40 to 50 ft., sometimes 80 ft. high (Sargent), with a trunk 3 ft. 6 ins. in diameter, and a narrow pyramidal head of rather pendulous branches; young shoots angled, not downy; winter buds stalked, resinous. Leaves ovate

or oval, 3 to 6 ins. long, 2 to 4 ins. wide, rounded or broadly wedge-shaped at the base, pointed, the margins decurved and with numerous small lobes or large teeth, each again unequally toothed; nerves parallel, reddish, ten to fifteen pairs; upper surface dark green, lower one pale or greyish, covered at first with down which mostly falls away except on the nerves; stalk $\frac{1}{2}$ to 1 in. long. Male catkins 4 to 6 ins. long, $\frac{1}{4}$ in. wide, usually three to five in a cluster. Fruits $\frac{1}{2}$ to $\frac{3}{4}$ in. long, barrel-shaped, three to six together.

Native of Western N. America from Alaska to California; introduced sometime previous to 1880, since when it has been grown at Kew. It is a handsome and striking alder, both when in flower in March and when in full foliage later. Jepson observes that in some parts of California it forms "pure groves of great beauty in bottom lands near the sea."

A. RHOMBIFOLIA, *Nuttall*. WHITE ALDER.

A tree 30 to 100 ft. high; forming a thin, spreading, round-topped head of branches, pendulous at the ends: young branches at first covered with pale hairs which soon fall away. Leaves ovate, oval, or rounded, ordinarily 2 to 4 ins. long, about two-thirds as wide; usually pointed (sometimes rounded) at the apex, tapered at the base, unevenly or doubly toothed; dark shining green (but at first very hairy) above; paler, yellowish, and permanently downy beneath. Male catkins two to seven in a cluster, opening on the naked shoots early in spring, each catkin 3 to 5 ins. long; stamens two, rarely three. Fruits $\frac{1}{3}$ to $\frac{3}{4}$ in. long, three to seven together.

Native of Western N. America. The leaves occasionally approach the diamond shape indicated by the name, and on vigorous shoots are up to 5 ins. long. According to Jepson, this alder keeps to streams which do not run dry, forming files of trees in mountain gorges which are "to the traveller a reliable sign of water." It is very rare in cultivation, the plant supplied for it in this country and on the Continent being, as a rule, *A. oregona*.

A. SERRULATA, *Willdenow*. SMOOTH ALDER.

(*A. rugosa*, *C. Koch*.)

A shrub, sometimes a small tree 30 to 40 ft. high; young twigs slightly downy and viscid. Leaves obovate (sometimes oval), rounded or pointed at the apex, always tapered at the base; minutely, often unevenly toothed; $1\frac{1}{2}$ to 4 ins. long, one-half as much or more wide, smooth above, downy to nearly smooth beneath; stalk $\frac{1}{4}$ to $\frac{5}{8}$ in. long. Male catkins up to 4 ins. long, appearing in spring before the leaves. Fruit oval, $\frac{3}{4}$ in. long.

Native of the eastern United States, from Maine to Florida; introduced in 1769. From *A. incana* this is distinguished by the more tapered (never rounded) base to the leaf, which is green on both sides, and usually broadest above the middle; and from its fellow American shrubby species, *A. viridis*, by flowering on the naked wood before the leaf-buds move, and by the very finely toothed leaves. A very hardy shrub, but of no particular merit for gardens.

A. SITCHENSIS, *Sargent*. SITKA ALDER.

This tree is a native of Western N. America, from the borders of the Arctic Ocean to Oregon. It was introduced in 1903 to Kew by Professor Sargent, who describes it as a tree sometimes 40 ft. high, with a trunk 2 ft. in girth, forming a narrow head of short and nearly horizontal branches; but sometimes a mere shrub, and forming thickets; young shoots finely downy at first, and very glandular. Leaves ovate, 3 to 6 ins. long, $1\frac{1}{2}$ to 4 ins. wide, rounded or broadly wedge-shaped at the base, pointed, doubly toothed; light green

above, pale, very lustrous green beneath; smooth or with hairs along the midrib, and tufts in the vein-axils; viscid when young; stalk stout, grooved, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Male catkins 4 to 5 ins. long. Sargent distinguishes this species among American arborescent alders by the flowers opening with or after the leaves, by the female catkins being enclosed during the winter, and by the lustrous under-surface of the leaves. It is the Western American representative of *A. viridis*.

A. SUBCORDATA, *C. A. Meyer*. CAUCASIAN ALDER.

A tree up to 60 ft. high; young shoots downy, angled toward the end; buds stalked. Leaves ovate or oval, with a rounded or slightly heart-shaped base, and a short, abrupt point; 3 to 6 ins. long, 2 to 4 ins. wide; irregularly and often doubly toothed towards the apex, more finely so towards the base; dark green and almost smooth above, paler and downy beneath, especially along the midrib and veins; primary veins in eight to ten pairs; stalk $\frac{3}{4}$ to over 1 in. long, downy. Male catkins in clusters of four or five, very slender, up to 6 ins. long, expanding sometimes as early as December. Fruits $\frac{3}{4}$ to $1\frac{1}{8}$ ins. long, nodding, solitary up to as many as five together.

Native of the Caucasus and Persia; introduced, according to Loudon, in 1838, and raised that year from seed in the Birmingham Botanic Garden. It is a handsome, fine-foliaged alder, retaining its leaves until the end of November. There is a specimen over 50 ft. high on the banks of the lake at Kew. *A. cordifolia* is the only other species with which it is likely to be confused, but that differs markedly in its smooth shoots, its less downy, simply toothed, deeply cordate leaves, and larger fruits.

A. TENUIFOLIA, *Nuttall*.

A shrub or tree, up to 30 ft. high, with a trunk $1\frac{1}{2}$ to 2 ft. in girth; young shoots red, and covered at first with a fine down, smooth by autumn; buds stalked, downy. Leaves oval or ovate, 2 to 4 ins. long, two-thirds as wide, rounded or slightly heart-shaped at the base, pointed; veins in about ten pairs, each vein ending at the point of a toothed lobe; dark green above, with down on the midrib and nerves; paler green and more or less downy beneath; stalk $\frac{1}{2}$ to 1 in. long, downy. Male catkins expanding in March in clusters of three or four, each $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long. Fruits narrowly egg-shaped, $\frac{1}{2}$ to $\frac{5}{8}$ in. long, three to five in a cluster.

Native of Western N. America, from British Columbia to California. It is, perhaps, most nearly allied to *A. oregona*, but the leaves are not greyish beneath, the male catkins are shorter, and the fruits smaller. According to Sargent, the wing of the seed in *A. tenuifolia* is reduced to a narrow border, whilst it is broad in *A. oregona*.

Var. OCCIDENTALIS, *Callier* (*A. occidentalis*, *Dieck*).—This distinct variety was introduced to Europe by Mr A. Purpus, and first cultivated at Zoeschen in Germany by Dr Dieck, from whom it came to Kew in 1889. The leaves are larger than in the type, and on young trees very large; at Kew they have been 7 ins. long by 5 ins. wide, and I have leaves from a tree in Sir Archibald Buchan-Hepburn's garden at Smeaton, N.B., even broader. Veins in ten to twelve pairs, the entire under-surface at first downy. Fruits $\frac{5}{8}$ to $\frac{7}{8}$ in. long. Native of British Columbia and Oregon.

A. VIRIDIS, *De Candolle*. GREEN ALDER.

(*A. alnobetula*, *Koch*; *A. crispa*, *Pursh*.)

A shrub 3 to 10 ft. high, forming a cluster of erect stems; young branchlets viscid and usually smooth. Leaves viscid, ovate, or roundish oval, 1 to $3\frac{1}{2}$ ins.

long, $\frac{5}{8}$ to 3 ins. wide, unevenly and sharply toothed, rounded or broadly wedge-shaped at the base, mostly abruptly pointed; dark green and smooth above, green and downy on the midrib and veins beneath; stalk about $\frac{1}{3}$ in. long. Male catkins opening in April and May with the leaves, 2 to 3 ins. long. Fruits $\frac{5}{8}$ in. long, oval, slender-stalked, borne in loose racemes.

Native of Europe, N. America, and N. China; usually wild in mountainous regions. The American plant was introduced in 1782 (as "*Betula crispa*"); the European one, according to Loudon, in 1820. It is a vigorous and exceptionally hardy shrub, of no special ornamental value, but useful for furnishing cold, damp spots.

Var. *MOLLIS*, *Beck*, has both surfaces of the leaves and the young shoots covered with grey down.

Var. *PARVIFOLIA*, *Dippel* (*A. breimbana*, *Rota*).—A curiously dwarfed mountain state of *A. viridis*, growing 1 or 2 ft. high, and forming little close mounds. Adult plants have leaves $\frac{1}{2}$ to 1 in. long. This dwarfed condition, however, is merely due to the climate under which it exists. A plant introduced to Kew twenty years ago gradually lost its dwarf character, and is now no longer distinguishable from ordinary *A. viridis*. Found on the Swiss Alps, etc.

AMELANCHIER. ROSACEÆ.

A genus of shrubs and small trees found wild in Europe, Asia, and most abundantly in N. America. The name is an adaptation of "amelancier," an old name for *A. vulgaris* in Savoy. The species are all deciduous, and have alternate, simple leaves, white flowers, and small black or purplish fruits, globose, or pear-shaped, and containing five or ten seeds. The attractions of the Amelanchiers are in the pure whiteness and abundance of the flowers, their graceful form, and in the fine shades of red, and sometimes yellow, the leaves assume before they fall. Although a compact small genus, there is considerable difficulty in distinguishing the American kinds, owing to the existence of forms intermediate between, or slightly differing from, the recognised types.

Their cultivation is easy, as they will thrive in any soil that is not too dry and poor on the one hand, or water-logged on the other. They may be raised from seed, by layers, or by division. The practice of grafting them on the hawthorn, more common in Britain once than it is now, but still usual on the Continent, should be strictly avoided.

A. ALNIFOLIA, *Nuttall*. WESTERN SHAD BUSH.

(Garden and Forest, 1888, p. 185.)

A small tree, up to 20 or 25 ft. high, of erect-branching habit, sometimes a shrub; branchlets usually smooth, except when quite young. Leaves broadly ovate or roundish; 1 to $1\frac{1}{2}$ ins. long, nearly as wide, often heart-shaped at the base, covered with loose floss when they first expand, soon becoming quite smooth; the margin toothed only on the terminal half. Flowers on erect racemes 2 ins. long, the stalks clothed with greyish wool; petals white, narrowly oblong, about $\frac{1}{2}$ in. long; calyx woolly, with five triangular lobes. Fruit of the size and shape of black currants, dark purple, $\frac{1}{3}$ to $\frac{1}{2}$ in. diameter, sweet, and of excellent eating when ripe.

Native of Western N. America; seeds of which were first sent to this country by Douglas in 1826-27. One of the most ornamental of the Amelan-

chiers, this is still one of the rarest. It flowers in May, some weeks later than *A. canadensis*, from which it is very distinct in the round not pointed leaves, in the toothing of the leaf being coarser and confined to the terminal part, and in the dense, erect racemes. A nearer ally is *A. florida*, which has similarly shaped leaves, but toothed nearly to the base, a much less woolly calyx, and flowers earlier. *A. alnifolia* is perfectly hardy, and flowers with the greatest freedom at Kew, where it is over 20 ft. high. The fruits are not likely to be of any service in this country, but in Western N. America they have always been an important item in the food of the native races, who gather the fruits, crush them, and then dry them for winter use.



AMELANCHIER ALNIFOLIA.

A. ASIATICA, Walpers. CHINESE SERVICE-BERRY.

(*A. canadensis* var. *japonica*, *Miquel*.)

A deciduous tree, of very graceful habit, 15 to 30 ft. high, branches slender. Leaves oval or ovate, pointed, $1\frac{1}{2}$ to 3 ins. long, half as much wide, sometimes nearly or wholly entire, but mostly toothed except at the base; covered when quite young with a loose floss which soon falls away, leaving both surfaces quite smooth. Flowers on stalks $\frac{1}{2}$ to $\frac{3}{4}$ in. long, in broad, erect racemes $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long; white, fragrant; petals strap-shaped, $\frac{5}{8}$ in. long. Fruit black-purple, about the size of a black currant.

Native of China, in the province of Hupeh, etc., but originally introduced from Japan, where it is commonly cultivated in the vicinity of temples. It is not easy to distinguish it from some of the forms of *A. canadensis*, but at Kew it always flowers two or three weeks later (usually in mid-May, when the leaves are about full size), and the petals are uniformly strap-shaped. The leaves, too, never appear to be heart-shaped at the base, as they often are in *A. canadensis*. A slender, elegant tree.

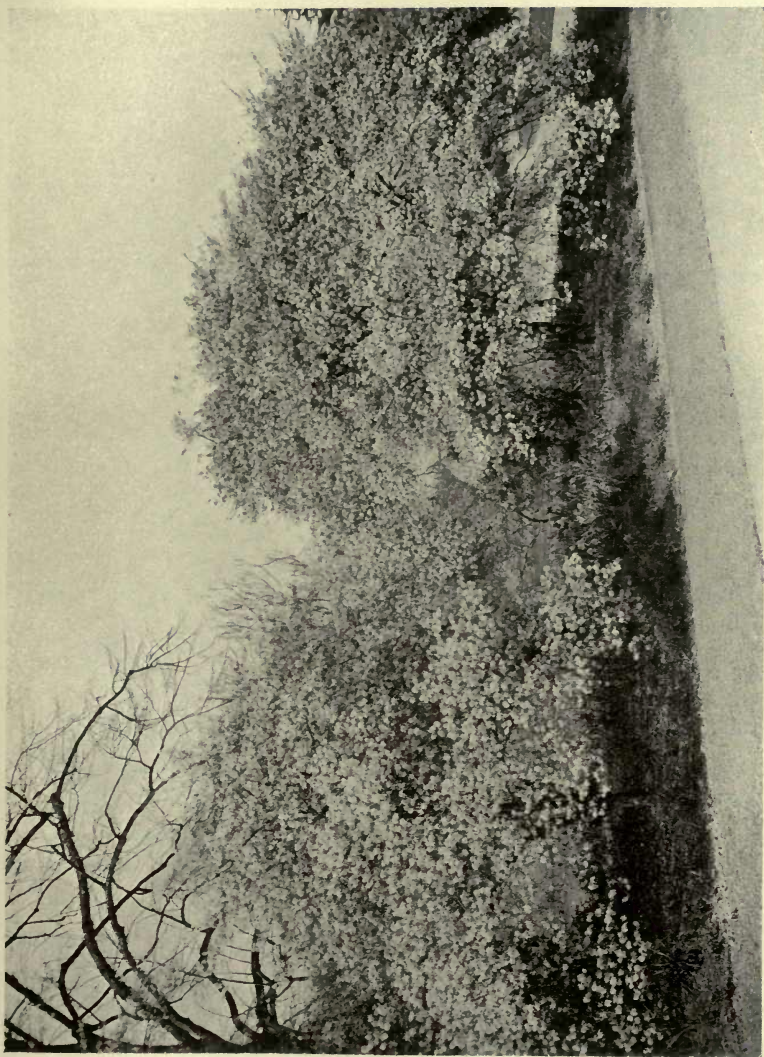
A. CANADENSIS, *Medicus*. SERVICE-BERRY, JUNE-BERRY.

A tree 20 to 30 ft. high in Great Britain, but occasionally over 40 ft. high in a wild state; branches slender, the lower ones pendulous, forming in the open a wide-topped, rounded head. Leaves ovate or oval, rounded or heart-shaped at the base, pointed, saw-toothed, $1\frac{1}{2}$ to 3 ins. long, 1 to $1\frac{1}{4}$ ins. wide;



AMELANCHIER CANADENSIS.

clothed with white hairs when they expand, soon becoming quite smooth and of firm texture. Flowers pure white, produced in April (usually when the leaves are less than half their full size), in erect or drooping racemes 2 to 3 ins. long, terminating short lateral twigs; petals obovate or strap-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. wide. Fruit ripening in June, orange-shaped, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, changing from green to red, finally to black-purple, very sweet and pleasant when ripe, in some forms, in others dry and tasteless.



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JUNEBERRY, *Amelanchier canadensis*.

[Face p. 188.

Native of Eastern and Central N. America, from Newfoundland and Canada to the southern United States; introduced to England, according to Aiton, in 1746. From the time of the ripening of the fruit it is often called "June-berry." There are few more delightful small trees than this is when seen at its best, which, at Kew, is usually about the second week in April; the whole tree then becomes sheeted with white. Unhappily, it is a very fleeting beauty, lasting, as a rule, less than a week. Its autumn beauty is more durable, and it is then one of the most striking of hardy trees, the foliage changing before it falls to a rich soft red; in some forms, however, to a clear bright yellow.

A. FLORIDA, *Lindley*.

(Bot. Reg., t. 1589; *A. Oxyodon*, *Koehne*.)

A deciduous shrub producing a thicket of erect stems, 8 to 10 ft. or more high. Leaves roundish oval, 1 to 2 ins. long, about two-thirds as wide, blunt or pointed, toothed almost to the base, smooth even when quite young. Flowers white, in erect racemes $1\frac{1}{2}$ to 2 ins. long, produced on short leafy twigs in early May; calyx slightly woolly. Fruit black-purple.

Native of N.W. America; introduced by Douglas in 1826. It has been much confused with *A. alnifolia*, to which no doubt it is allied, but is, nevertheless, well distinguished by its leaves being toothed nearly to the base, and by having a less woolly calyx. With us, too, its habit is quite shrubby. The foliage turns rich yellow in autumn.

A. OBLONGIFOLIA, *Roemer*. SWAMP SUGAR PEAR.

(*A. canadensis* var. *oblongifolia*, Bot. Mag., t. 7619.)

A shrub at present 6 to 8 ft. high at Kew, with erect stems, spreading by means of sucker growths from the base; said to be sometimes a small tree 12 ft. or more high. Leaves very woolly when quite young, ultimately becoming smooth; firm and rather leathery when mature, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; oblong, rounded (rarely cordate) at the base, finely and evenly toothed. Racemes erect, covered at first with a thick loose floss, 2 or 3 ins. long, carrying numerous white flowers, the petals of which are more distinctly and uniformly obovate than in *A. canadensis*. In a wild state it usually occurs in wet ground, and its fruit is said to be more juicy and agreeable than that of *A. canadensis*.

Native of Eastern N. America, and no doubt very nearly allied to *A. canadensis*, and connected with it by intermediate forms. As a shrubby Amelanchier it is useful in gardens, forming in time a dense thicket. Easily increased by division in spring.

A. OLIGOCARPA, *Roemer*.

(Bot. Mag., t. 8499; Garden and Forest, 1888, fig. 41; *A. Bartramiana*, *Roemer*.)

A low shrub, usually 2 to 3 (rarely more than 6) ft. high. Leaves oval or slightly ovate, 1 to 2 ins. long, tapering towards both ends, sharply toothed nearly to the base, almost smooth from the commencement, but with some loose floss on the surfaces and edges when expanding. Flowers pure white, $\frac{3}{4}$ to 1 in. across; solitary, in pairs, sometimes in threes or fours, on short lateral twigs, each flower on a slender stalk $\frac{1}{2}$ to 1 in. long. Petals rounded, obovate, $\frac{1}{4}$ in. wide, broader in proportion to their length than in any of the Amelanchiers. Fruit pear-shaped or oblong, dark purple, nearly $\frac{1}{2}$ in. long, not so wide.

Native of Canada, Newfoundland, and the northern United States, and the most northerly of the Amelanchiers, inhabiting cold swamps and mountain bogs. It is extremely rare in cultivation, the plant usually supplied by nurserymen for it being a form of *A. canadensis*. It is easily distinguished by its few-flowered inflorescence and the rounded petals; and differs from all other species in cultivation by the prussic acid odour of the bark when bruised—like that of many cherries and almonds.

A. RUBESCENS, Greene.

A shrub with downy branchlets. Leaves orbicular or broadly obovate, $\frac{1}{2}$ to 1 in. long, dark green above, the lower surface glaucous and covered with a fine close down, very distinct from the loose woolly covering of the young leaves of most Amelanchiers; the upper surface is furnished with scattered, flattened hairs; margins set with sharp, triangular, comparatively large teeth, more especially towards the apex. Flowers pure white, $\frac{1}{2}$ to $\frac{5}{8}$ in. across, three to six together in a short raceme; petals oval-lanceolate, half as long again as the sepals, which are narrow and linear; stamens ten; styles united.

Native of New Mexico, Utah, etc., at elevations of 3000 to 5000 ft. Introduced to England by way of Germany in 1900, and first flowered at Kew in April 1910. It probably finds the climate of Britain too dull to bring out its best qualities; and so far, at any rate, is nothing like so free-flowering and ornamental as the other species. It is allied to *A. UTAHENSIS, Koehne*, another species from the same region with blunter leaves, fifteen to twenty stamens to each flower, and free styles.

A. VULGARIS, Moench. SNOWY MESPILUS.

(Gardeners' Chronicle, 1890, i., fig. 104.)

A low tree, 15 to 20 ft. high, or more often a shrub. Leaves roundish oval, very downy and pure white beneath when young, becoming nearly or quite smooth at maturity, 1 to $1\frac{1}{2}$ ins. long, $\frac{3}{4}$ to 1 in. wide; the margin sometimes quite entire, but usually more or less toothed, especially towards the apex. Racemes erect, carrying few but large white flowers often $1\frac{1}{2}$ ins. in diameter. Petals narrowly oblong; calyx covered with loose floss at first, its lobes triangular. Fruit at first red, then black, covered with a purplish bloom; about the size of a black currant, eatable but not very palatable.

Native of the mountains of Central and S. Europe; of unrecorded introduction, but in cultivation more than two hundred years ago. It has the largest individual flowers of all the Amelanchiers as seen in cultivation, and is very beautiful in late April or early May. One of its forms,

Var. *CRETICA*, is found as far eastwards as Dalmatia and Crete, and is a shrub covered with a close white down on leaf, young wood, calyx, and flower-stalk. Another form with always entire leaves is called var. *INTEGRIFOLIA*.

AMORPHA. LEGUMINOSÆ.

A genus of shrubs exclusively native of N. America, with alternate pinnate leaves and elongated racemes of blue, purple, or white flowers. These plants belong to the pea-flowered group of Leguminosæ, but the flowers, instead of having the normal five petals (namely, the standard petal, the two wing petals, and the two forming the keel), have but one—the standard. The flowers, however, are so crowded that the others are

not missed. The two dwarf species—*canescens* and *nana*—are best adapted for gardens, although the foliage of *A. fruticosa* is very handsome.



AMELANCHIER VULGARIS.

The two former can be increased by cuttings when seeds are not available, and *A. fruticosa* produces sucker growths from the base which can be removed with some roots attached. Besides the species more fully

described below, there are sometimes seen in cultivation *A. CALIFORNICA* (California) and *A. VIRGATA* (S.E. United States). Both resemble *A. fruticosa* in habit and general aspect, but *A. californica* has downy stems and leaf-stalks set with prickly glands, whilst *A. virgata* has broad leathery leaflets and twiggy branches.

A. CANESCENS, *Nuttall*. LEAD PLANT.

(Bot. Mag., t. 6618.)

A sub-shrubby plant, 2 to 4 ft. high, entirely covered with grey down. Stems erect, unbranched, springing from a woody base to which they largely die back every winter. Leaves pinnate, 2 to 3 ins. long, composed of from ten to twenty pairs of leaflets and an odd one; leaflets $\frac{3}{8}$ to $\frac{5}{8}$ in. long, oblong or ovate, stalkless, extending the entire length of the main stalk; they are downy on both sides, but paler beneath. Flowers thickly crowded on cylindrical spikes, 3 to 6 ins. long, produced from the leaf-axils near the apex of the shoot, and thus forming a large, leafy panicle 6 to 10 (sometimes 15 to 18) ins. high. Each flower is about $\frac{1}{4}$ in. long, with a dull purplish blue standard petal, and a grey downy calyx; they are borne close enough together to touch. Pod less than $\frac{1}{4}$ in. long, hairy, one-seeded.

Native of Eastern N. America; introduced in 1812. It flowers from late July to September, and only ripens seeds during very fine autumns. It may be increased by cuttings made of shoots too weak to flower, which must be rooted in gentle warmth. It makes a large deep root-stock, which enables it not only to withstand, but to thrive best in, hot, droughty seasons. It is an interesting and rather striking plant which is well suited for the front of a shrubbery. In a wild state it extends over a considerable latitude, and shows some variation in the grey tints of its stems and leaves, and especially in the size and openness of its inflorescence. The popular name of "lead plant" is founded on the belief which once prevailed that its presence in a wild state indicated the existence of lead ore beneath the soil.

A. FRUTICOSA, *Linnaeus*. FALSE INDIGO.

(Bot. Reg., t. 127.)

A deciduous shrub, 6 to 15 ft. high, of spreading, rather ungainly habit, branches slightly grooved, either slightly downy or smooth. Leaves pinnate, smooth or somewhat downy, with thirteen to thirty-three leaflets, which are oval or oblong, ending in a bristle-like apex, and varying in length from 1 to 2 ins.; there is a short, thread-like stipule at the base of each leaflet, and numerous transparent dots are scattered over the blade. Racemes slender, cylindrical, 4 to 6 ins. long, more or less downy, or almost smooth, produced at the end of the shoots of the year, and from the axils of the terminal leaves. Flowers $\frac{1}{2}$ in. long, densely packed, purplish blue, with yellow anthers. Pod $\frac{1}{2}$ in. long, very warty, one- or two-seeded.

Native of the southern United States; introduced to England in 1724 by, it is said, Mark Catesby, the author of the *Natural History of Carolina*. It exhibits under cultivation a certain amount of variation in the shape and size of the leaflets, in the number to each leaf, and especially in the degree of pubescence on various parts of the plant. Of numerous forms the most distinct are mentioned below. This shrub flowers in July, when its slender racemes give a pretty effect; the foliage also is ornamental; yet it belongs to an inferior class of shrubs, and is perhaps best suited for rough shrubberies where it may be left to take care of itself. At Kew, in open ground, the shoots die back nearly their entire length, and they have to be pruned over every spring.

Var. FRAGRANS.—Leaflets large, 2 to 3 ins. long, usually $4\frac{1}{2}$ to $7\frac{1}{2}$ pairs ; shrub glabrous, except on inflorescence.

Var. GLABRA.—Leaves and stem smooth, inflorescence slightly downy.

A. NANA, *Nuttall*.

A low, deciduous shrub, about 2 ft. high ; stems branching, and having little or no down. Leaves pinnate, 2 to 3 ins. long, with eight to thirteen pairs of leaflets and an odd one ; leaflets $\frac{1}{8}$ to $\frac{3}{8}$ in. long, oval or obovate, nearly smooth. Flowers purple, fragrant, very closely set in cylindrical terminal racemes 1 to 2 ins. long. Pod one-seeded.

Native of Eastern and Central N. America ; introduced in 1811. Although somewhat similar to *A. canescens* in foliage, it is really very distinct. It is a true shrub, and has little or none of the grey down so conspicuous in *A. canescens* ; its flower-spikes are also much shorter and not clustered. A rather dainty plant, but scarcely known in gardens nowadays.

ANAGYRIS FÆTIDA, *Linnaeus*. LEGUMINOSÆ.

A deciduous bush, or small tree, with alternate, trifoliolate leaves. Leaflets 1 to $2\frac{1}{2}$ ins. long, narrow oval, covered with fine down beneath, greyish green. Flowers pea-shaped, yellow, produced in short racemes on the growth of the previous year ; each flower $\frac{3}{4}$ to 1 in. long, and but little expanded ; calyx bell-shaped, downy and ciliated, green ; petals yellow, the standard one hooded ; wings narrow oblong. The racemes are $1\frac{1}{2}$ to 3 ins. long, and carry six to twenty flowers. Seed-pod 3 to 5 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. broad, pointed at both ends, curved like a scimitar, and containing three or four seeds.

Native of the countries bordering the Mediterranean Sea, and requiring at Kew the protection of a south wall—even there occasionally killed. The specific name refers to the unpleasant odour of the leaves, which is, however, only perceptible when they are crushed. The tree is known in the south of France as “bois puant” on that account. The flowers are inodorous. In S. Europe they open in early spring, later in Britain.

ANDRACHNE. EUPHORBIACEÆ.

A group of plants belonging to the Spurge family, of which two shrubby species are sometimes seen in cultivation. They have little beauty of flower or fruit, but are rather neat in habit. Leaves alternate. Flowers unisexual, produced in the leaf-axils of the current season's growth, small, green ; the females solitary. Fruit a dry capsule of three divisions, each division two-valved. There are about twelve species known, inhabiting both the New and Old Worlds, but the two following are the only shrubby ones I have seen in cultivation. Neither can be said to deserve a place in gardens except for its botanical interest. They thrive in ordinary loam in full sunshine, and can be increased by cuttings in August.

A. COLCHICA, *Fischer*.

A native of the Caucasus, and a deciduous shrub, about 3 ft. high, of dense, erect habit, and with very slender, quite smooth, leafy shoots, the terminal

portions of which die back in winter. Leaves set about $\frac{1}{4}$ in. apart on the shoots, ovate, $\frac{1}{3}$ to $\frac{2}{3}$ in. long, about half as wide, rounded at the base, blunt at the apex; quite smooth, and with thickened, entire margins; dull green. Flowers $\frac{1}{4}$ in. across, on thread-like stalks $\frac{1}{2}$ to $\frac{5}{8}$ in. long, produced successively along the young shoots throughout the summer and early autumn. Fruit pale brown, $\frac{1}{4}$ in. across. Introduced to Kew, in 1900, from the Botanic Garden of Tiflis, but probably cultivated long previously.

A. RÆMERIANA, *Mueller.*

(*A. phyllanthoides*, *Mueller.*)

An erect, much-branched, deciduous shrub, 1 to 3 ft. high, its twigs angled, slightly downy, becoming glossy; slender, but not so slender as in *A. colchica*. Leaves obovate or oval, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide, tapered or rounded at the base, bluntish or rounded at the apex, entire; quite smooth or sparingly downy beneath, glossy green above; stalk $\frac{1}{10}$ in. long. Flowers $\frac{1}{4}$ in. across, yellowish green, produced in summer and autumn. Fruits nearly globose.

Native of the S. Central United States. It is easily distinguished from the Caucasian species by its stouter branchlets, and its partially downy, shorter-stalked leaves, often broadest above the middle.

ANDROMEDA POLIFOLIA, *Linnaeus.* BOG ROSEMARY.

ERICACEÆ.

A low evergreen shrub, rarely more than $1\frac{1}{2}$ ft. high, whose slender, smooth, wiry stems are clothed thickly with stiff, hard-textured leaves; young wood pinkish. Leaves linear-oblong, tapered at both ends, 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, but made to appear narrower than they really are by the recurving of the margins; dark green above, glaucous or slightly felted beneath. Flowers produced in short, compact clusters at the end of the shoots during May and succeeding months, each flower on a stalk $\frac{1}{4}$ in. or less in length. The corolla is pink, $\frac{1}{4}$ in. long, pitcher-shaped, contracted towards the mouth, where are five small recurved teeth. Calyx five-lobed, the lobes triangular, glaucous.

Native of peat bogs in N. Europe, including Britain. It is an interesting and pretty shrub, requiring a damp peaty soil to thrive in. In the Thames Valley it succeeds better if the ground in which it is planted is covered with an inch or two of sphagnum moss, which acts as a sponge in conserving moisture. Some eight or ten names have been given to forms of this little shrub, which differ chiefly in the size and width of the leaf. They may very well be reduced to two, viz. :—

Var. *ANGUSTIFOLIA*, with very narrow leaves; and

Var. *MAJOR*, with leaves broader than those of the type.

The N. American *Andromeda*, which has for long been regarded as a form of the European *A. polifolia*, appears to be distinct in its more robust growth and larger leaves, which are often over 2 ins. long and $\frac{1}{4}$ in. or more wide, covered beneath with a white close felt. Link's name of *A. GLAUCOPHYLLA* may be revived for this.

The name *Andromeda* has been extensively used for what are here

regarded as distinct genera, and the student must look for the other shrubs and trees still frequently known as "Andromeda," under *Oxydendron*, *Pieris*, *Lyonia*, *Leucothoë*, *Cassine*, *Cassiope*, *Zenobia*, and



ANDROMEDA POLIFOLIA.

Enkianthus. The above, or true *Andromeda*, is propagated by division, by seed, and by cuttings. The last should be put in peaty, sandy soil under a cloche, but they do not take root readily.

ANTHYLLIS. KIDNEY VETCH. LEGUMINOSÆ.

Two attractive shrubs belonging to this genus are cultivated in gardens—one unfortunately too tender to withstand our winters unprotected. The most distinctive botanical feature of the genus is the persistent calyx, which, after the petals fall, becomes more or less inflated and encloses the seed-pod. The flowers are aggregated in umbellate clusters. Neither of these shrubs needs a rich soil, but rather a warm, well-drained one, and abundant sunshine.

A. BARBA-JOVIS, *Linnaeus*. JUPITER'S BEARD, SILVER BUSH.

An evergreen shrub, growing 8 to 12 ft. high on walls in this country; branchlets crooked, covered with appressed, silky hairs. Leaves pinnate, $1\frac{1}{2}$ to 2 ins. long, composed of nine to about nineteen leaflets. Leaflets linear-oblong, $\frac{1}{3}$ to 1 in. long; covered with silvery hairs, especially beneath and at the edges, which towards the base are often incurved. Flowers pea-

shaped, pale yellow, crowded in rounded heads at the end of short twigs; each head of flowers is $\frac{3}{4}$ to 1 in. across; calyx silky hairy, $\frac{1}{4}$ in. long.

Native of S.W. Europe and the Mediterranean region; cultivated in England since the middle of the seventeenth century. It is too tender to thrive in the open ground, but makes a charming shrub for a wall, where its sheen of silvery grey and (in May and June) clusters of yellow flowers are very effective. At Kew it is occasionally injured even growing against a wall. Seeds are said sometimes to ripen in this country, but the plant has, as a rule, to be increased by cuttings.

A. HERMANNIÆ, *Linnaeus*. HERMANN'S KIDNEY VETCH.

(Bot. Mag., t. 2576.)

A deciduous shrub, of low, bushy habit, $1\frac{1}{2}$ to 2 ft., perhaps more, high; branches crooked or zigzag, covered with short greyish down, and ending in a spine. Leaves simple (or occasionally trifoliate), linear-obovate, $\frac{1}{2}$ to 1 in. long, $\frac{1}{8}$ in. or less wide, clothed more or less with silky hairs; apex rounded; base tapering. Flowers yellow, three to five together in axillary, very shortly stalked clusters, each flower about $\frac{1}{3}$ in. long; calyx green, tubular, $\frac{1}{8}$ in. long.

Native of the Mediterranean region from Corsica eastwards to Turkey. It was in cultivation early in the eighteenth century, and is said to have been not uncommon up to the great frost of 1739-40, when most of the plants were destroyed. I have known it in Kew for over twenty years without protection, and although occasionally injured on the upper growth in severe winters it has never been killed. It is a much-branched, twiggy bush of greyish aspect, flowering freely in June and July, and very pretty then. It is a suitable plant for a sunny place in the rock garden. As it rarely ripens its seeds here, it has to be increased by cuttings. They should be put in sandy soil under cloches in August.

APHANANTHE ASPERA, *Planchon*. URTICACEÆ.

(*Celtis* Muku, *Siebold*.)

A deciduous tree, 60 to 70 ft. high, allied, and similar in appearance to the nettle trees (*Celtis*); young shoots at first covered with flattened hairs, which mostly fall away before the leaves do. Leaves alternate, ovate, long- and taper-pointed; the base wedge-shaped, rounded, or (on very vigorous shoots) heart-shaped, often oblique; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide; prominently parallel-veined, distinctly three-nerved at the base. When young both surfaces are densely covered with minute, flattened hairs which fall away from the upper surface, leaving it bright green and slightly rough, persisting more or less on the midrib and veins beneath; stalk $\frac{1}{4}$ to $\frac{1}{3}$ in. long. Flowers unisexual, very small; the males numerous, crowded in slender, stalked, cymose clusters at the base of the young side twigs; females solitary at the end. Fruit a roundish oval drupe, $\frac{1}{4}$ to $\frac{1}{3}$ in. long, black-purple.

Native of Japan and probably China; introduced from the former country to Kew in 1895. It differs from *Celtis* in the invariably unisexual flowers. As a garden tree it does not promise much, and judging by its behaviour at Kew, where it makes long, succulent growths, frequently cut back during winter, it needs more summer sun than our climate affords. It has little or no flower beauty.

APLOPAPPUS ERICOIDES, *De Candolle*. COMPOSITÆ.

(Gardeners' Chronicle, 1896, ii., fig. 57.)

An evergreen shrub, 3 to 5 ft. high, with erect branchlets, slightly downy and glutinous when young. Leaves very small, numerous, and heath-like, from $\frac{1}{8}$ to $\frac{1}{3}$ in. long, of the thickness of stout thread; dark green, stalkless, produced in clusters at each joint. Flower-heads in corymbs borne on long slender stems, the whole forming a crowded mass of yellow blossom at the end of the shoots of the year; at their best in August and September. Each flower-head is $\frac{1}{2}$ in. in diameter, with five ray-florets.

Native of California, and not hardy at Kew except on a wall. On the south coast it thrives well, especially at Worthing; it succeeds also in Canon Ellacombe's garden, near Bristol. Like some other shrubby composites it is apt to wear out under cultivation, and should be occasionally renewed by means of cuttings, which root freely if put in a propagating frame with gentle heat in July. It is a pretty and interesting plant, quite distinct from all other introduced shrubby composites, especially in its deep green, heath-like foliage.

ARALIA CHINENSIS, *Linnaeus*. CHINESE ANGELICA TREE.
ARALIACEÆ.

A deciduous tree, 30 ft. or more high, with a few stout branches; more often a shrub renewing itself by sucker growths from the base; young growths very thick (over 1 in. in diameter), pithy, and armed more or less with spines. Leaves doubly pinnate, often 3, sometimes 4 ft. long, two-thirds as wide; composed of numerous ovate, taper-pointed, short-stalked leaflets, from 3 to 5 ins. long, 2 to 3 ins. wide, toothed; dark bright green and slightly hairy on the veins above, paler and always downy beneath, often much so, and especially on the midrib and veins; stalks somewhat prickly. Flowers small, whitish, produced in August and September in numerous globose umbels $\frac{3}{4}$ to $1\frac{1}{4}$ ins. across, the whole forming a huge panicle 1 to 2 ft. long and from half to nearly as much through; flower-stalks covered densely with down. Several varieties of this *Aralia* are in cultivation:—

VAR. ALBO-MARGINATA.—Leaflets irregularly margined, sometimes more than half covered, with creamy white.

VAR. AUREO-MARGINATA.—Similar in variegation to the preceding, but the colour golden yellow. These two are amongst the most effective and beautiful of all variegated shrubs.

VAR. MANDSCHURICUS (*Dimorphanthus mandschuricus*, *Maximowicz*).—Downy only on the veins and midrib beneath, more sharply toothed; hardier than the type.

VAR. PYRAMIDALIS.—Leaves rather smaller than in the type, and growing erect instead of spreading.

Native of China, Japan, and Manchuria; introduced about 1865, and

perhaps the finest of all hardy shrubs with foliage of its particular type. It is hardy enough in all but the colder parts of the country, but still is seen at its best in the milder places: Near Falmouth, some years ago, I saw a tree about 30 ft. high, and as much in the spread of its branches,



ARALIA CHINENSIS.

the main trunk 10 ins. thick. In its ordinary shrubby state it makes an admirable ornament for a sheltered lawn, peculiarly effective at flowering time. Easily propagated by taking off small suckers or even pieces of root, potting them, and establishing them in heat.

A. SPINOSA, *Linnaeus*. HERCULES' CLUB.—A native of the south-eastern United States, and very similar to *A. chinensis*. These two afford one of many instances of an extraordinary similarity between a plant native of North America and another of North Asia, which are yet not absolutely identical. In this case *A. spinosa* is distinguished by the leaflets being more glaucous beneath and much less downy, sometimes quite smooth beneath, and by their being more distinctly stalked. The stems, too, are better armed with prickles. This American species is not so hardy and vigorous as the Asiatic one, and the two seen in juxtaposition are quite distinct. It is extremely rare in cultivation, and I only saw the real plant for the first time at the Arnold Arboretum in 1910. Even American nurserymen send over *A. chinensis* as their native *spinosa*. It is now in the Kew collection.

Although both these species make finer foliage when grown in rich than in comparatively poor soil, the latter is, I think, to be preferred if healthy, long-lived plants are desired. In rich soil the wood, always soft and very pithy, becomes especially so, and renders the plants very liable to injury by winter cold.

ARAUCARIA IMBRICATA, *Pavon.* CHILE PINE, MONKEY
PUZZLE. CONIFERÆ.

An evergreen tree, 50 to 80 ft. high, of pyramidal or rounded form, with an erect, cylindrical bole, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. thick, all but the oldest parts prickly with living leaves or the remains of dead ones. Branches produced in regular tiers of five to seven. Leaves very uniform, ovate, with a slender spine-tipped point, from 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; hard, rigid, and leathery; dark glossy green except at the paler-growing tips of the branches, and with numerous stomatic lines on both surfaces. The leaves are arranged spirally on the branch, overlapping at the broad, stalkless base, and are very densely packed (about twenty-four to 1 in. of stem); they remain alive for ten to fifteen years, and then persist for an indefinite time dead. Male and female flowers are usually borne on separate trees, but not invariably; the former are produced on egg-shaped or cylindrical catkins 3 to 5 ins. long, the scales lanceolate, densely packed, with the slender points reflexed, the pollen being shed in early July. The female cones take two seasons to develop; appearing in the spring of one year, and shedding their seeds in August or September of the next; they are globose, and usually 5 to 7 ins. thick. Seeds conical, $1\frac{1}{2}$ ins. long, $\frac{3}{4}$ in. wide.

Native of Chile; originally discovered about 1780, and introduced to England by Archibald Menzies in 1795. Menzies had, two or three years previously, when attached to Vancouver's voyage of survey, pocketed some nuts put on for dessert whilst he and the ship's officers were dining with the Viceroy of Chile. He sowed these nuts on board ship, and ultimately landed five plants, which proved to be the *Araucaria*, alive in England. One of the five existed at Kew until 1892. The Chile pine, whilst hardy in most parts of the British Isles, attains its finest development in the softer, moister counties, and in good free soil. It should always be raised from seeds, fertile ones of which are now regularly produced in several gardens. At Castle Kennedy I have seen seedling plants springing up naturally near the trees from which seeds had fallen. *Araucaria imbricata* is of peculiar interest as the only tree from south of the equator that attains to timber-producing size in the average climate of the British Isles. It becomes over 100 ft. high and 7 ft. in diameter of trunk in Chile, deriving its name from the Arauco province (inhabited by the Araucanos Indians), where it was first found. A species is found in Brazil, and several others in Australia and New Caledonia—all tender. In its general aspect, and especially as compared with ordinary types of northern vegetation, the Chile pine is the most remarkable hardy tree ever introduced to Britain. It should always be grown as an isolated tree, or in an isolated group, as it associates very badly with ordinary garden vegetation. It was first introduced in quantity to this country in 1844, by Wm. Lobb.

ARAUJIA SERICOFERA, *Brotero*, ASCLEPIADACEÆ.(Physianthus albens, *Martius*, Bot. Mag., t. 3201.)

An evergreen climber of very vigorous growth, the stems twining, covered with pale down when young. Leaves opposite, ovate-oblong, pointed, the base cut off squarely or broadly wedge-shaped; 2 to 4 ins. long, $\frac{3}{4}$ to 2 ins. broad; pale green, and clothed beneath with a pale minute felt; stalk $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Flowers fragrant, borne two to eight together on racemes about 2 ins. long, produced at the joints of the stem, not in either of the leaf-axils, but at the side between the leaf-stalks. Corolla white, swollen at the base, the tube $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide, opening at the top into five spreading lobes, and there 1 to $1\frac{1}{4}$ ins. across. Calyx with five ovate lobes $\frac{1}{3}$ in. long. Fruit a large grooved pod, 5 ins. long, 2 to 3 ins. wide at the base, tapering slightly towards the end; each seed with a tuft of silky hairs 1 in. or more long attached at the end.

Native of S. America; introduced by Tweedie from Buenos Ayres in 1830. It is not hardy at Kew, and even against a wall does not long survive, but at Pendell Court in Surrey it used to grow and flower. Where it is warm enough, as in the Channel Islands, it flowers and produces its curious large fruits freely. It likes a good loamy soil, and can be increased by cuttings as well as by seed. Flowers in late summer.

ARBUTUS. ERICACEÆ.

A group of evergreen trees and shrubs, of which three species are hardy in the average climate of the British Isles. They have alternate, leathery leaves, and bear their flowers in terminal panicles; corolla pitcher-shaped, white or pink; calyx five-lobed, persisting through the fruiting stage; stamens ten. The fruit is an edible but not very palatable drupe, roundish, orange-red, and very ornamental when ripe, enclosing numerous seeds.

The arbutuses are exceptionally attractive evergreens in their foliage, which is healthy dark green, and abundant, also ornamental in flower and fruit. *A. Unedo* thrives on a limestone, as well as other formations, and may thus be included among the few ericaceous plants that can be grown where lime is present. Still it, like the others, succeeds very well in peaty or loamy soil. Wherever possible all the species should be raised from seed, but the named varieties have to be grafted on seedlings of *A. Unedo*. They transplant rather badly, and are best grown in pots until finally planted out, which should be done as soon as possible. Besides the species more fully noticed below, there is a fourth and more tender one from Chile, viz.:—

A. FURIENS, *Hooker*.—It is a shrub whose leaves are $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, ovate, pointed, finely toothed; bristly, leathery, and hard in texture; dark glossy green above, pallid green beneath. Flowers in axillary, hairy racemes $1\frac{1}{2}$ to 2 ins. long, dull white; each blossom $\frac{3}{16}$ in. long, densely set on the stalk. It is not hardy at Kew, but is grown out-of-doors

(sometimes as *Gaultheria furiens*) in the extreme south and south-western counties, and in Ireland, where it flowers in April and May.

A. ANDRACHNE, *Linnaeus*.

An evergreen tree, 30 to 40 ft. high in a wild state, but usually a shrub 10 to 20 ft. high in Great Britain; young shoots smooth; bark on older branches smooth and reddish brown. Leaves oval, usually 2 to 4 ins. long, 1 to 2 ins. wide, dark glossy green above, paler below, smooth, toothed in young specimens and on very vigorous shoots, but entire in the adult normal state; stalks $\frac{1}{2}$ to 1 in. long. Flowers produced during March and April in terminal, downy panicles, 2 to 4 ins. long and wide; corolla pitcher-shaped, $\frac{1}{4}$ in. long, dull white, with five shallow, reflexed lobes at the contracted mouth; calyx lobes ovate, pointed; flower-stalks glandular-hairy. Fruit globose, $\frac{1}{2}$ in. diameter, much smoother than that of *A. Unedo*, orange red.

Native of S.E. Europe, especially in the Eastern Mediterranean region; introduced from Smyrna in 1724. It is but little known in cultivation, nearly all the plants so-called being *A. hybrida*. From *A. Unedo* it is distinguished by its comparatively broader, entire leaves and smooth shoots; and from *A. Menziesii* by the leaves being less glaucous beneath, the smaller panicles, and the more compact habit.

A. HYBRIDA, *Ker-Gawler*.

(Bot. Reg. t. 619; *A. andrachnoides*, *Link.*)

A hybrid between *A. Andrachne* and *A. Unedo*, intermediate in many respects between the two, and very variable within the limits set by the parent species, sometimes leaning more to one species, now more to the other. The leaf-stalks and young branches are glandular-hairy, but not so much so as in *A. Unedo*; sometimes they show it only when quite young, and not very much even then. The leaves are toothed, rather glaucous beneath, and intermediate in size. Flowers produced in late autumn or in spring, in terminal, glandular-downy panicles, white, pitcher-shaped, $\frac{1}{4}$ in. long. Fruit not so rough nor so large as in *A. Unedo*.

Found wild in Greece, where both the parent species occur, and said also to have been raised by Messrs Osborn of Fulham about 1800. On the whole it is the most useful as it is the commonest of the genus. Several of its finest forms have been given names, such as *magnifica*, *photinæfolia*, *Rollissoni*, all notable for their fine foliage and goodly sized trusses. It is distinct from *A. Andrachne* in the toothed leaves, and from *A. Unedo* in having them slightly glaucous beneath and longer-stalked.

Var. *QUERCIFOLIA*.—Leaf-margin set with large, irregular teeth, especially towards the apex.

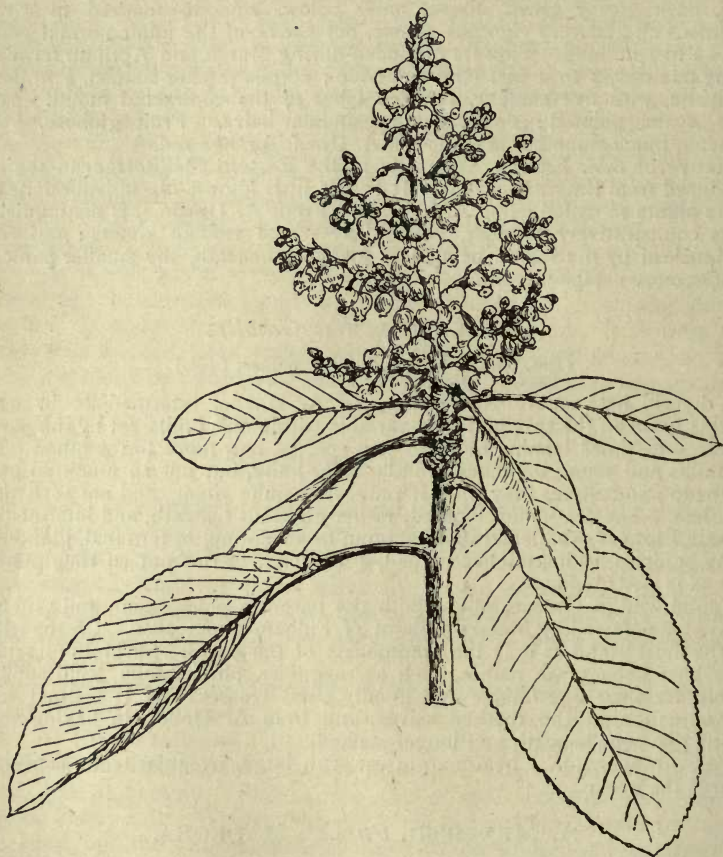
A. MENZIESII, *Pursh*. MADROÑA.

(Bot. Mag., t. 8249; *A. procera*, *Douglas*, Bot. Reg., t. 1753.)

An evergreen tree, reaching in its native state heights of 20 to 100 ft., with a trunk 1 to 6 ft. in thickness; in Britain it has not yet exceeded 50 ft. in height, and is usually 20 to 30 ft. Young shoots quite smooth; bark peeling, and, on the older branches and trunk, leaving the wood perfectly clean, and of a striking cinnamon colour. Leaves oval, 2 to 6 ins. long, $1\frac{1}{4}$ to 3 ins. wide; toothed on young plants or very vigorous shoots, but mostly with entire margins; dark glossy green above, glaucous or almost white beneath; stalk $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Flowers produced during May in a terminal pyramidal panicle, from 3 to 9 ins. long and up to 6 ins. wide; corolla pitcher-shaped,

about $\frac{1}{4}$ in. long, dull white ; flower-stalks downy ; calyx small, greenish ; fruit about the size of a large pea, orange-coloured.

Native of California ; introduced by Douglas in 1827. This is one of the most beautiful of all broad-leaved trees, and as seen at its best in the moist rich valleys of N. California is by far the noblest of all the heath family. It is especially noticeable for the perfectly smooth red branches. In the milder parts of Britain, it succeeds very well, and at Kew is perfectly hardy, except



ARBUTUS MENZIESII.

that in a young state the vigorous sappy shoots are apt to be cut back in winter. It should be propagated by imported seed, which is obtainable from American nurserymen and germinates well. The young plants should as soon as possible be given a permanent place, as they transplant badly. Mr W. L. Jepson says that in N. California no other tree makes so strong an appeal to man's imagination as this, and that wherever it grows, "the traveller, forester, hunter, artist, and botanist is held by the spell of its crown of flowers and masses of red fruits, its terra-cotta bark and burnished foliage." It is far too rarely seen in cultivation. When once established it grows

quickly; a tree at Kew raised from seed in 1894 is now 22 ft. high, with a trunk 30 ins. in girth.

A. UNEDO, *Linnaeus*. STRAWBERRY TREE.

(Gardeners' Chronicle, 1878, ii., fig. 115.)

An evergreen tree, from 15 to 30 ft. high, occasionally 40 ft. in its native districts in Ireland, but nearly always a wide-topped shrub under cultivation; young shoots glandular-hairy. Leaves smooth, 2 to 4 ins. long, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide, narrowly oval or obovate, tapering towards both ends, toothed, dark shining green and leathery; stalk $\frac{1}{4}$ in. long, glandular. Flowers produced from October to December in drooping panicles 2 ins. long and wide. Corolla white or pinkish, pitcher-shaped, $\frac{1}{4}$ in. long, with small, rounded, reflexed lobes at the mouth; calyx-lobes small, triangular, edged with minute hairs. Fruit globose, strawberry-like, $\frac{3}{4}$ in. across, orange red, rough on the surface. It ripens during the autumn following the production of the flowers, at the same time as the succeeding crop of blossom.

Native of the Mediterranean regions and S.W. Ireland, especially on the islands and shores of the Lakes of Killarney, where it attains its largest dimensions. I have seen it wild also in Dalmatia (on calcareous ground), where, however, it was always scrub not more than 10 ft. high. It is quite hardy in the warmer parts of England, and has withstood 30° of frost at Kew without injury. Both it and its varieties are of especial value through flowering so late in the season.

Var. COMPACTA.—A dwarf bush which does not flower freely.

Var. INTEGERRIMA, *Sims* (Bot. Mag., t. 2319).—A distinct shrub with quite entire leaves, which, as in the type, vary from narrow-oval to obovate.

Var. RUBRA, *Aiton* (Croomei).—A very pretty variety with deep pink flowers, usually a low, rather spreading bush. Found wild by the Irish botanist, Mackay, near Glengarriff, about 1835, but known fifty years previously to Aiton.

The strawberry tree is one of the few ericaceous plants which will thrive on limestone. Distinguished from the other species by its hairy twigs,

ARCTOSTAPHYLOS. ERICACEÆ.

Some four or five species of *Arctostaphylos* are cultivated in gardens, one of which is deciduous, the others evergreen. They vary from small trees to creeping shrubs, and are widely spread over the northern hemisphere, being most abundant in regard to number of types and largest in size in Western N. America. Leaves alternate, of leathery texture, except in *A. alpina*. Flowers globose to pitcher-shaped, $\frac{1}{4}$ in. or less long, narrowed at the mouth, where are five small teeth; produced in short, terminal, drooping racemes. Fruit a berry with one to five bony seeds. Most nearly allied to *Arbutus* among hardy shrubs.

All the following species are worthy of cultivation, especially the W. American ones, of which several beautiful species have yet to be introduced. They love such a soil as suits rhododendrons. Imported seeds from California are frequently difficult to get to germinate, and Miss Alice Eastwood, a well-known Californian botanist, believes that it is advisable to subject the seeds to heat before they are sown. This may best be done by immersing them in water at boiling-point for ten to

twenty seconds; experiment may prove a longer immersion to be necessary. Some of the Californian species inhabit hot dry regions, and their seeds are said to germinate freely after a fire has swept over where they grow. Our two British species, which inhabit moist mountain regions, can be increased by cuttings, and the seeds do not offer any difficulties in germination.

A. ALPINA, *Sprengel*. BLACK BEARBERRY.

A low, deciduous shrub of tufted or creeping habit, about 6 ins. high; the younger branches slightly bristly, clothed with the bases of fallen leaves, the older ones with loose bark. Leaves obovate, rounded or abruptly tapering at the apex, much tapered at the base, 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide, round-toothed towards the top; thin, conspicuously veined, and without down; stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long, and, like the lower part of the leaf-margins, bristly. Flowers white, two or three together on short, reflected racemes; corolla $\frac{1}{8}$ in. long, pitcher-shaped. Fruit a black berry, globose, $\frac{1}{8}$ in. across, containing five seeds or less.

Native of the mountains of Europe (including the north of Scotland), N. Asia, and N. America. It is a lover of damp, cool conditions, and near London its roots should be surfaced with Sphagnum moss. Without having any particular beauty of flower or fruit, it makes a pleasing low tuft, distinct because of its wrinkled leaves, and rather suggestive of *Rhododendron kamschaticum* on a small scale. The leaves often turn a brilliant red in autumn. Propagation may be effected by division as well as by seeds and cuttings.

Var. RUBRA.—A variety with red fruits found in Western N. America and in W. China.



ARCTOSTAPHYLOS MANZANITA.

A. MANZANITA, *Parry*. MANZANITA.

(Bot. Mag., t. 8128.)

An evergreen shrub, 4 to 8 ft. high in this country, but becoming a small tree 25 ft. high in its native home; young shoots, inflorescence, leaf-stalks, and midribs covered with dense down; bark peeling.

Leaves ovate, heart-shaped, or oval, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide, entire, thick and leathery; at first of a dull grey, afterwards bright grey-green, slightly downy when young; leaf-stalk stout, $\frac{1}{8}$ to $\frac{1}{2}$ in. long. Flowers produced in March and April in short terminal

panicles about $1\frac{1}{2}$ ins. long and wide, lasting long in beauty. Corolla egg-shaped, about $\frac{1}{4}$ in. long, deep pink, with five small, rounded teeth at the nearly closed mouth; sepals whitish; flower-stalks slender, $\frac{1}{4}$ in. or less long. Fruit not seen in Britain, but described as a brownish red, orange-shaped berry $\frac{1}{3}$ to $\frac{1}{2}$ in. wide.

Native of California; introduced to Kew in 1897. This shrub requires a sunny position and a peaty, well-drained soil. Cuttings will not take root easily, at least a way has not yet been found, so far as I know, to make them do so. It is impatient of root disturbance, and should be given a permanent place early, and till then grown in pots. Its stiff, somewhat gaunt branches, red where not hidden by peeling bark; the rigid, hard, grey foliage; and the short, crowded flower-clusters, give this rare shrub a most distinct appearance. "Manzanita," which has been selected for its specific name, is an old Spanish-Californian term for the bushy members of the genus generally.

A. TOMENTOSA, *Lindley*. DOWNY MANZANITA.

(Bot. Reg., t. 1791; *Arbutus tomentosa*, *Pursh*, Bot. Mag., t. 3320.)

An evergreen shrub of somewhat irregular habit, growing from 3 to 5 ft. (perhaps more) high; young wood clothed with dense, often glandular hairs. Leaves oblong or ovate, rounded or slightly heart-shaped at the base, abruptly pointed, 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide, not toothed, leathery, dull greyish green, downy above, thickly felted beneath; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long, hairy. Flowers produced from March to May, densely, in short, drooping racemes 1 in. or less long, from the end of the previous season's growth, and in the axils of one or two of the uppermost leaves. Corolla white, pitcher-shaped, $\frac{1}{4}$ in. long; sepals rounded, hairy on the margins; flower-stalks very hairy, $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Fruit a berry, brownish red, orange-shaped, $\frac{1}{3}$ in. wide, downy.

Native of the coast regions of California and Washington; discovered by Alexander Menzies about 1793. It is a rare shrub, but is thriving in peaty soil at Kew. The densely hairy character of its shoots and leaves distinguishes it from the other species in cultivation.

A. UVA-URSI, *Sprengel*. RED BEARBERRY.

A trailing evergreen shrub, sending out long, slender, leafy branches, but rising only a few inches above the ground; young shoots furnished with minute down. Leaves leathery, obovate, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, with a long, tapering base; bright green on both sides; the margins hairy, otherwise smooth; stalk $\frac{1}{4}$ in. or less long. Flowers produced from April onwards in small, drooping, terminal clusters; corolla pitcher-shaped, $\frac{1}{3}$ in. long, pink. Fruit a globular berry, $\frac{1}{4}$ to $\frac{1}{3}$ in. diameter, red, smooth and shining.

Native of the cool temperate regions of the northern hemisphere, both in the New and Old Worlds. In gardens it is useful for forming a low evergreen ground-cover, its spreading masses of green foliage and small pink flowers being always pleasing. It may also be planted on the top of upturned tree-roots, which it will eventually completely drape, or on the top of miniature declivities of the rock garden. It is easily propagated by cuttings. As seen on the mountains of the north of England and Scotland, or of Central Europe, its growth is much more compact and stunted, but less graceful than in gardens.

Plants sold in nurseries as "*A. nevadensis*" (really a very different species) and "*A. californica*" are simply the W. American representatives of the species, and do not differ appreciably from our own.

ARDISIA JAPONICA, *Blume*. MYRSINACEÆ.

A low evergreen shrub, 1 ft. or rather more high, its erect clustered stems covered with dark, minute down when young. Leaves clustered in one or two whorls near the top of the stem; oval, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; tapered at both ends, sharply toothed; bright dark green, and nearly or quite smooth; stalks $\frac{1}{4}$ in. long, minutely downy. Flowers white, $\frac{1}{2}$ in. across, star-shaped, with five narrow, ovate, pointed petals, the flowers occur singly or in twos or threes on short, downy stalks $\frac{1}{2}$ to $\frac{3}{4}$ in. long, in the leaf-axils. They appear in August and September, and are followed by red (in one form white), globular berries, $\frac{1}{4}$ in. diameter.

Native of China and Japan, and the only member of a large genus grown outside in this country. Its beauty is in the glossy foliage and bright fruits. It is suitable for the rock garden, in the south and west of England or Ireland, but is not wholly hardy at Kew. It first flowered in Knight's nursery at Chelsea in 1834.

ARISTOLOCHIA. BIRTHWORTS. ARISTOLOCHIACEÆ.

Although the most remarkable of the plants which constitute this genus are found in tropical countries, some half a dozen woody, climbing species can be grown in the open air in Britain which present so remarkable a flower-structure and are, withal, so vigorous in growth, that one or more of them ought to be seen in every garden. Leaves alternate, mostly heart-shaped. The flower has no corolla; the calyx (or perianth) is more or less tubular, curiously inflated, and bent so as to resemble a siphon or Dutch pipe. Some of the flowers of tropical Aristolochias are fly-traps; the insect is attracted by a foetid odour, and enters the tube, which is clothed with hairs pointing downwards; these hairs offer no obstacle to the ingress of the fly, but effectually bar its return.

The hardy species like a good loamy soil, and can be increased by division or by cuttings. They are suitable for the various positions adapted for climbers.

A. ALTISSIMA, *Desfontaines*.

(Bot. Mag., t. 6586.)

Chiefly of botanical interest, and not very hardy, this species is not common in gardens, although one sees it occasionally cultivated in the south and west country. It has Smilax-like leaves, with three or five prominent veins, heart-shaped, 2 to 4 ins. long, bright green, and quite smooth, as are also the slender, six-ribbed stems. Flowers solitary on slender stalks 1 to $1\frac{1}{2}$ ins. long; calyx yellow-brown, striped with darker lines, $1\frac{1}{2}$ ins. long, bladder-like at the base, the upper part somewhat funnel-shaped, but doubled back on itself, expanding at the mouth into one ovate, oblique lobe. Seed-vessel oblong, $1\frac{1}{4}$ ins. long, $\frac{3}{4}$ in. wide, minutely downy.

Native of S.E. Europe, and N. Africa. At Kew it has to be grown against a wall, and even there in severe winters is cut to the ground. During the

summer it sends up shoots 8 to 10 ft. high, which flower from June to August. It ripens seed with Canon Ellacombe at Bitton, near Bristol. From all the other species here mentioned it is distinguished by the smooth, glossy leaves.

A. CALIFORNICA, *Torrey*.

A vigorous, deciduous climber, with twining, downy stems, 10 ft. or more high. Leaves heart-shaped, rounded or blunt-pointed at the apex, 3 to 8 ins. long, nearly as wide; downy on both sides; stalk downy, 1 to 2 ins. long. Flowers solitary on slender, downy stalks 1 in. long, with a tiny ovate bract at mid-length. Calyx tubular, inflated, about 2 ins. long, bent double, about $\frac{3}{4}$ in. wide at the bend; downy, slightly contracted at the mouth, where are three slightly expanding lobes, dull purple.

Native of California; introduced to Kew in 1877 by Sir Joseph Hooker, who had collected it at Chico. In foliage it is similar to *A. tomentosa*, the leaves remaining downy until they fall, but not so markedly so. The flower, too, is less downy, larger, broader, and more inflated. *A. Siphio* differs from both in its smooth flowers, with a large bract on the stalk.

A. HETEROPHYLLA, *Hemsley*.

A rambling or climbing, half-woody, deciduous shrub, whose young shoots and leaves are covered with fine down; buds hairy. Leaves narrowly to broadly ovate, with a heart-shaped base, or sometimes with a shallow or prominent rounded lobe at each side near the base; pointed, $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide, dull green; leaf-stalk $\frac{1}{2}$ to 1 in. long. Flowers solitary on almost smooth stalks $1\frac{1}{2}$ to 2 ins. long, which spring from the leaf-axils singly or in pairs, and are furnished near the base with a leaf-like, heart-shaped bract. The flower has the typical "Dutchman's pipe" shape characteristic of the genus, the tube being about 2 ins. long, yellow, downy, the terminal part sharply curved upwards; the orifice is $\frac{1}{4}$ in. diameter, bright yellow inside. The spreading part of the flower is lurid purple, almost black, the lower lobe rounded, the two side ones given a pointed shape by the curling back of the margins. Flowers in June. Fruit 2 to $2\frac{1}{2}$ ins. long, 1 in. wide, six-ribbed.

Native of W. China; introduced by Wilson for Messrs Veitch in 1904. It is quite hardy in the Coombe Wood nursery. The flowers are pretty and striking, and the plant a decided curiosity.

A. MOUPINENSIS, *Franchet*.

(Bot. Mag., t. 8325.)

A deciduous climber, of vigorous habit, with downy stems. Leaves heart-shaped, usually pointed at the apex, $2\frac{1}{2}$ to 5 ins. long, three-fourths as wide; covered beneath with down, slightly downy above; stalk 1 to 2 ins. long, downy. Flowers solitary, produced in June from the joints of the stem, on slender, pendulous, slightly downy stalks about 2 ins. long. Calyx $1\frac{1}{2}$ ins. long; the tube inflated, $\frac{1}{2}$ in. wide, somewhat flattened, downy, pale green, much bent back so as to expose the yellow mouth and three spreading lobes, which are yellow, dotted with purplish red, greenish towards the margin. Seed-vessel 3 ins. long, $1\frac{1}{4}$ ins. wide, with six ridges.

Native of W. China; discovered by the Abbé David in 1886, but first introduced to cultivation by Wilson in 1903, and flowered in the Coombe Wood nursery in 1908. It appears to be quite hardy, and, although not showy, is well worth growing for its prettily coloured, quaintly formed flowers.

A. SIPHO, *L'Héritier*. DUTCHMAN'S PIPE.(Bot. Mag., t. 534; *A. macrophylla*, *Lamarck*.)

A vigorous, deciduous climber, with twining stems, 20 to 30 ft. high; stems smooth, buds woolly. Leaves kidney-shaped or heart-shaped, pointed or blunt, 4 to 10 ins. long, often almost as wide, downy beneath when young, afterwards almost or quite smooth, pale green; leaf-stalk 1 to 3 ins. long, smooth, or slightly downy near the blade. Flowers produced in June at the joints, often in pairs, each flower solitary on a flower-stalk 2 to 4 ins. long, clasped by a roundish oval bract on the lower third of its length. Calyx 1 to $1\frac{1}{2}$ ins. long, tubular and inflated, bent like a siphon, and resembling a Dutch pipe; yellow-green outside; at the mouth the tube contracts to a small orifice, the three lobes spreading there into a flat, brown-purple border $\frac{1}{2}$ to $\frac{3}{4}$ in. across.

Native of the eastern United States; sent to England first in 1783 by John Bartram of Philadelphia. This is the best known of the genus in gardens, and is a handsome-foliaged climber; its flowers, although not highly coloured, are, like those of the other species, curiously and beautifully constructed. The plant may be used for covering pergolas, arbours, or pillars. Increased by division. The bark and more especially the root have an aromatic odour.

A. TOMENTOSA, *Sims*.

(Bot. Mag., t. 1369.)

A vigorous, deciduous climber, 20 to 30 ft. high, with very woolly young stems, leaves, and flowers. Leaves broadly ovate to roundish, heart-shaped at the base, mostly rounded at the apex; 3 to 8 ins. long, often nearly as wide; dull pale green, only slightly downy above; leaf-stalk 1 to 3 ins. long, woolly. Flowers solitary on a woolly stalk, which is 2 ins. long, gradually thickening upwards. Calyx about $1\frac{1}{2}$ ins. long, tubular, inflated at the base, bent to resemble a Dutch pipe, $\frac{3}{4}$ in. wide at the orifice, where it expands into three distinct lobes; the tubular part of the flower is greenish yellow, the throat dark brown, and the lobes yellowish. Flowers about midsummer. Fruits 2 ins. long, cylindric, angled.

Native of S.E. United States; introduced in 1799. Although not so frequently seen in gardens as *A. Siphon*, this is also a useful climber for similar positions. Its leaves do not run so large, and it is very distinct in its woolly parts, in the more deeply and distinctly three-lobed limb of the calyx, and in the absence of a bract on the flower-stalk.

ARISTOTELIA. TILIACEÆ.

A small genus of trees and shrubs, two species of which are in cultivation, one native of Chile, the other of New Zealand. Both are somewhat tender in our average climate, and are only seen at their best in the south-west counties. Given warm enough conditions they will thrive in any soil of moderate quality, and both can be easily propagated by cuttings made of half-ripened wood and put in gentle heat.

A. MACQUI, *L'Héritier*.

(Gardeners' Chronicle, 1875, ii., p. 773.)

An evergreen, spreading shrub, 6 to 10 ft. high, considerably higher in the mildest counties. Leaves opposite and alternate on the same plant, ovate,

usually from 2 to 5 ins. long, shallowly toothed; dark lustrous green, almost smooth except when young. Flowers in small, few-flowered cymes coming from the leaf-axils, or from the ends of short twigs; small (not more than $\frac{1}{4}$ in. across), greenish white. Male and female flowers appear on different plants. The fruit is about the size of a pea, at first purplish then black.

Native of Chile, whence it is said to have been introduced in 1773. This shrub is best fitted for the warmer parts of the British Isles, where it forms a luxuriant but somewhat commonplace evergreen, and where the female plant bears fruit freely. At Kew it is cut back to the ground in all but the mildest winters, but sends up during the summer a crowd of thick, succulent, big-leaved shoots 3 or 4 ft. high. In these circumstances it does not flower and has little interest, but on a wall it often flowers. The Chileans make a wine from the fruit, said to have medicinal properties.

Var. VARIEGATA.—A form whose leaves are variegated with yellow; it is handsome where it thrives, but is more tender than the type.

A. RACEMOSA, *Hooker fil.*

A small, deciduous tree of graceful form, up to 25 ft. high. Leaves 2 to 4 ins. long, opposite or nearly so, ovate with a heart-shaped or rounded base, long-pointed, the margin cut up into deep, narrow, irregular teeth; the blade is thin and the stalk about half as long. All the younger parts of the plant are downy. Flowers in downy panicles from the leaf-axils; they are numerous but very small ($\frac{1}{8}$ in. across), rose-coloured; male and female flowers are on separate trees. Fruit a dark red or almost black berry, about the size of a pea.

Native of New Zealand, and only suitable for the milder parts of the kingdom, being more tender than *A. Macquii*. There is a good specimen in Mr Herd's garden at Rossdohan, in Co. Kerry, which flowers in May. The wood is used in New Zealand for making charcoal for gunpowder.

ARTEMISIA. COMPOSITÆ.

A large genus of shrubby and herbaceous plants with composite flowers, abundant in Europe, and especially in the dry, hot regions of Western N. America, where they cover great plains and form what is known there as "sage brush." Most of them are of a more or less greyish tinge, and are notable for their strong, often agreeable odour. Some half-dozen shrubby species have at times been in cultivation, the two best of which are *A. Abrotanum* and *A. tridentatum*. They need a sunny position, and a well-drained, not rich soil. Increased by cuttings.

A. ABROTANUM, *Linnaeus*. SOUTHERNWOOD.

A soft-wooded, semi-shrubby, fragrant plant about 3 ft. high; stems erect, densely furnished with foliage, and covered at first with a grey down. Leaves downy, the terminal half doubly or trebly pinnate, the final divisions scarcely thicker than a thread; the entire leaf is from 1 to 2 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide, and dull green. Flower-heads dull yellow, $\frac{1}{8}$ in. across, nodding; produced during September and October in a tall, slender panicle 12 to 18 ins. high, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. through, terminating each shoot.

Native of S. Europe; cultivated in England since the sixteenth century. The flowers have little beauty, but the plant has always been a favourite in gardens, especially cottage gardens, for the sweet aromatic odour of its finely divided leaves. Village children are very fond of taking a sprig to

school, and in the north of England the plant is often called "lad's love." It thrives in any soil, but likes a sunny, well-drained spot. Increased by cuttings taken any time during the summer, and placed either in gentle heat, or under a bell-glass in some sheltered corner. It flowers infrequently in most parts of Britain, and is valued solely for its fragrant sprigs.

A. PROCERA, *Willdenow.*

A semi-woody plant of thin, erect habit, with pithy stems 6 to 8 ft. high, smooth or furnished with a little grey down. Leaves treble pinnate, the final divisions thin and thread-like; the entire leaf is 2 to 3 ins. long, and the same wide; dark green. Flower-heads nodding, $\frac{1}{2}$ in. across, yellowish green; produced in August in tall, slender panicles 12 to 20 ins. long, the lower portion composed of racemes springing from the axils of the uppermost leaves.

Native of S.E. Europe and Asia Minor. Although rather elegant in late summer and autumn, when its tall stems are surmounted by their flower-panicles, the plant is of only third-rate value in gardens. It is quite hardy, and has lived outside for many years at Kew without protection. The leaves when crushed have a slightly pungent aroma.

A. TRIDENTATA, *Nuttall*, SAGE BRUSH.

An evergreen shrub of rather open habit, 6 to 8 ft. high; stems lax when young, clothed with shredding bark when old; young shoots and leaves covered with a dense, grey felt. Leaves of various sizes, crowded on the stems in clusters; wedge-shaped, tapering gradually from the apex (which is three-toothed and truncate) to the stalk; $\frac{1}{2}$ to $1\frac{3}{4}$ ins. long, $\frac{1}{10}$ to $\frac{1}{4}$ in. wide at the apex. Flower-heads small, yellowish, $\frac{1}{4}$ in. long, supported by grey-felted bracts; produced in October in long, slender panicles, more or less arching or pendulous, and 12 to 18 ins. long. No other hardy shrub in cultivation has a leaf similar to this in colour and shape.

Native of the western United States; introduced to Kew in 1895. When rubbed, the plant emits a strong but pleasant odour, which moisture of itself appears to release, for after a shower, or still more after a wet day, the air for several yards round a group of plants is filled with this aromatic scent. The species is usually a great favourite with those who cultivate it on this account. This shrub is one of those found in the dry alkaline districts of Western N. America, which are known collectively as "sage-brush," and cover immense areas with a grey, monotonous vegetation. In our gardens it makes a very pleasing feature, not only for its fragrance, but also for the silvery grey foliage, which provides an agreeable contrast to ordinary green shrubs. It can be increased by cuttings made of half-ripened wood, and placed under a bell-glass in the propagating frame. But it does not take root with the readiness and certainty of most of its allies.

ARUNDINARIA. BAMBOO. GRAMINEÆ.

Hardy bamboos are known in gardens under three generic terms, viz.—ARUNDINARIA, BAMBUSA, and PHYLLOSTACHYS. Whilst all the species of Phyllostachys so-called are probably correctly placed, so much cannot be said for all the species put under Bambusa and Arundinaria. Many of them have never been critically examined in flower, and their location is more or less guesswork. In the nomenclature of the bamboos included in this work I have followed as closely

as possible *The Bamboo Garden*, an admirable monograph by Mr A. B. Freeman-Mitford (now Lord Redesdale), published in 1896.

The bamboos are really woody grasses, mostly characteristic of moist, tropical regions. The species we cultivate in the open air, except one from N. America, are northern outliers of the great bamboo regions of Asia, and although they are mere pigmies compared with the giants of equatorial regions, they have a special value in our gardens in introducing to them a form of vegetation not only of surpassing grace and beauty, but one of an absolutely distinct type.

Naturally they are evergreen, but in cold winters and in cold districts some of them lose much of, or all, their foliage. They have hollow stems divided into sections by a transverse woody layer at each node (or "joint"), and the branches (from one to many) are produced at these joints. In a young state the stems are more or less encased in membranous sheaths, which in some species fall away, in others persist; at the end of each sheath there is a small leaf-like expansion which is known as the "limb," and differs from the true leaves in having no midrib. The joints are farthest apart about the middle of the stem.

The leaves of bamboos have a midrib supported on either side by from two to nearly twenty more or less prominent veins, between which again are thin, delicate veins of a third dimension, easily visible by holding the leaf between the eye and the light. In all but two of the species mentioned in these notes the thin veins are united by tiny cross-veins—easily seen with a lens by holding the leaf up to the light—which divide the space between each longitudinal vein into rectangular spaces of irregular size. Lord Redesdale made the interesting discovery that this tessellation of the veins is invariably characteristic of a really hardy bamboo; those that do not possess it are as invariably tender. This, however, does not mean that every bamboo with a tessellated venation is hardy. The leaves are attached to the branchlet by a clasping sheath, which is easily detached by pulling at the blade.

In habit, bamboos are either tufted—*i.e.*, they keep their stems in a close cluster and extend but slowly—or they spread by means of underground runners, which in some species push through the ground several feet away from the previously made stem.

The flowering of bamboos is a phenomenon of peculiar interest, but as the flowers have little bearing on the identification of those we cultivate, it is not necessary to enter into a definition of them here. On many of the sorts we grow they have never been seen in this country, nor, indeed, ever examined by botanists. There is no doubt that the flowering of many bamboos is shortly and inevitably followed by their death: *Arundinaria Falconeri* is an example. Others flower and, although seriously crippled, in time recover: some of the *Phyllostachys* behave in this way. In a third group a small proportion of the stems flower, and although those particular stems die, the plant as a whole is unaffected; *Arundinaria auricoma* is an example; plants at Kew have flowered partially for the last twenty years. It is not certain, however, that those of the last group will not eventually flower all over simultaneously and then die, as did *A. Simoni*, after blossoming partially for at least twelve

years. I have been informed that the lives of bamboos (or of some of them) may be saved by cutting off all the stems close to the ground as soon as ever there is any indication that they are about to blossom. I cannot guarantee the efficacy of this plan, but it is worth trying. A curious circumstance in connection with the flowering of bamboos is the simultaneous flowering of all the plants of one species, although spread over great areas and growing under different conditions. Instances have been known where plants grown in English hothouses for many years have flowered (and died) during the same season as plants of identical species growing wild in the tropics. Hardy species in our gardens have behaved in the same way, flowering simultaneously all over the country; but the period of flowering appears to be longer and less clearly defined than in the case of wild species, and may extend over four or five years.

CULTIVATION.—After a quarter of a century's experience with hardy bamboos, I am inclined to believe that the most important item in the cultivation of the group as a whole is the provision of good shelter. Few plants we grow are less adapted to withstand cutting blasts from north and east than these. They need some position protected from those quarters, but open to the south and west. Nothing in our gardens is more lovely in form than a well-grown bamboo from midsummer to Christmas, but with the January and February frosts and the biting winds of March, many of them become seared and brown, and anything but pleasant objects. Adequate shelter from cold winds does much to prevent or defer this disfigurement.

As regards soil, they appear to thrive best in an open loam of fair quality; neither so sandy as to be poor, nor so clayey as to be heavy and cold. They also succeed well on a peaty formation. Being gross feeders they need abundant moisture, and are benefited by occasional mulchings with manure.

TRANSPLANTING AND PROPAGATION.—In the absence of seed—a very uncertain product in this country—propagation is effected by division. All disturbance at the root, whether for propagation or transplanting, is best deferred until May, or until the unfolding of new leaves indicates that root action has begun. Early autumn is also a good time, but from late autumn to early spring is the worst time to transplant. In order to divide some clumps of the tufted sorts it may be necessary to use a pickaxe, so hard and matted does the root system become; but from the running sorts pieces can be easily taken. To get a big stock quickly, a clump should be broken up into comparatively small pieces, which should be potted or planted thickly in a warm, moist greenhouse until re-established. In this case it is advisable to cut down the stems in proportion to the sacrifice of roots. Imported plants are safer if established in heat in this way before planting in the open ground.

For districts where the success of bamboos is problematical, the following sorts are the best to experiment with:—*Arundinaria anceps*, *fastuosa*, *japonica*, *nitida*, *palmata*, and *Ragamowski*; *Phyllostachys Henonis*, *nigra*, and *viridi-glaucescens*.

ARUNDINARIA.—The most obvious distinctive characters of *Arundin-*

aria are in the stems. These are round and straight, and develop the branches almost simultaneously from top to bottom, and, in the taller species, the branches at each joint are indefinite and numerous. The low, slender-stemmed, sparsely-branched, very rhizomatous species included here under this genus, viz., *A. Veitchii*, *palmata*, and *Ragamowski*, have by Japanese authorities been recently separated with others into a genus, *SASA*, a name founded on the Japanese term for dwarf bamboos generally.

A. ANCEPS, *Mitford*. RINGAL.

Stems 10 to 14 ft. high, cylindrical, erect or arching at the summit, $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter; purplish at first, changing to brownish green; from 3 to 7 ins. between the joints; branches purple, slender, forming dense clusters on the older stems. Stem-sheaths mottled within, hairy on the margin. Leaf-sheath fringed with bristles and small hairs where it joins the base of the blade. Leaves $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, brilliant green above, slightly glaucous beneath, edged with minute bristles on each margin. There are two or three secondary veins on each side of the midrib, and the tessellation is very minute, but quite distinct under a lens.

Native of the N.W. Himalaya; introduced by Col. Edmund Smyth from Garhwal, about 1865, and first cultivated at Elkington Hall, Lincolnshire. It is a handsome and graceful bamboo, spreading rapidly by means of underground suckers. It is very hardy, and although it loses its leaves in severe winters its stems are rarely injured. It grows at elevations of 10,000 to 11,000 ft., and is said to flower and seed in its native home at intervals of twenty to twenty-five years, when vast fields of it die.

A. ANGUSTIFOLIA, *De Lahaie*.

(*Bambusa angustifolia*, *Mitford*; *B. Vilmorinii*, *Hort.*)

Stems erect, 2 to 6 ft. high, round, $\frac{1}{2}$ to $\frac{1}{4}$ in. in diameter, with a very small hollow up the centre; joints rather prominent, from 10 ins. apart at the base to about 1 in. near the apex; branches slender, erect. Leaves $1\frac{1}{2}$ to 6 ins. long, $\frac{1}{8}$ to $\frac{3}{4}$ in. wide, rounded at the base, long and slenderly pointed, smooth, and of the same shade of brilliant green on both surfaces; bristle-toothed on one margin, minutely so on the other; secondary veins two to four each side the midrib; leaf-sheath with a tuft of erect hairs at the top, and smaller ones on the margin.

Native of Japan; introduced about 1895 by way of France. This bamboo spreads rapidly by means of underground suckers, and forms a dense thicket of slender, erect stems of very various heights. Its distinguishing marks are in the narrowness of the leaves, their smoothness, and similarity of shade on both surfaces.

A. AURICOMA, *Mitford*.

(*Bambusa Fortunei* var. *aurea*, *Hort.*)

Stems tufted, 3 to 4 ft. high, about as thick as a knitting-needle, slightly hollow, dark purplish green. Stem-sheaths persistent, edged with minute hairs. Leaves 3 to $8\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; rounded, or even slightly heart-shaped at the base, fine-pointed, dark green always more or less striped with rich golden yellow. These yellow stripes vary in width and number, often the major part of the leaf is golden, with only thin lines of green. Secondary veins five to seven each side the midrib. The upper surface is at first minutely downy, and becomes rough to the touch with age; the lower surface remains velvety.

Native of Japan ; cultivated since the "seventies" of last century, probably before, and long known as "*Bambusa Fortunei aurea*." In its full late summer leafage it is a beautifully variegated plant, and quite distinct from all other dwarf bamboos. A few stems flower every year at Kew, but no plant has yet broken completely into blossom.

A. CHRYSANTHA, *Mitford*.

(*Bambusa chrysantha*, *Hort.*)

Stems 2 to 6 ft. high, $\frac{1}{8}$ to $\frac{1}{6}$ in. diameter, dark green, round ; joints 2 to $5\frac{1}{2}$ ins. apart. Leaves 3 to 7 ins. long, $\frac{1}{2}$ to 1 in. broad, rounded at the base, rather abruptly tapered to a short, slender point, smooth on both surfaces, minutely toothed at the margins. There is a tuft of long, silky hairs at the top of the leaf-sheath. Most of the leaves are quite green, but some are more or less striped with golden yellow like *A. auricomma*. Secondary veins four to six each side the midrib.

Native of Japan ; introduced in 1892, but a bamboo of no great attractiveness. The variegation is not abundant enough to give a colour effect, and the plant cannot be compared with *A. auricomma* in this respect. It spreads rapidly by its underground stems.

A. FALCATA, *Nees*.

(*Bambusa falcata*, *Hort.* ; *B. gracilis*, *Hort.*)

Stems tufted, 10 to 15 ft. high, glaucous when young, slender, round ; the joints clothed with a velvety down ; stem-sheaths with long, tapered points, edged with hairs, especially when young, pale purple. Leaves 2 to 6 ins. long, $\frac{1}{6}$ to $\frac{7}{8}$ in. wide, rather pale green, somewhat glaucous beneath ; secondary veins two to five each side the midrib, not tessellated with cross-veinlets.

Native of the Himalaya up to 7000 ft. It is not a very hardy species, and is only suitable for the mildest parts of the kingdom. From all the bamboos here mentioned, except *A. Falconeri*, it can be distinguished by the absence of cross-veinlets in the leaves. *A. Falconeri* differs in having green or yellowish (not glaucous) stems with dark brown stains at the joints.

A. FALCONERI, *Gamble*.

(*A. nobilis*, *Mitford* ; *Thamnocalamus Falconeri*, *Hooker fil.*, *Bot. Mag.*, t. 7947.)

Stems up to 25 ft. long in the mildest parts of the kingdom ; tufted, very slender, round, olive-green, becoming yellowish, with a very distinct stain of purplish brown at the joints ; the joints quite devoid of down ; stem-sheaths purple, smooth, except towards the top and at the margins. Leaves normally 2 to 4 ins. long, about $\frac{1}{3}$ in. wide ; bright green, rather glaucous beneath, with purplish stalks and margins ; secondary veins three or four each side the midrib, not tessellated with cross-veins ; leaf-sheaths purplish, not hairy at the top.

Native of the Himalaya ; first introduced to England in 1847 by Mr Madden, who sent large quantities of seeds to Kew, which were distributed through Europe. These plants grew well where the climatic conditions were favourable, and flowered in 1875 and 1876. Every plant ultimately died, but from the seed they produced a new generation was raised, which in its turn flowered between 1903 and 1908. It would thus appear that the next general flowering may be expected from 1931 onwards. *A. Falconeri* produces its stems in a dense, crowded cluster, and does not spread by underground suckers. It is not very hardy, but in such places as Cornwall and the south-west of Ireland



ARUNDINARIA FASTUOSA.

it is magnificent. At Kew it is killed to the ground every winter. The species has been much confused with *A. falcata*—an inferior bamboo, more tender, not so tall, and really very distinct in its glaucous stems with velvety joints, and in the long, tapered points of the stem-sheaths.

A. FASTUOSA, Makino.

(*Bambusa fastuosa, Marliac* ; *Phyllostachys fastuosa, Hort.*)

Stems up to 22 ft. high, $1\frac{1}{2}$ ins. diameter at the base, perfectly erect, very hollow, dark green, round except at the upper internodes, which are flattened on one side ; branches short, very leafy. Stem-sheaths very large, up to 9 ins. long by 4 ins. wide at the base when spread out, purplish and at first downy outside, beautifully glazed within ; they fall off early. Leaves 4 to 8 ins. long, $\frac{1}{2}$ to 1 in. wide, wedge-shaped at the base, long and taper-pointed ; dark lustrous green above ; one side the midrib beneath glaucous, the other greenish ; margins toothed ; secondary veins four to six each side the midrib.

Native of Japan, where it is known as "Narihira-dake." Narihira, Lord Redesdale tells us, was the beautiful hero of one of the classic romances of Japan, written in the eleventh century. Although in some respects this bamboo resembles *A. Simoni*, it is perfectly distinct and a superior plant. If not the most graceful, it is the loftiest and stateliest of hardy species, differing from *A. Simoni* in the early fall of the stem-sheaths ; in the short, crowded branches at each joint, which give to each stem-growth a columnar appearance ; and in the more tufted habit. Although suckers do push through the ground good distances away from the parent clump, it is not so rampant as *A. Simon.* Introduced in 1892, it has not yet flowered in cultivation. It is very hardy, and the foliage of no bamboo suffers less from winter cold.

A. FORTUNEI, A. and C. Rivière.

(*Bambusa Fortunei variegata, Hort.*)

Stems up to $3\frac{1}{2}$ ft. high, very slender, the strongest only $\frac{1}{8}$ in. diameter, the pipe up the centre very small ; joints 1 to 6 ins. apart ; stem-sheaths persistent, hairy at the base. Leaves 2 to $7\frac{1}{2}$ ins. long, $\frac{1}{4}$ to 1 in. wide ; rounded at the base, dark green copiously striped lengthwise with creamy white—sometimes it would be more correct to say "white striped with green" ; hairy on both surfaces, especially beneath ; both margins toothed ; leaf-sheaths hairy when young ; secondary nerves three to five both sides the midrib.

Native of Japan ; cultivated by Van Houtte of Ghent before 1863. This is the prettiest white variegated hardy bamboo we have, giving a very bright effect from late summer up to Christmas. It is of tufted habit, but spreads rapidly, and is easily increased by division.

A. GRAMINEA, Makino.

A. Hindsii var. *graminea, Bean* ; *Bambusa graminea, Hort.*)

Stems up to 10 ft. high, and about $\frac{1}{4}$ in. diameter, at first yellowish ; the central hollow very large, leaving only thin walls ; joints 3 to 6 ins. apart ; ultimately very densely branched and leafy towards the top, and forming besom-like masses. Leaves the narrowest in proportion to their length of all hardy bamboos, being 4 to 9 ins. long, but never, so far as I have observed, more than $\frac{1}{2}$ in. wide ; secondary nerves two to four either side the midrib.

Native of Japan, where it is known as *Taimin-chiku* ; cultivated by Messrs Veitch in 1877, and probably introduced by John Gould Veitch during the

previous decade. It forms thickets of stems of great density, but spreads rapidly, and can be increased very quickly by division. In the earlier days of its cultivation in Britain I regarded it as a variety of *A. Hindsii*, but in twenty years these two have assumed very different characters. *A. graminea* is a much more slender, leafy plant, hardier, and better for gardens; the leaves are only half as wide, and the secondary veins fewer.

A. HINDSII, *Munro*. KAN-ZAN-CHIKU.

(*Bambusa erecta*, *Hort.*)

Stems tufted, 8 to 10 ft. high, round, quite erect, up to 1 in. diameter; dark olive green; at first covered with a waxy bloom; joints often 8 to 10 ins apart; central pipe large. Branches erect, forming dense clusters at each joint. Leaves mostly erect, dark green above, rather glaucous beneath, smooth on the surfaces, but with numerous bristle-like teeth on one margin and a few scattered ones on the other; the longest are 8 to 9 ins. long, the broadest $\frac{3}{4}$ to 1 in. wide; the average width is from $\frac{1}{4}$ to $\frac{5}{8}$ in., tapered at the base, the apex long, tail-like. Secondary veins four to six each side the midrib.

Native of Japan; cultivated in England since about 1875. It flowered in 1910 and 1911. It is one of the least elegant of bamboos, similar in foliage to *A. graminea*, but less copiously leafy and with larger leaves. The stems and leaves are also stouter and darker green, the habit is less dense, and the plants do not "run" so rapidly.

A. HUMILIS, *Mitford*.

(*Bambusa Nagashima*, *Marliac*.)

A dwarf, rapidly spreading bamboo, 2 to 5 ft. high as a rule; stems very slender, and with a minute hollow up the centre. Leaves bright green on both sides, 2 to 7 ins. long, $\frac{1}{3}$ to $\frac{2}{3}$ in. wide, rounded at the base slender-pointed; secondary veins three to five each side the midrib; leaf-sheaths with two clusters of bristles at the top.

A native of Japan, long grown in gardens as *A. Fortunei* ("green form"). The true *A. Fortunei* is well marked by its white-variegated leaves. I am, however, unable to see any real distinction between it and the *Bambusa Nagashima* of French nurserymen; nor is there much to choose between these two and *A. chrysantha*, except the occasional variegation of the last. *A. humilis*, without possessing any special merit, forms pleasant masses of greenery from midsummer onwards.

A. JAPONICA, *Siebold*. MÉDAKÉ.

(*Bambusa Metake*, *Siebold*.)

Stems 10 to 12 ft. high (5 or 6 ft. more in the milder counties), round, very hollow, erect, $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, with erect branches near the top, producing only a few leaves the first year. Stem-sheaths nearly as long or longer than the space between the joints, which is sometimes 1 ins., very persistent, soon turning pale brown, covered at first with flattened bristles; terminated when young by an awl-shaped tongue up to 3 ins. long, but only $\frac{1}{8}$ in. wide. Leaves 7 to 12 ins. long, $\frac{3}{4}$ to 2 ins. wide, terminated by a long, tail-like point; the upper surface glossy dark green; rather glaucous beneath, except a strip about one-fourth of its width near one margin, which is green. There are five to nine secondary veins each side the midrib, minutely tessellated with cross veinlets; one margin is minutely, the other scarcely toothed.

Native of Japan; introduced by Von Siebold in 1850, and for long the only bamboo commonly grown in British gardens. It is a very hardy and accommodating species, and a handsome evergreen, having larger leaves than any other bamboo of its height and character we can grow outside. It does not spread quickly by underground suckers, but maintains a rather tufted habit. It flowered in Europe between 1872 and 1874.

A. MARMOREA, *Makino*. KAN-CHIKU.

(A. Kokantsik, *Kurz*; *Bambusa marmorea*, *Mitford*.)

Stems round, slender, solid, erect, 3 to 5 ft. high; purplish green, from $\frac{1}{8}$ to $\frac{1}{4}$ in. thick at the base, almost hidden the first season by the clasping, persistent sheaths, which are at first purplish, mottled conspicuously with pinkish grey, turning grey-white with age. Branches erect, normally three at each joint, forming a dense but elegant, cylindrical mass of foliage; the branches, however, do not develop until the second year, the tops of the slender, whip-like, leafless stems of the first year standing out above the mass of foliage throughout the winter. Leaves bright green, 2 to 5 ins. long, $\frac{3}{8}$ in. to $\frac{1}{2}$ in. wide, with slender, awl-like points; four or five secondary nerves each side the midrib; margins set with minute bristles; leaf-sheath terminated by a tuft of pale curly bristles and edged with small hairs.

Native of Japan; introduced to Ireland in 1889. A very pretty, well-marked bamboo, distinguished by the marbled stem-sheaths, the stems remaining unbranched the first season, the absence of a pipe or hollow up the centre, and by the apex of the leaf being constricted about $\frac{1}{2}$ in. from the tip. It spreads very rapidly by underground suckers, forming luxuriant masses, but, is liable to injury by winter cold.

A. NITIDA, *Mitford*.

Stems up to 10 ft. high, $\frac{3}{8}$ in. diameter, erect and leafless the first year, very dark purple, round and hollow; the branches develop the second season and the stems then arch beautifully at the top. Stem-sheaths purplish, downy, measuring with the tongue at the apex 2 to 4 ins. long, which is about the distance the stem joints are apart. Leaves 2 to 3½ ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in. wide; rounded at the base, finely pointed, vividly green above, somewhat glaucous beneath; secondary veins three or four each side the midrib, very faintly defined in the fresh leaf, but conspicuous enough in the dry; margins very minutely bristly on one side.

Native of Central and W. China; introduced by way of St Petersburg in 1889, and one of the very hardiest of bamboos. It withstood the bitter weather of February, 1895, better than any other species, and scarcely lost a leaf; but this evergreen character appears to belong only to young plants. Since then, the same plants have often lost nearly all their leaves even in comparatively mild winters. The stems are never injured. This bamboo is of extraordinarily vigorous growth, sending up every year a crowd of new stems, which are erect and remain leafless except at the tips throughout the first winter; the second season the branches develop, and as the foliage increases in bulk the stems arch outwards, and the whole plant becomes an object of surpassing elegance. If I were restricted to the cultivation of one bamboo, this would be my selection. It has to be mentioned that no bamboo is more susceptible to intense sunshine and dryness at the root, conditions whose presence is immediately indicated by the temporary curling up of the leaves. It should be given a semi-shaded spot, and abundant moisture. Easily distinguished from all other bamboos by its round, black-purple stems.

A. PALMATA, *Bean.*(A. *metallica*, *Mitford*; *Bambusa palmata*, *Burbidge*.)

Stems 6 to 8 ft. high, $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, more or less glaucous, with a few erect branches near the top, hollow; joints 5 or 6 ins. apart. Stem-sheaths smooth, terminated by a narrow, lanceolate tongue, which is strongly tessellated and edged with minute bristles, but soon falls away. Leaves bright green above, glaucous beneath; 6 to 13 ins. long, $1\frac{1}{2}$ to 3 ins. wide, confined to the apex of the branches; broadly wedge-shaped at the base, with long, slender points; secondary veins seven to thirteen at each side the midrib, very strongly developed, and giving the leaf a ribbed appearance; tessellation minute; margins set with bristles, which fall away with age.

Native of Japan; introduced about 1889. This has the largest leaves of all hardy bamboos except A. *Ragamowski* (*g.v.*), and is undoubtedly one of the noblest of them all. The stems and leaves are apt to get somewhat battered and shabby with age, and it is a good plan every few years to cut the plants back to the ground entirely. If this be done in May, taking care not to injure the young, pushing stems, the plant will soon be furnished with a perfectly fresh set of leaves. The only defect of this bamboo is its extraordinarily rampant habit. It is no uncommon thing for a young stem to push through the ground a yard or two away from the previous ones. It is not a suitable neighbour for other shrubs, but is very well adapted for the undergrowth of thin woodland.

A. PUMILA, *Mitford*.(Bambusa *pumila*, *Marliac*.)

A dwarf species of tufted habit, with the few-branched stems as thick as a knitting-needle, and from 1 to 2 ft. high; joints 2 to 6 ins. apart. Stem-sheaths persistent, smooth except at the base, where is a conspicuous ring of hairs. Leaves $2\frac{1}{2}$ to 6 ins. long, $\frac{1}{3}$ to $\frac{7}{8}$ in. wide, rounded at the base, narrowed often abruptly to a short slender point; dark green, and with minute hairs on both sides. Secondary veins four or five each side the midrib.

Native of Japan, and a neat little bamboo, but with no striking characters. It resembles A. *humilis*, but that species has longer leaves with little or no hair on them, and their points are more gradually tapered.

A. PYGMÆA, *Kurz*. DWARF BAMBOO.(Bambusa *pygmæa*, *Miquel*.)

The dwarfest of hardy bamboos, although the stems when drawn up in a dense mass will grow 18 ins. high; they are bright green, about $\frac{1}{16}$ in. diameter, with a hollow up the centre which would only admit of a needle point; joints 1 to 4 ins. apart. Leaves 2 to $5\frac{1}{2}$ ins. long, $\frac{1}{3}$ to 1 in. wide, rounded at the base, rather abruptly narrowed at the apex to a slender point; sparsely hairy above, more so beneath. Secondary veins three to five each side the midrib.

Native of Japan. This little bamboo forms a low, dense carpet over the ground, and spreads with great rapidity. Because of its rampant habit it is not suited for borders or kept portions of the garden, but may be relegated to the wilder parts, where it will hold its own against the most vigorous of our native weeds. Among the dwarf creeping sorts with green leaves, the velvety under-surface of the leaves will best distinguish it.



ARUNDINARIA (BAMBUA) PALMATA.

[Face p. 218.

L.]

A. RAGAMOWSKI, *Pfitzer*.(Bambusa tessellata, *Munro*; B. Ragamowski, *Hort.*)

Stems 2 to 3 ft. high, $\frac{1}{8}$ to $\frac{1}{6}$ in. diameter, with a very small hollow up the centre; the joints 1 to 3 ins. apart. Stem-sheath persistent, 8 to 10 ins. long, clasping not only that part of the stem above the joint from which it springs, but also portions of the two or three stem-sheaths above it; it is fringed with hairs. Leaves somewhat ribbed, of varying size, the largest 18 ins. long, and 3 to 4 ins. wide in the middle; abruptly tapered at the base, very slenderly pointed, dark green above, glaucous beneath. The larger leaves have fifteen to eighteen secondary veins at each side the midrib, which is yellow; and tucked under one side of the midrib, especially towards the base, is a line of pale hairs. (See Plate, p. 78.)

Native of China; cultivated in England since 1845, probably before. It is the most striking of dwarf bamboos, with larger leaves than any other, tall or dwarf, and forms broad, rounded masses, the outer stems of which arch outwards to the ground, and out of which spring each summer the spike-like new growths. It has never been known to flower under cultivation. Very hardy. It differs from A. palmata in the dwarfer habit but larger leaves.

A. SIMONI, *Rivière*.(Bambusa Simoni, *Carrière*; B. viridi-striata, *Hort.*)

Stems up to 18 ft. high, round, very hollow, from 1 to $1\frac{1}{2}$ ins. diameter at the base, the outer ones arching outwards. Stem-sheaths rather persistent, the largest 8 to 10 ins. long, purplish when young, hairy at the margins, very glazed within. Leaves narrow-oblong, broadly wedge-shaped at the base, with long, tapered points; 3 to 12 ins. long, $\frac{1}{3}$ to $1\frac{1}{4}$ ins. wide, vivid green above, glaucous on one side of the midrib beneath, rather greener the other; secondary veins four to seven each side the midrib.

Native of China; introduced to France by M. Simon in 1862. A very vigorous bamboo, which spreads rapidly by means of its underground suckers, and, with the exception of A. fastuosa, the tallest of our hardy sorts. It bears some resemblance to that species, under which the distinctions are pointed out. A. Simoni flowered all over the country between 1903 and 1905. For many years previous to those dates odd stems had flowered, and occasionally borne seed without any damage to the plants, but then came the flowering of the entire plants, none of which ever recovered. In gardens now A. Simoni is only known by small plants raised from the seed then obtained.

Var. CHINO, *Makino* (Bambusa Laydekeri, *Marliac*).—A dwarf plant rarely more than 3 to 4 ft. high. Its relationship with A. Simoni was not suspected until it flowered in 1896, when a botanical examination of the flowers showed them to be almost identical with those of that species. The leaves of Laydeker's bamboo are $1\frac{1}{2}$ to 6 ins. long, $\frac{1}{6}$ to $\frac{5}{8}$ in. wide, dark green, mottled with dull yellow. This mottling distinguishes it from all other hardy Arundinarias. Most, if not all the plants in cultivation, died after flowering, and it is now only known in gardens from a few seedlings raised at the time. Its loss is not a great one, for it is, perhaps, the duller and least effective of hardy bamboos.

Var. VARIEGATA, *Hooker* (Bot. Mag., t. 7146); Bambusa albo-striata, *Hort.*.—In this variety some of the leaves are striped with white, the leaves so marked being very small and narrow. The full-sized green leaves do not differ from those of the type. This variety has not yet flowered, except partially, in this country. It is of little value.

A. TECTA, *Muhlenberg*. SMALL CANE.(A. *macrosperma* var. *pecta*, A. *Gray*.)

Stems up to 12 ft. high in a wild state, rarely more than half as high with us; round and hollow, branching at the upper joints. Stem-sheaths persistent, fringed with hairs, and slightly downy when young, becoming smooth. Leaves narrow-oblong, 5 to 10 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide, downy beneath; secondary veins six or seven each side the midrib.

Native of the south-east United States, from Maryland to Illinois and southwards. It is by some authors regarded as a variety of A. *MACROSPERMA*, *Michaux*, a taller species sometimes over 30 ft. high, which inhabits the swamps and river-sides of the Southern States. Both species form dense, scarcely penetrable thickets, known as "Cane-brakes." In the old slave days these cane-brakes were of the greatest service to escaping negroes in affording shelter and hiding from their pursuers. As an ornamental bamboo for gardens, A. *pecta* is second-rate. It spreads by suckers, and has not been known to flower in this country.

A. VEITCHII, *N. E. Brown*. VEITCH'S BAMBOO.(Bambusa *albo-marginata*, *Hort.*; Sasa *albo-marginata*, *Makino*.)

Stems usually 1 to $1\frac{1}{2}$, sometimes 3 to 4, ft. high, with a single branch at each of the upper joints; green, round, $\frac{1}{8}$ in. diameter; the pipe very small; joints 3 to $4\frac{1}{2}$ ins. apart, rather prominent. Stem-sheaths persistent, very downy at first; both they and the leaf-sheaths have at the apex a curious group of bristles (themselves minutely hairy), resembling in their tapering, twisted ends the arms of an octopus. Leaves narrow-oblong, 4 to 8 ins. long, 1 to $2\frac{1}{4}$ ins. wide, abruptly tapered at the base, and narrowed quickly also at the top to a short, slender point; at first dark green above, glaucous beneath, but afterwards turning yellow and finally pale brown at the margins; secondary veins 5 to 9 each side the midrib.

Native of Japan; introduced by Maries for Messrs Veitch about 1880. It forms dense, matted patches and spreads very rapidly. Pleasing in the summer and early autumn, the habit of decaying at the leaf-margins spoils its value. This character, which is equally apparent on plants wild in Japan, is not found, so far as I know, in any other hardy species.

ASCYRUM HYPERICOIDES, *Linnaeus*. ST ANDREW'S CROSS.

HYPERICACEÆ.

(A. *Crux-andrea*, *Linnaeus*.)

A low, decumbent, much-branched plant of semi-shrubby character, growing about 1 ft. high; stems winged. Leaves opposite, $\frac{1}{2}$ to 1 in. long, narrowly obovate, tapering at the base; stalkless. Flowers terminal, usually solitary or in threes, yellow, $\frac{1}{2}$ to $\frac{3}{4}$ in. across; petals four, arranged in the form of a St Andrew's Cross; sepals four, in two pairs of unequal size, the larger ones almost as long as the petals.

Native of the eastern United States; introduced in 1759. This belongs to a small genus of N. American plants closely allied to St John's worts

(*Hypericum*), but readily distinguishable by having four sepals and four petals instead of five. This species is grown in the rock garden at Kew, where it flowers from July to September; it likes a light, loamy soil, and can be increased by cuttings taken in July. It appears to be a rather delicate plant, or perhaps naturally short-lived, for which reason it is advisable to renew the stock from seed occasionally.

ASIMINA TRILOBA, *Dunal*. PAPAW. ANONACEÆ.

(Bot. Mag., t. 5854.)

A robust, deciduous shrub in this country, but developing into a small tree in the south-eastern United States. Leaves alternate, obovate, pointed, short-stalked, 4 to 8 ins. long, smooth except when quite young. Flowers produced singly on the wood of the previous year, during June. Calyx three-lobed; each lobe $\frac{1}{2}$ in. long, ovate, downy outside. Petals six, of a dull lurid purple, the outer three much the larger, roundish, 1 in. long; the inner three half as large. Flower-stalk thick, often recurved, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, densely downy. Fruit bottle-shaped, 3 to 5 ins. long, containing when ripe a sweet, yellow, edible pulp.

Introduced from the south-eastern United States by Peter Collinson in 1736, this interesting shrub has never become common. Its foliage is striking, but the flowers although curious are not ornamental, and the fruit rarely develops in this country. It is of interest botanically as the only hardy plant of its natural order. It grows rather slowly, and one of the finest specimens in this country is at Claremont, a huge, spreading bush 15 ft. or so high. It thrives in a good loam, and propagation can be effected by layering; but seeds, procurable from American nurserymen, are preferable.

ASTRAGALUS TRAGACANTHA, *Linnaeus*. GOAT'S THORN.

LEGUMINOSÆ.

A dwarf, deciduous, excessively spiny shrub of extremely slow growth, rarely exceeding 1 ft. in height. The old wood is completely covered with the closely set, sheathing bases of stiff, sharp spines, 1 to $2\frac{1}{2}$ ins. long, which are really the persistent stalks of the leaves become hard with age. These spines remain on the plant for many years. Leaves pinnate, $1\frac{1}{2}$ to 2 ins. long, composed of seven to eleven pairs of leaflets set on a spine-tipped, hoary stalk. Leaflets $\frac{1}{8}$ to $\frac{1}{4}$ in. long, obovate or elliptic, covered with silky down. Flowers purplish red, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, borne about four together in short axillary umbels; calyx $\frac{1}{4}$ in. long, cylindrical, five-toothed, hairy.

Native of the Mediterranean region and Asia Minor. This remarkable and pretty shrub was cultivated by Parkinson in 1640, and is interesting as one (but not the chief) of the plants that yield the gum-tragacanth, used in medicine as a demulcent. It is so slow of growth that a plant I have known for over twenty years is still but 12 ins. high, its lower branches

decumbent. The flowers appear in May and June, and the plant is quite pretty then. It is very well adapted for a shelf in the rock garden. Seeds rarely, if ever, ripen in England; but the plant can be increased



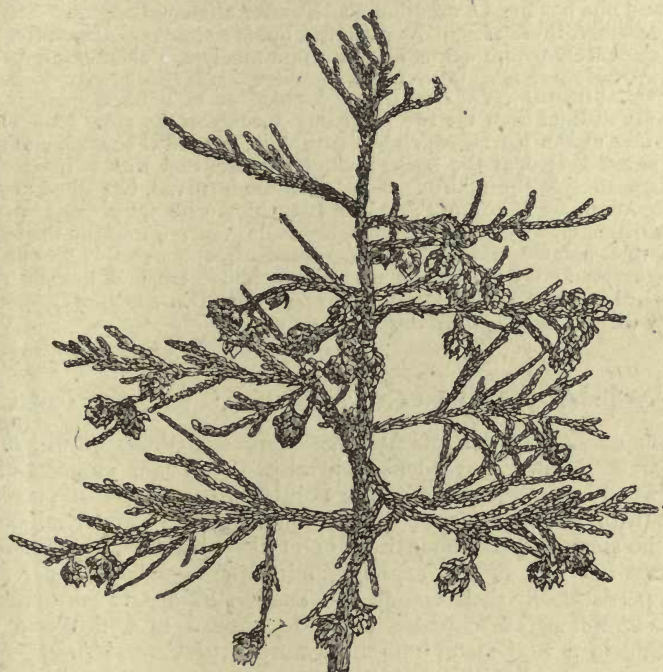
ASTRAGALUS TRAGACANTHA.

by cuttings made, $1\frac{1}{2}$ to 2 ins. long, of the tops of the shoots in August, and placed under handlights in sandy soil.

A. MASSILIENSIS, *Lamarck*, is very similar to the above in habit, foliage, and spininess, but has white flowers. Native of the Mediterranean region.

ATHROTAXIS. CONIFERÆ.

The three species which constitute this interesting genus of conifers are all natives of the Western Mountains of Tasmania, and were all introduced about 1857. Owing to their tenderness, they can best be grown in such places as Cornwall and Ireland, where, however, their distinctness and beauty are very marked. Their nearest relatives are the Sequoias of Western N. America, and Cryptomeria of Japan, and remarkable as is the fact of the widely separate habitats of these three allies, still more remarkable is it, that during the Eocene period *Athrotaxis* formed part of the British flora.



ATHROTAXIS CUPRESSOIDES.

They are small evergreen trees or shrubs with scale-like or awl-shaped leaves, closely and spirally arranged. The flower-catkins are unisexual, but both male and female are on the same tree. Cones woody, roundish, composed of numerous scales, which are closely packed, tapered at the base and swollen at the top, where they end in a point. It is in the last respect where the cones differ from those of *Sequoia*. Seeds much winged.

A. CUPRESSOIDES, *D. Don*.—Branchlets round and cord-like, the final subdivisions about $\frac{1}{8}$ in. diameter, bearing scale-like leaves which are very closely flattened to the twig, blunt or rounded at the apex, the bases overlapping, the

exposed part $\frac{1}{8}$ to $\frac{1}{6}$ in. long, diamond-shaped, convex or somewhat keeled on the back, dark green. On the main branches the leaves are much larger, and sharply pointed. Cones $\frac{1}{8}$ in. diameter before expanding, scales ten or twelve. A small tree, 20 to 45 ft. high in Tasmania. It is easily distinguished from the other two species in the very closely appressed leaves and smaller cones.

A. LAXIFOLIA, *Hooker fil.* (A. Doniana, *Maule*).—From the preceding species this differs in the longer, much less appressed leaves, the points of which are sharp and incurved but quite free. Branchlets round, slender, the final subdivisions (including the foliage) $\frac{1}{6}$ in. wide, bearing leaves $\frac{1}{6}$ to $\frac{1}{4}$ in. long, ovate-lanceolate, keeled and thickened down the middle, with a sharp, rather hook-like point. Cones $\frac{5}{8}$ to $\frac{3}{4}$ in. in diameter. A tree 25 to 35 ft. high in Tasmania. I have seen fine specimens at Kilmacurragh in Co. Wicklow, and at Menabilly in Cornwall. There is a good plant at Grayswood Hill, Haslemere, and one has lived out-of-doors at Kew for a few years past. The shoots rather resemble those of *Sequoia gigantea*, but are stronger. In cultivation the tree is of densely pyramidal habit. It is intermediate in character between the other two, but more resembles *A. cupressoides*. It is the hardest of the genus.

A. SELAGINOIDES, *D. Don*.—A tree up to 40 or more ft. high in a wild state, very distinct from the two preceding species in the stout branchlets and in the size of the leaves, which are $\frac{1}{4}$ to $\frac{1}{2}$ in. long, awl-shaped, ending in a sharp point, keeled at the back, hollowed inside, and with a band of white stomata each side the midrib. The leaves are incurved, but stand away from the twig at angles of 30° to 45° . The branchlets with their foliage are about $\frac{3}{8}$ in. in diameter. Cones 1 in. across, the scales tapered towards the base, and with a thin, pointed, triangular apex. Good examples of this species are at Kilmacurragh and Castlewellan in Ireland, and there is a healthy plant at Osborne, Isle of Wight. Fossil *Athrotaxis* found in Sheppey is said to be scarcely distinguishable from this species.

ATRAPHAXIS. GOAT WHEAT, POLYGONACEÆ.

Four or five species of *Atraphaxis* are sometimes grown, but they are scarcely known in gardens generally. They are amongst the few hardy woody representatives of the *Polygonum* family; being lax-habited shrubs with alternate leaves, and pale, transparent, slender stipules that clasp the stem and terminate in a point at each side. The flowers have no petals, but four or five sepals prominently veined, the inner ones of which persist, keep their colour, and enlarge, ultimately surrounding the fruit. Flower-stalks jointed. They are exclusively Old World plants, extending in a wild state from S.E. Europe to Central Asia. As they do not ripen seed in this country, at any rate commonly, they are best propagated by layers. A sunny position is best for them, and a well-drained sandy soil.

A. BUXIFOLIA, *Jaubert*.

(*Polygonum crispulum*, *Sims*, Bot. Mag., t. 1065.)

A deciduous shrub, 2 to $2\frac{1}{2}$ ft. high; branches not or slightly spiny, often decumbent; young wood pale, very minutely glandular. Leaves dull green obovate, oval, or roundish, $\frac{1}{3}$ to $\frac{3}{4}$ in. long, from half to nearly as wide, smooth, tapering at both ends, margins wavy and decurved; stalk $\frac{1}{8}$ in. or less long with a pale, membranous, chaffy stipule at each side $\frac{1}{4}$ in. long. Flowers pinkish white, produced in June in racemes that are 1 to $1\frac{1}{2}$ ins. long; each flower is $\frac{1}{8}$ in. diameter. Of the five divisions of the calyx, three remain

deepen in colour, and ultimately enclose the three-angled fruit. Flower-stalk slender, about $\frac{1}{4}$ in. long, jointed at about one-third of its length from the base.

Native of the Caucasus, cultivated for more than a century in England, but not sufficiently showy to have ever become common. It is, nevertheless, interesting and pretty.

A. LANCEOLATA, *Meissner*.

(*A. frutescens*, *K. Koch.*)

A deciduous mostly unarmed shrub of straggling habit, 1 to 2½ ft. high; young wood smooth, whitish. Leaves variable, linear-oblong or oblanceolate to lanceolate or oval; $\frac{1}{3}$ to 1½ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; grey green, wavy at the margin; stipules ending in long points. Flowers whitish, produced in slender, leafy racemes; from 1 to 3 ins. long, at the end of short lateral twigs; flower-stalk jointed about midway; inner sepals becoming at the fruiting stage rounded, $\frac{1}{4}$ in. across, and ultimately rose-coloured.



ATRAPHAXIS MUSCHKETOWI.

Native of S.E. Europe and the Caucasus, to Siberia and Turkestan; introduced in 1770. It flowers in August, and long remains pretty, but, like the rest of the genus, has never attracted much notice in gardens.

Var. VIRGATA, *Regel*, found in Turkestan, has whiter and more slender twigs than the type.

A. MUSCHKETOWI, *Krassnov*.

(*Bot. Mag.*, t. 7435; *A. latifolia*, *Koch.*)

A deciduous shrub, 6 to 8 ft. high, of open, lax, rather straggling habit; young stems smooth, pale; bark peeling. Leaves $\frac{3}{4}$ to 2½ ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in.

wide ; oblong or oval, tapered at both ends, margins wavy ; smooth, pale green ; stalk very short ; stipules pale, translucent, with two awl-shaped points, $\frac{1}{2}$ in. or more long. Flowers $\frac{1}{2}$ in. wide, white, with the anthers and ovary rose-coloured, produced in May and June in racemes 1 to $1\frac{1}{2}$ ins. long, at the end of the previous year's growth, when the young shoots are already several inches long ; flower-stalk jointed near the base.

Native of the Thian Shan range of mountains in Central Asia, where it was discovered by Krassnov ; introduced to Kew from St Petersburg in 1880. It is the strongest growing and perhaps the most ornamental of cultivated species of *Atraphaxis*, and distinct from the others in the large leaves.

A. SPINOSA, *Linnaeus*.

(*Tragopyrum spinosum*, *Presl*.)

A low, deciduous, twiggly shrub of sprawling habit, 1 to 2 ft. high, and twice or thrice as wide ; the slender branches often spine-tipped ; young wood smooth and whitish ; bark loose. Leaves oval or obovate to roundish, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, smooth, blue-green. Flowers $\frac{1}{2}$ in. across, white, rosy-tinted, borne in small axillary clusters on short, spine-tipped, lateral twigs ; sepals four, the two large inner ones roundish, veined, persisting and keeping their colour a long time, ultimately becoming flat, membranous, rounded, $\frac{1}{3}$ in. across, pressed close together with the two-edged fruit between them. It blossoms in August.

A widely spread species, native of W. Asia, S.E. Europe, the Orient, etc. ; cultivated since early in the eighteenth century. In some of its drier native localities its leaves are very small. Very pretty and interesting in flower and fruit. Although sometimes confounded with *A. lanceolata*, it is easily distinguished by its two-edged fruit, spiny branchlets, and smaller leaves.

ATRIPLEX. CHENOPODIACEÆ.

About half a dozen species of *Atriplex* are occasionally met with in gardens, the commonest and best being *A. Halimus*. They belong to the Goosefoot family, and are chiefly distinguished by the grey, whitish or silvery aspect of the foliage. The West American species form part of the characteristic grey vegetation of the great alkaline and saline areas of that region. Leaves alternate or rarely opposite ; flowers very small and quite unattractive. They need a light soil of moderate quality not enriched with manure, and a sunny position. They rarely bear fruit, and some do not even flower in cultivation. All should be tried in maritime localities. Increased easily by summer cuttings.

A. CANESCENS, *James*. GREY SAGE BRUSH.

An evergreen, unisexual shrub of sprawling habit, 5 or 6 ft. high, twice as much in diameter, of a light grey colour ; leaves and young branches covered with a fine scurfy down. Leaves alternate, narrowly oblong, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, fleshy, bluntish at the apex, tapered at the base. Flowers yellowish, very small ; produced during July in cylindrical, spiked clusters, both terminal and axillary, $\frac{1}{2}$ to 1 in. long ; the whole forming a slender, tapered, leafy panicle 6 to 12 ins. long. Fruit bracts $\frac{1}{2}$ in. long, deeply toothed.

Native of Western N. America from British Columbia to Nebraska, and found in dry, saline localities. It has long been cultivated at Kew, and is

perfectly hardy. In no way showy in flower, it attracts notice and pleases many by its almost white appearance.

A. NUTTALLII, *S. Watson*, with which the above has been confused in gardens, is quite a different plant. Its leaves are not very dissimilar, being $\frac{3}{8}$ to 2 ins. long, narrowly oblanceolate, often rounded at the apex, and grey; but the plant itself is low, and is only shrubby at the base, sending up erect, more or less annual stems, 1 to 3 ft. high. The fruit bracts, too, are less than half as large as those of *A. canescens*, being $\frac{1}{4}$ in. or less long. Native of Western N. America.

A. CONFERTIFOLIA, *S. Watson*.

A spreading, unisexual, sub-evergreen shrub, 2 to 4 ft. high; young branches and leaves covered with scurfy down, and the whole plant of a greyish white aspect. Leaves alternate, obovate, sometimes ovate or lance-shaped; $\frac{1}{2}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; bluntish or rounded at the apex, tapered at the base. Flowers very small, yellowish green, crowded densely in the leaf-axils in small, stalkless, roundish clusters. It blossoms in June.

Native of Western N. America from Oregon to New Mexico, and one of the characteristic inhabitants of the alkaline plains of that region. The male plant has, for some years, been cultivated in the rock garden at Kew; only attractive in its grey leaves.

A. HALIMUS, *Linnaeus*. TREE PURSLANE.

A vigorous, semi-evergreen shrub, 4 to 8 ft. high, of loose, bushy habit, the whole plant of a beautiful, silvery-grey aspect. Leaves alternate, ovate, rhomboidal or obovate; $\frac{1}{2}$ to 2 $\frac{1}{2}$ ins. long, $\frac{1}{4}$ to 1 in. wide; tapered at both ends, minutely and abruptly pointed, covered with a fine silvery scurf. Panicle terminal, 6 to 12 ins. long, produced in July, the flowers very small, greenish.

Native of S. Europe; cultivated since early in the seventeenth century. This is certainly the most attractive of the purslanes in this country, producing a very striking, silvery effect when planted in a group, especially in association with dark-leaved shrubs. It is also one of the best seaside shrubs. It is very rarely seen in blossom with us, but that does not detract much from its value. Severe frosts injure it, but it springs out afresh and soon recovers. Sparrows are said to be fond of the leaves, but I have never noticed them touch the plants at Kew.

[A. BREWERI, *S. Watson*, found in California, must be very closely allied to *A. Halimus*. Neither of them flowers at Kew, but there is no difference in foliage and habit. Can *A. Halimus* have been introduced to California and become naturalised there?]

A. PORTULACOIDES, *Linnaeus*. SEA PURSLANE.

A low shrub of straggling habit, 1 to 2 ft. high, and of a greyish aspect; young shoots and leaves covered with a close scurf. Leaves opposite, obovate or oblong, $\frac{1}{2}$ to $\frac{1}{2}$ in. long, $\frac{1}{8}$ to $\frac{1}{8}$ in. wide, tapered at the base. Flowers very small, greenish, borne on a terminal panicle, composed of slender spikes, on which the flowers are arranged in small clusters.

Native of Europe, including Britain, where it is common on the shores. It has nothing to recommend it for the inland garden, for it is not so distinct and silvery as the other species here mentioned. But it is worthy of notice for planting in exposed positions near the sea, where almost anything that will grow is welcome. Flowers in August, and well distinguished from the other species in cultivation by its opposite leaves.

AUCUBA. CORNACEÆ.

A genus of two or three Asiatic evergreen shrubs with opposite, leathery leaves; the sexes are on different plants, in which respect it differs from it allies the cornels (*Cornus*). The petals, calyx-lobes, and stamens are four to each flower; and the fruit is a large, oblong berry, scarlet or orange coloured.

A. JAPONICA, *Thunberg.*

(Bot. Mag., t. 1197 (variegated); t. 5512 (green).)

A unisexual, evergreen shrub of rounded bushy form, 6 to 10 ft. high, consisting of a thicket of erect or arching, little-branched stems. Branchlets stout, fleshy, quite smooth and green, bud-scales hairy at the tips. Leaves opposite, leathery, narrowly oval; 3 to 8 ins. long, $1\frac{1}{2}$ to 3 ins. wide; smooth, green and glossy on both surfaces, with usually a few large teeth towards the apex; stalk $\frac{1}{2}$ to 2 ins. long. On the male plant the flowers are produced on an erect, terminal panicle, 2 to 4 ins. long; each flower $\frac{1}{2}$ in. across, with four (occasionally five) purplish petals; flower-stalks downy. Fruits only borne by the female plant, and produced in compact clusters 2 or 3 ins. long, each berry roundish oval, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, bright scarlet.

Native of Japan; introduced by a Mr John Graeffier in 1783. This first plant was the well-known yellow-spotted form (*MACULATA*) and a female, but owing to the absence of pollen it was not until Fortune, sixty years later, introduced the green-leaved male plant, that the great beauty of the *Aucuba* as a berry-bearing shrub became known. Now, both green and variegated plants of both sexes are common, and small plants in pots, with large crops of fruit, can be bought from costermongers' barrows in the streets of London. As a bright and lasting decorative plant for rooms scarcely anything is so good. The plant flowers in March and April, and the fruit is in good colour all through the late autumn, winter, and spring.

The *Aucuba* has one merit in greater degree than any other evergreen: this is its capability of thriving under the shade of trees. Even under a beech, lime, or horse-chestnut, where grass will not grow, it will maintain a cheerful aspect. This means, of course, that it can not only manage without direct sunlight, but can fight its way against the roots of its big neighbours. To get fruits in abundance a moderately sunny spot is desirable, and of course plants of both sexes must be contiguous. For the pot plants as grown for market (all females) artificial fertilisation is needed.

There are now many slightly different forms of *Aucuba* grown that have originated as sports or seedlings, and vary chiefly in size, shape, and marking of leaf, also in the size and vigour of the shrub. Many which have been given names are apt to revert to the common spotted form. It is not, at any rate, necessary to specify but a few of them here. As a matter of fact, the spotted *Aucuba* is too common in gardens—the green type should largely replace it. Cuttings, or even small branches, root with great freedom.

Var. *DENTATA*.—Leaves small, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, with one or two very coarse teeth at each side. Var. *FRUCTU-ALBO*.—Berries yellowish white.

Var. *PICTA*.—Leaves not spotted, but with a broad, conspicuous margin of yellow; sometimes almost wholly yellow.

Var. *SALICIFOLIA*.—Leaves 3 to 5 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide, wholly green. Very distinct in its narrow leaves, sharply pointed.

A. HIMALAICA, *Hooker fil.*—In many respects this does not differ from *A. japonica*, but it is certainly not so useful a shrub. I do not, indeed, think the true plant is in cultivation, and may possibly not be hardy. It has much narrower leaves, 5 to 8 ins. long by 1 to $1\frac{1}{2}$ ins. wide, toothed much more finely, and lower down the leaf than in the common *Aucuba*; often the young shoots and young leaves are hairy. The petals are more pointed; berry scarlet, $\frac{1}{2}$ in. long.

Native of the eastern Himalaya at 5000 to 9000 ft., also of China. A plant in cultivation is sometimes called "*himalaica*," which is really only the long, narrow-leaved form of green *A. japonica*—properly var. *salicifolia*.

AZARA. BIXACEÆ

A genus of more or less tender shrubs, evergreen, and natives of Chile. Leaves alternate, and often arranged in pairs at each joint of the branchlet, one of the pair much the larger. The flowers have no petals, but abundant stamens, and are usually fragrant. *A. microphylla* may be grown in the open, but the others require the protection of a south or west wall. All can be propagated by cuttings made of ripened wood placed in gentle heat.

A. DENTATA, *Ruiz.*

(Bot. Reg., t. 1788.)

An evergreen shrub, 8 to 12 ft. high, sometimes a low tree, with downy branchlets. Leaves solitary, in pairs, or in threes at each joint, the largest ones ovate or oval, 1 to $1\frac{1}{2}$ ins. long, deep shining green above, very downy beneath; the smaller ones are from one-eighth to one-third the size of the larger; both are toothed. Flowers fragrant, borne on short, branching corymbs, the yellow stamens, as in *A. Gilliesii*, giving the flower whatever beauty it possesses. A tender shrub, only hardy against a wall at Kew; introduced from Chile about 1830. The leaves have a bitter taste. In some of the gardens in the milder parts of our islands may occasionally be seen *A. SERRATA*, *Ruiz*, but *A. dentata* is sometimes grown under the name. The true *A. serrata* has downy branchlets like *A. dentata*, but the leaves are larger, not felted beneath, often nearly smooth. The inflorescence too is very distinct, the flowers being arranged in a globose umbel borne at the end of a slender, downy stalk, up to $1\frac{1}{2}$ ins. long. Native of Chile.

A. GILLIESII, *Hooker.*

(Bot. Mag., t. 5178.)

An evergreen shrub or small tree. Leaves holly-like, pointed, ovate or oval, $1\frac{1}{2}$ to 3 ins. long, with distant teeth, deep lustrous green, pale beneath, smooth. Flowers densely crowded on racemes scarcely 1 in. long, springing from the axils of the leaves. Each flower is small, creamy yellow, the beauty of the raceme being due entirely to the numerous comparatively long stamens, which hide the remainder of the flower. This charming shrub, a native of Chile, is the most ornamental of cultivated Azaras in its blossoms, but is, unfortunately, not hardy enough to succeed in the open at Kew. Even against a wall it is sometimes cut down by a severe frost. It flowers in April and May, and may be recommended for the south-western counties.

A. MICROPHYLLA, *Hooker fil.*

(Gardeners' Chronicle, 1874, i., fig. 21.)

An evergreen shrub or small tree, the branchlets covered with a very dense dark down, and arranged on the same plane in two opposite rows. Leaves shining dark green, small, and very abundant, produced in pairs, one of each pair being about thrice as large as the other; the larger ones are obovate, $\frac{1}{2}$ to 1 in. long, usually more or less toothed, sometimes entire; the smaller ones more rounded. Flowers tiny, numerous, fragrant, borne in clusters at the leaf-axils; sepals green, the more conspicuous stamens deep yellow. Fruit a small, red, globose berry.

A delightful small tree, and one of the most elegant of all evergreens, owing to the small leaves and the frond-like arrangement of the branches. In the west of England it has reached nearly 30 ft. in height, and even at Belvoir, in Leicestershire, I have seen it nearly 20 ft. high. The flowers open in February if the weather be mild, later if severe; and their vanilla-like fragrance is perceptible yards away from the bush. The species, however, is not absolutely hardy. In 1895 it was killed to the ground at Kew, and in 1908-9 all the leaves came off and the smaller branches were destroyed. Still it has never been killed outright, and is decidedly the hardiest of the genus; introduced from Chile by Richard Pearse for Messrs Veitch, about 1861.

BACCHARIS. TREE GROUNDSEL. COMPOSITÆ.

A large genus of shrubs, small trees, and herbaceous plants, found exclusively in the New World. With the exception of the two species here described, the introduced species are too tender for all but the mildest parts of the kingdom. Leaves alternate. The flower-heads have no ray florets, and flowers of one sex only are found on a plant. The two following are easily accommodated in almost any soil, and are quite easily increased by summer cuttings. Many of the species have resinous secretions on the leaves and young wood, which give them, in the countries where they grow, a special value as firewood.

B. HALIMIFOLIA, *Linnaeus.*

A deciduous, unisexual shrub, ultimately 12 ft. high, and as much in diameter; of somewhat loose habit; young branches angular, smooth. Leaves grey green, alternate, very variable in shape and size, broadly obovate to narrowly oval, coarsely and unevenly toothed, except those at the flowering portion of the shoot, which are entire; 1 to 3 ins. long, $\frac{1}{4}$ to $1\frac{1}{2}$ ins. wide, tapering at the base to a stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; both surfaces are freely sprinkled with resin dots, and rather viscid. Flower-heads produced in October in axillary, stalked clusters, about five in a cluster. The shoots of the year branch at the top into numerous short twigs furnished with untoothed leaves, from the axils of which the clusters of flower-heads are produced, so that the whole forms a large rounded or cylindrical leafy panicle 3 to 6 ins. across. The blossom has little beauty, being of a dull white; but the numerous thistle-like heads of fruit of the female plant, with their silky white pappus, are rather striking.

Native of Eastern N. America; introduced in 1683, but not ornamental

enough to have ever become widely cultivated. It is hardy at Kew, and is a useful shrub for coast situations.

B. PATAGONICA, *Hooker*. PATAGONIAN GROUNDSEL TREE.

An evergreen shrub, of somewhat open but stiff habit, with angled, viscid, rather scurfy twigs, densely furnished with leaves. Leaves obovate, rounded at the apex, tapering at the base, stalkless, $\frac{1}{4}$ to 1 in. long, half as wide; usually coarsely toothed towards the apex; deep green above, scurfy on both surfaces. Flower-heads stalkless or nearly so, produced singly in the leaf-axils, yellowish white, and of little beauty.

Native of Patagonia in the region of the Magellan Straits. It is quite hardy at Kew, and is a rather interesting, small-leaved evergreen, growing 8 to 10 ft. high there, probably considerably more in warmer districts. It blossoms in May, and this character as well as its stalkless, solitary flower-heads and evergreen leaves, make it very distinct from *B. halimifolium*. It can be increased by cuttings at almost any season.

BAMBUSA. BAMBOO. GRAMINEÆ

The two species of bamboo here included under *Bambusa* are known as such in gardens. They have, however, little in common, and the generic name is only given provisionally; the flowers of neither of them have been produced in gardens, and until that happens their exact place in the natural order of grasses must remain uncertain. For cultivation and general remarks, see ARUNDINARIA.

B. DISTICHA, *Mitford*.—A dwarf bamboo, with stems 1 to 2½ ft. high, most of them about as thick as a lady's hatpin, zigzagged; joints $\frac{1}{2}$ to 3½ ins. apart, bearing solitary branches. Leaves arranged in two opposite rows; $\frac{1}{4}$ to 2¼ ins. long, $\frac{1}{6}$ to $\frac{1}{3}$ in. wide; rounded at the base, pointed, bright green above, slightly glaucous beneath; both margins bristle-toothed, but one more than the other; secondary veins two or three each side the midrib; leaf-sheaths hairy on the margins.

Native of Japan; cultivated by Messrs Veitch in the "seventies" of last century, and probably introduced for them by John Gould Veitch during the previous decade. Its dwarf, erect stems and tiny, distichously arranged leaves easily distinguish it from all other hardy bamboos. Before Lord Redesdale gave it the above name it was erroneously known as "*B. nana*."

B. QUADRANGULARIS, *Fenzi*. SQUARE-STEMMED BAMBOO.—A bamboo up to 30 ft. high in a wild state, but usually 6 to 12 ft. high in Europe. Stems round in a small state, but distinctly four-sided (with rounded corners) when $\frac{1}{2}$ in. or more thick. It is best distinguished in a small state by curious little spine-like protruberances at the joints, which are probably arrested branches. Joints of stem very prominently ridged. Leaves rich green, 4 to 8 ins. long, $\frac{1}{3}$ to 1 in. wide, minutely hairy when young on both surfaces, and bristly on both margins.

Native of China and Japan; introduced about 1892. This very distinct bamboo is, unfortunately, not very hardy, and is killed to the ground at Kew during all but the mildest winters, although never outright. It is, no doubt, admirably adapted for the south-western counties, where its remarkable quadrangular stems and generally ornamental character would make it well worth cultivation. It runs freely, even at Kew, where the top growth is so frequently killed. It is 12 ft. high on Isola Madre, Lake Maggiore.

BERBERIDOPSIS CORALLINA, *Hooker*. CORAL PLANT.

BIXACEÆ.

(Bot. Mag., t. 5343.)

An evergreen, scandent shrub of remarkable beauty. Leaves alternate, ovate or heart-shaped, rather hard in texture, the apex and margins set with spiny teeth; dark green above, glaucous beneath, $1\frac{1}{2}$ to 4 ins. long. Flowers produced in the axils of the uppermost leaves and in a terminal raceme, the whole forming a crowded group of pendent blossoms. Each flower is borne on a slender stalk, $1\frac{1}{2}$ to 2 ins. long, deep red like the flower itself which is globose, $\frac{1}{2}$ in. across, composed of nine to fifteen petal-like segments, the outer ones of which are small and spreading, the inner ones larger and concave, all of the deep fine red which pervades the whole inflorescence.

Native of the forests of Chile; discovered in the province of Valdivia, and introduced to England by Richard Pearse in 1862. The species is the only one of its genus at present known, and its botanical status is somewhat doubtful. It has usually been associated with the barberries. It is one of the most gorgeous of climbers, but unfortunately is not very hardy. At Kew it thrives fairly well on the outside wall of a hothouse, but is really only happy without protection in the mildest counties. At Carlew, in Cornwall, there is (or was a short time ago) a splendid plant 20 ft. across; and at Cragside, in Northumberland, another covers 20 ft. of a north wall, but is protected by glass in winter. The species makes a very attractive climber for an unheated greenhouse. It commences to flower in July, and continues in beauty for two or three months. The fruits form in this country, but do not usually produce good seed. Young plants can be raised from cuttings or layers. A little peaty soil may be put about the roots when first planted out; but afterwards as they gain in strength they will spread out into any open, sandy loam, so long as it is free from lime.

BERBERIS. BARBERRY. BERBERIDACEÆ.

A genus of deciduous and evergreen shrubs, now including sixty to seventy species. The hardy ones are natives of Europe, N. Asia, and the two Americas; the common barberry (*B. vulgaris*) is found in N. Africa—perhaps introduced. The leading characteristics of the genus are, the yellow wood, yellow flowers, and the three-parted character of the flowers; the sepals being six or nine, the petals six, and the stamens six. The fruit is an oblong or egg-shaped berry containing one to several seeds. The stamens are irritable, and if touched at the base with a fine-pointed instrument like a pin, they suddenly move from their sheltered position in the concavity of the petals, and close inwards on the pistil. The object of this interesting power is, no doubt, to secure cross-fertilisation. An insect in search of honey pushes itself or its proboscis into the flower, sets the stamens in action, and, becoming itself smeared

with pollen grains, carries them away to another flower and deposits them on the pistil.

As ornamental shrubs the barberries have many good qualities, and several of them, like *B. Aquifolium*, *Darwinii*, *aristata*, *stenophylla*, are in the very first rank of garden plants. They prefer a warm, loamy soil, but are by no means fastidious. Seeds are, as a rule, freely borne, and afford the best and readiest means of propagation; but for those sorts which do not produce seed in this country, and for those also that do not come true from seed like the coloured-leaved varieties, cuttings, layers or division of the plants must be resorted to. Cuttings should be made of fairly ripened wood, and put in sandy soil under a bell-glass or in cold frames.

The genus *Berberis* is one of the most troublesome to study, owing to the variability of the species and the difficulty of finding reliable characters to keep some of them apart. There is no genus of shrubs into which the irresponsible and careless maker of species has introduced more confusion than this. There are two leading groups, as follows:—

1. *MAHONIA*.—Invariably evergreen; leaves pinnate, no spines on the branches.

2. *BERBERIS* (proper).—Leaves simple, arranged in tufts; branches spiny. These may be divided into (*a*) evergreen, and (*b*) deciduous; and again separated according to the arrangement of the flowers; whether racemose, umbellate, fasciculate, or solitary.

The morphology of the leaves and spines of barberry is interesting. In the true barberry group, the "leaf," as we call it, is really the terminal leaflet of a pinnate leaf, the side ones of which are suppressed, and the tuft of leaves as a whole is a branch in which the internodes are suppressed. Then the spines (usually three-parted, but sometimes simple, sometimes much divided), in the axil of which the tuft of leaves is borne, is a metamorphosed pinnate leaf. An occasional reversion to the ancestral type reveals their true origin.

B. ACTINACANTHA, *Martius*.

(Bot. Reg., vol. 31, t. 5.)

A deciduous shrub, 3 ft. or sometimes more high, with rigid, crooked branchlets. The spines are very variable, some being the ordinary three-forked ones, so common in the genus; others are curiously flat and leaf-like, semi-circular or heart-shaped, the margins cut up into several long, triangular, spiny teeth. The spines on barberries, as has already been observed, are really modified leaves, and there is no species which shows their foliate character better than this. Leaves hard, rigid, not downy; variable in shape, and either obovate, oblong, or roundish; $\frac{1}{4}$ to $1\frac{1}{2}$ ins. long, with a few large spiny teeth. Flowers sweetly fragrant, produced in short umbels or clusters, deep yellow, $\frac{2}{8}$ in. across. Fruit blue-black, $\frac{1}{8}$ in. long.

This remarkable barberry, common enough in a wild state on the mountains of Chile, and often introduced to cultivation, is still comparatively rare. It does not flower freely, and seldom produces fruit. It is well adapted for a sunny spot on the rockery, but has more scientific interest than horticultural value.

B. ACUMINATA, Franchet.

An evergreen shrub, of open, spreading habit, with bright red young wood. Leaves two to four together in the axils of stout, three-parted spines, which are $\frac{3}{4}$ to 1 in. long; 3 to 6 ins. long, narrowly lance-shaped, stalkless, smooth, dark green; the margins cartilaginous, and armed with slender spiny teeth. Flowers brownish yellow, produced in clusters of four to eight from the leaf-axils of the previous year's shoots; each flower $\frac{3}{4}$ in. across, solitary on a slender stalk 1 to $1\frac{1}{4}$ ins. long. Fruit oblong, nearly $\frac{1}{2}$ in. long, black, covered with bluish bloom.

Discovered by the French missionary Delavay in Central China, in 1882, this fine barberry was not introduced to cultivation until 1900, when Wilson collected seeds in W. Hupeh. From these, plants were raised by Messrs Veitch at Coombe Wood, which flowered in 1904. The species is evidently hardy, and is likely to prove as ornamental as it is distinct.

B. ÆTNENSIS, Presl. MOUNT ETNA BARBERRY.

A deciduous, dwarf, stunted bush, about 2 ft. high, with crooked branches. Leaves small, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, obovate, sometimes bristle-toothed, sometimes entire; spines three-parted, sometimes over 1 in. long. Flowers yellow, in short racemes $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, carrying six to fifteen flowers. Fruit red.

Native of Sicily and Calabria, a scrubby bush inhabiting the mountains. It flowers in May and June, and is very pretty with its numerous closely set racemes. Suitable for the rock garden.

B. ANGULOSA, Wallich.

(Bot. Mag., t. 7071.)

A deciduous shrub, 4 ft. or more high, with erect, grooved branchlets covered when young with a short, dark down. Leaves dark glossy green, clustered in the axils of stiff spines, which are sometimes single, but usually three- or five-branched, and up to $\frac{1}{2}$ in. long; the leaves are obovate, or narrowly wedge-shaped, 1 to $1\frac{1}{2}$ ins. long, leathery, narrowing at the base to a very short stalk or none at all, the apex either rounded or pointed, often terminating in a short tooth; the slightly curled back margins are either entire, or have one to three spiny teeth at each side. Flowers solitary, on stalks $\frac{1}{2}$ to 1 in. long, or on short two- to four-flowered racemes; orange-yellow, globose, $\frac{1}{2}$ to $\frac{3}{4}$ in. across; outer sepals narrow oblong, inner ones twice as wide; petals obovate. Fruit elliptical, $\frac{2}{3}$ in. long, scarlet.

Native of N. India; first discovered in Kumaon early in the nineteenth century, and in 1849 by Hooker, in the Sikkim-Himalaya, at 11,000 to 13,000 ft. It is absolutely hardy at Kew, and although not one of the showiest barberries, is noteworthy for its unusually large flowers and berries. The latter are eatable, and, being less acid, are more palatable than most barberries.

B. AQUIFOLIUM, Pursh. OREGON GRAPE.

(Bot Reg., t. 1425; Mahonia Aquifolium, Nuttall.)

An evergreen shrub reaching a height of 6 ft., but as commonly seen usually 2 to 3 ft. high. Stems spineless, but little branched, spreading by underground suckers; bark grey-brown, smooth. Leaves 6 to 12 ins. long, pinnate, consisting of five to nine leaflets, which are stalkless, or nearly so, of variable shape, but usually broadly and (except the terminal one) obliquely ovate; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, glossy dark green, turning purplish in winter; the apex and

margin set with slender, spiny teeth. Racemes erect, produced in a crowded group from just beneath the terminal bud, each 2 to 3 ins. long, thickly set with golden yellow, slender-stalked flowers. The first flowers begin to open in February, or in mild seasons even earlier, but the great flowering time is April and May. Berries very abundant and ornamental, black, but covered with a fine violet-coloured bloom.

Native of Western N. America from Vancouver Island southwards; introduced in 1823. For some time after that date it remained very expensive, costing as much as ten pounds per plant, but in 1837 the price had been reduced to five shillings. At the present time nice plants can be obtained for thirty shillings per thousand. Few evergreen shrubs introduced from abroad have proved so valuable in British gardens as this. It is very hardy; I have seen it thriving on the bleak elevations of the Yorkshire wolds. For forming a low evergreen covering for the ground in moderately shaded positions, such as beneath deciduous trees, there is no evergreen so beautiful and so thriving as this. It is also admirable for planting as a groundwork for flowering shrubs that are leafless when in blossom, like the Forsythias and *Jasminum nudiflorum*. It is not particular as to soil. Easily increased by seed, but an abundance of plants can be obtained by dividing the old plants in spring.

Raised from seed it varies to a considerable extent, and names have been given to several varieties. It appears also to have hybridised with other W. American species like *B. pinnata* (*B. fascicularis*) and *B. repens*, as is shown by the dull glaucous-leaved forms seen in gardens, very different from the polished dark green of the type.

Var. *LATIFOLIA* and *MACROPHYLLA* have much larger, broader leaves than ordinary.

Var. *MURRAYANA*.—Leaflets dull green, shorter, broader, and more wavy than those of the type; perhaps a hybrid with *B. repens*.

Var. *ROTUNDIFOLIA HERVEYI*.—Leaflets often in threes, large and broad, the plant forming a low tuft. Probably a hybrid with *B. repens*.

B. ARISTATA, De Candolle.

A very handsome shrub, of spreading, elegant habit, as much as 10 ft. high and 15 ft. in diameter, with smooth young branchlets becoming grey the second



BERBERIS ARISTATA.

season. Ordinarily it is deciduous, but young plants or vigorous sucker growths will retain their foliage through the winter. Leaves three to seven in a tuft, $1\frac{1}{2}$ to 4 ins. long in each tuft, obovate, green on both sides, or often

whitish beneath; always spine-tipped, but varying from few or numerous teeth on the margins to none at all. Each tuft of leaves springs from a single or triple spine sometimes $1\frac{1}{4}$ ins. long, and produces one drooping raceme 2 to 3 ins. long. Flowers numerous, bright golden yellow. Berries spindle-shaped or oblong, up to $\frac{1}{2}$ in. long, red, covered with blue-white bloom.

Var. CHITRIA (B. Chitria, *Lindley*, Bot. Reg., t. 729).—Flowers in panicles (not racemes) up to 5 ins. long; wood reddish brown the second year; blossoming season, June and July. Twigs downy when young.

Var. FLORIBUNDA, *Hooker fil.* (Bot. Reg., vol. 27, t. 46, as *B. coriaria*), has smaller leaves and longer-stalked flowers.

Var. INTEGRIFOLIA is a form whose leaves have very few or no teeth.

Native of the Himalaya, and represented by a great number of slightly varying forms, all of which are valuable garden plants. Of all deciduous barberries this is the strongest-growing; it is also one of the most ornamental. It is an admirable shrub on a spacious lawn, almost as striking when loaded with its fine trusses of blue-white berries as when it is in bloom. So well adapted to our climate is it, that it has been found wild in English hedgerows, having grown there, no doubt, from seeds deposited by birds.

B. ASIATICA, *Roxburgh.*

A strong-growing, vigorous evergreen shrub, 6 ft. or more high, branchlets very minutely downy, somewhat furrowed, yellowish. Leaves hard and leathery, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, obovate, or sometimes nearly orbicular, tipped with a spiny tooth, the margin often entire, sometimes set with a few large, sharp teeth, dark green above, whitish beneath. Flowers yellow, in short corymbose racemes. Berries egg-shaped or nearly globular, red, then black covered with purplish bloom.

Native of the Himalaya; first introduced early in the nineteenth century, but still very rare. It is only suitable for Cornwall and similarly mild localities, and even there is sometimes affected by cold. It lived at Kew for a good many years on a sunny wall. *B. aristata* and its var. *Chitria* are often mistaken, and made to do duty, for this species. But *asiatica* is more strictly evergreen, is always white beneath the harder leaves, and the inflorescence is shorter and wider.

B. BREVIPANICULATA, *C. K. Schneider.*

A deciduous shrub, 4 to 6 ft. high, of rather spreading habit, with whip-like branches; young branchlets reddish, not downy, grooved; spines in threes (solitary towards the end of the shoot), pale brown, slender, up to 1 in. long. Leaves $\frac{3}{8}$ to $1\frac{1}{4}$ ins. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide, obovate, tapered at the base, rounded or abruptly pointed at the apex, very shortly stalked, entire or sparsely toothed towards the end, dull green and smooth. Flowers pale yellow, in panicles 1 to 2 ins. long, produced towards the end of the shoots from the joints. Fruit egg-shaped, $\frac{1}{4}$ in. long, terra-cotta red, more or less covered with purple bloom.

Native of W. China; introduced by Wilson in 1904. This bush forms a dense mass of twiggy branches from out of which the long whip-like young shoots are thrust. It is very handsome in fruit in September. Closely allied and very similar to this is *B. PRATTII*, *C. K. Schneider*, but its leaves are pale green beneath, not glaucous, as in *brevipaniculata*, and its young shoots are minutely downy (see Bot. Mag., t. 8549, Wilson, No. 1050A).

B. BUXIFOLIA, *Lamarck.*

(Bot. Mag., t. 6505; *B. dulcis*, *Sweet.*)

A bush usually 6 to 10 ft. high, of erect, stiff habit, partially evergreen in ordinary seasons, but losing most or all of its leaves during winters of

unusual severity. Leaves leathery, even hard in texture, produced in tufts in the axils of stiff triple spines, or (near the end of the shoots) simple spines. Each leaf is $\frac{1}{2}$ to 1 in. long, obovate or oblong, tapered at the base to a short stalk, spine-tipped but otherwise quite entire, smooth. Flowers solitary on stalks $\frac{3}{4}$ to 1 in. long, amber yellow; one or two flowers spring from each tuft of leaves. Fruit globular or orange-shaped, dark purple.

An old inhabitant of gardens, having been introduced about 1826 by Anderson, the botanical collector attached to Capt. King's expedition to survey the Magellan Straits. Seeds were sent to Mr Low's nursery at Clapton, and a plant flowered there in 1831. It is the first of the true barberries to flower, its blossoms appearing early in April, sometimes in March. The berries are said to be used for conserves, etc., in Chile, where it extends in a wild state from the Straits of Magellan as far north as Valdivia. A fine example, 13 ft. high and 28 ft. through, is in Sir H. Maxwell's garden at Monreith, planted in 1872.

Var. AUREO-MARGINATA has its leaves edged with golden yellow.

Var. NANA is a curious dwarf form, of tufted habit, producing a thick mass of weak, unarmed stems rarely more than 18 ins. high; leaves larger, rounder than in the type; flowers rarely seen.

B. CANADENSIS, *Miller*. \ AMERICAN BARBERRY.

(*B. angulizans*, *Hort.*)

A deciduous shrub, 3 to 5 ft. high, with the branchlets not downy, but thickly covered with small, warty lenticels, and armed with three-parted spines. Leaves narrowly obovate, from 1 to $2\frac{1}{2}$ ins. long, tapering very gradually at the base, the apex rounded or acute, but always terminating in a short spine, the margin toothed, sometimes remotely so, sometimes almost entire, smooth. Racemes 1 to $1\frac{1}{2}$ ins. long, bearing from six to twelve yellow flowers. Fruit oval or nearly globose, red.

The specific name of this barberry is a misnomer, for it does not appear to be a native of any part of Canada, its real home being on the slopes of the Allegheny Mountains in Virginia, North Carolina, etc., where it is oftenest found on the banks of mountain streams. It is closely related to the Old World *B. vulgaris*, but it is not quite so attractive a shrub; it differs in its paler and more glaucous leaves, its smaller flowers, its shorter, almost corymbose racemes, and in its shorter, rounder fruit. It has been cultivated in this country since the middle of the eighteenth century, but is now rarely seen.

B. CANDIDULA, *C. K. Schneider*.

(*B. Wallichiana pallida*, *Hort.*; *B. W. hypoleuca*, *Hort.*)

An evergreen, dwarf shrub of dense, hemispherical habit, probably never much more than 2 ft. high; the branches rigidly arching, quite smooth when young, bright brown, armed at each joint with a trio of stiff, sharp, pale brown spines, up to $\frac{5}{8}$ in. long. Leaves produced in tufts in the axils of the spines, dark shining green above, vividly blue-white beneath; $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide; oblong or narrowly oval, terminated by a minute, slender spine, and armed with a few similar ones on the recurved margins; very shortly stalked. Flowers bright yellow, somewhat globose, $\frac{5}{8}$ in. across, solitary, on a slender stalk about $\frac{1}{2}$ in. long. Fruit oval, covered with a purple bloom.

Native of China; first collected by Farges, and raised in 1895 by M. Maurice de Vilmorin. It flowered in 1900, and was figured in the *Fruticetum Vilmorinianum*, p. 15, as "*B. Wallichiana* var. *pallida*." It has since been

introduced by Wilson for Messrs Veitch. It appears distinct enough to rank as a species, being different in habit from either *B. Hookeri* or *B. Wallichiana*. Its neat, dense habit and slow increase in size make it very suitable for the rock garden.

B. CONCINNA, Hooker fil.

(Bot. Mag., t. 4744.)

A low, deciduous bush, 3 ft. high, of close, compact habit; branches furrowed. Leaves lustrous green above, white beneath, obovate, 1 in. or less long, tapering at the base to a short stalk, the midrib ending in a spiny tooth. Three spines, each $\frac{1}{2}$ to $\frac{3}{4}$ in. long, guard the base of each tuft of leaves. Flowers solitary, on a slender stalk 1 to $1\frac{1}{2}$ ins. long, pendent, globose, deep yellow, $\frac{1}{2}$ in. across. Berries oblong, fleshy, red, $\frac{1}{2}$ to $\frac{3}{4}$ in. long.

Native of the Sikkim-Himalaya at 12,000 to 13,000 ft.; introduced to Kew by Sir Joseph Hooker about 1850. A very pretty barberry, and distinct through the vivid whiteness of the under-surface of the leaves. It is best propagated by seeds, which it produces most seasons.

B. CRETICA, Linnaeus. CRETAN BARBERRY.

(Sibthorp's Flora Græca, t. 342.)

A low, sometimes prostrate, deciduous shrub; branches crooked, formidably armed with three-forked spines, each fork $\frac{1}{2}$ to $\frac{7}{8}$ in. long. Leaves small, obovate, pointed, averaging $\frac{1}{2}$ in. in length, mostly without teeth, sometimes slightly toothed. Flowers yellow, in short, few-flowered clusters. Berries globose, nearly black, with a bloom.

Native of the mountains of Crete and other islands of the Mediterranean. The leaves, spines, and flowers form a dense, crowded mass along the branches. A shrub for the rock garden.

B. DARWINII, Hooker. DARWIN'S BARBERRY.

(Bot. Mag., t. 4590.)

An evergreen shrub of dense habit, from 6 to 12 ft. high; branchlets covered with a dense, reddish brown down. Leaves very dark, glossy green, stalkless, hard in texture, obovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, the apex three-spined, and with one to several spiny teeth down each side; they spring in tufts from the axils of short, multiple spines. Flowers on drooping racemes $1\frac{1}{2}$ to 2 ins. long, each flower on a slender stalk longer than itself, deep golden or orange-coloured, tinged with red; petals elliptical, notched at the tip. Fruit plum-coloured, roundish oval, the size of small peas.

Native of Chile; first discovered by Charles Darwin in 1835, when attached as naturalist to the *Beagle* on her famous voyage. It was introduced in 1849 by William Lobb for Messrs Veitch, from the island of Chiloe. One of the finest of all evergreen shrubs, this is also tolerably hardy. It likes a good loamy soil and should be given a position sheltered from cutting winds. It is in its greatest beauty, of course, during April and May, when laden with its profusion of golden blossom, but it is often very attractive also in early autumn, bearing a large crop of the bluish berries and occasionally a small crop of flowers. Should be propagated by seeds. *B. Darwinii nana* is a seedling of *B. stenophylla* (q.v.).

B. DICTYOPHYLLA, *Franchet.*

(Bot. Mag., t. 7833.)

A graceful, deciduous bush, free from down on leaf and twig ; with long, slender branches, often sent up from the base as strong sucker growths, covered at first with a glaucous bloom, afterwards brown. Leaves in small tufts ; each tuft subtended by a stout, triple spine, as long or longer than the leaves ; obovate, stalkless, green above, glaucous beneath, armed with a spiny tooth at



BERBERIS DICTYOPHYLLA.

the apex, and usually with one to five more on each margin. Flowers very short-stalked, one (rarely two) in each cluster of leaves ; $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter, of a soft, pale yellow. Berries bright red, egg-shaped.

First discovered by the French missionary Delavay, in Yunnan, at 3000 ft. altitude in 1886 ; introduced to France by the Abbé Farges from Szechuen. It reached this country in 1897, when it was sent to Kew by M. Maurice de Vilmorin. It blossoms regularly in May, and ripens seed from which new plants can be raised. The leaves turn a beautiful warm red in autumn.

B. EMPETRIFOLIA, *Lamarck*. DWARF BARBERRY.

(Bot. Reg., vol. 26, t. 27.)

A low, evergreen shrub, rarely more than 12 to 18 ins. high, with slender trailing branches in this country, but, as seen in Chile, often sturdier and more erect; young shoots red. Leaves $\frac{1}{2}$ to 1 in. long, quite narrow (less than $\frac{1}{8}$ in.), and made to look still narrower by the margins being curled down; the apex is spine-tipped. The leaves arise in tufts from the axils of simple, or three-parted spines, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers produced singly, or two together at each tuft, golden yellow. Fruit nearly black. Blossoms in mid-May.

Introduced from Chile in 1827 by Messrs Low, then nurserymen at Clapton. Quite distinct from any other barberry in leaf and habit, and the lowest-growing of them all, this little shrub is well worth a place in the rock garden. It is not common, but has played an important part in European horticulture in being one of the parents of the beautiful hybrid—*B. stenophylla*. It was originally discovered by Commerson, the South American traveller.

B. FENDLERI, *A. Gray*. FENDLER'S BARBERRY.

(Garden and Forest, 1888, fig. 72.)

A deciduous shrub up to 6 ft. high, with stems and branches "shining as if varnished." Leaves glossy green, lanceolate, $1\frac{1}{2}$ to 2 ins. long, $\frac{3}{8}$ to $\frac{1}{2}$ in. wide; stalkless, toothed except at the base, produced in tufts of four or five. Flowers in racemes $1\frac{1}{2}$ to 2 ins. long, each flower $\frac{1}{2}$ in. across, the outer segments orange-coloured, the inner ones yellow. Fruit red.

Native of Western N. America; first found by Mr Fendler near Santa Fé, New Mexico, and afterwards at the forks of the Rio Grande in S. Colorado. It is at present little known, and does not appear to have any particular value for gardens. It is interesting, geographically, as the only West N. American representative of the true barberries, as distinct from Mahonias.

B. FORTUNEI, *Lindley*. FORTUNE'S BARBERRY.(Mahonia Fortunei, *Fedde*.)

An evergreen shrub, 5 to 6 ft. high, with erect, unbranching stems. Leaves 6 to 8 ins. long, pinnate, consisting usually of seven leaflets, which are linear-lanceolate, taper gradually to both ends, and are 2 to 4 ins. long, and about $\frac{1}{2}$ in. wide; margins except towards the base set with forward-pointing teeth; under-surface marked with prominent, netted veins. Flowers yellow, densely crowded on narrow, cylindrical racemes 2 to 3 ins. long, erect. Blossoming in late autumn (October and November), the species rarely develops fruit in this country.

Robert Fortune found this shrub cultivated in a nursery at Shanghai, and introduced it in 1846. It has since been found wild in several parts of China. It is rather tender, and will not thrive in the open ground at Kew. In milder districts it grows quite well, as in Canon Ellacombe's garden at Bitton, near Bath, where it flowers annually in October. It is distinct from all the other pinnate-leaved barberries in the narrow, dull green leaflets, and in the slender racemes, less than $\frac{1}{2}$ in. in diameter; but is one of the least effective.

B. FREMONTII, *Torrey*. FREMONT'S BARBERRY.(Garden and Forest, 1888, fig. 77; Mahonia Fremontii, *Fedde*.)

An evergreen shrub, 3 to 12 ft. high, with pinnate leaves composed of five or seven leaflets of a vividly glaucous colour. Leaflets $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long,

spine-tipped, and with one or more spiny teeth at each side; the terminal leaflet is stalked and ovate to lanceolate, the others sessile and shorter. Flowers yellow, and produced four to eight together towards the end of a raceme 2 to 3 ins. in length; each flower on a slender stalk about $\frac{1}{2}$ in. long. Fruit blue, becoming dry and inflated at maturity, enclosing six to eight seeds.

Native of the hot, dry, south-western United States (Texas, Arizona, etc.). A striking and handsome species, but too tender for the open ground except in the milder counties. It may be grown on a south wall, and, wherever cultivated, should be given the sunniest position available. The only species in cultivation likely to be confused with this is *B. trifoliolata*, which has leaflets of the same form and very glaucous hue, but only three of them to each leaf.

B. GAGNEPAINII, C. K. Schneider.

(Bot. Mag., t. 8185, erroneously as *B. acuminata*.)

An evergreen shrub with clustered stems, free from down in all its parts, at present 2 to 3 ft. high (perhaps ultimately 4 or 5 ft.), the branches set with three-parted spines $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Leaves of firm texture, $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide; linear-lanceolate, tapering to a fine point; dark dull green, the margins undulated and set with slender, forward-pointing teeth. Flowers in clusters of about six (sometimes ten or twelve) at each tuft of leaves, each flower on a slender stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, bright yellow, $\frac{1}{2}$ in. across. Berry black, covered with blue bloom, oval, $\frac{1}{3}$ to $\frac{5}{8}$ in. long, $\frac{1}{4}$ in. wide.

Native of Szechuen, China, introduced for Messrs Veitch by Wilson about 1904. This barberry is one of the most promising of Wilson's introductions from China, being evergreen, of compact, neat habit, and flowering abundantly. Allied to *B. Hookeri*, it is of more graceful habit. It is quite hardy at Kew, and free growing. It flowers in late May.

B. HAKEOIDES, C. K. Schneider.

(*B. congestiflora* var. *hakeoides*, *Hooker fil.*, Bot. Mag., t. 6770.)

An evergreen shrub of loose, rather ungainly habit, as much as 12 ft. high in favourable situations; branches erect, not downy, slightly furrowed and but little branched. Leaves produced mostly in pairs, and very variable in size, ranging from $\frac{1}{2}$ to $2\frac{1}{2}$ ins. in length; usually almost orbicular, with a heart-shaped or rounded base; thick and hard in texture, pale or slightly glaucous beneath, the margins armed with extended spiny teeth. On the lower, bigger leaves of the branch the stalks are as much as $1\frac{1}{2}$ ins. long, but towards the end of the branch the leaves become smaller and the stalks shorter, until finally they are sessile. The leaves spring



BERBERIS HAKEOIDES.

from the axil of a spiny stipule, and this too becomes smaller as the leaves decrease in size, until, near the apex of the shoot, leaves cease to be borne and tiny stipules alone remain. Flowers borne during April and May, on the shoots of the previous summer in dense, round clusters, $\frac{1}{2}$ to $\frac{3}{4}$ in. across, from the axil of each pair of leaves right to the leafless end of the branches; they are bright golden yellow, $\frac{1}{4}$ in. across; sepals nine, concave; petals six, erect, incurved, slightly notched. Fruit usually one-seeded, blue-black.

Native of Chile; discovered by Pearce, and introduced in 1861. In spite of its somewhat ungainly habit it is, when seen at its best, a shrub of striking beauty. There is a fine plant in the Coombe Wood nursery, the mother probably of all the plants in cultivation, but a still finer one is in Canon Ellacombe's garden at Bitton; this is growing against, but not on, a wall, and is 12 ft. high. Still it is not amongst the hardiest of barberries, and at Kew is apt to become shabby during hard winters. It is usually propagated by grafting on *B. Aquifolium* or *B. vulgaris*, but owing to the habit of the stock producing suckers, layering would be preferable. *B. CONGESTIFLORA*, Gay, of which the above has been regarded as a variety, is not in cultivation.

B. HETEROPHYLLA, *Jussieu*.

A deciduous shrub, 3 or 4 ft. high, of straggling habit, with crooked, much branched stems. Leaves of two kinds; the first kind $\frac{1}{2}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, narrowly obovate, rounded or spine-tipped at the apex, margins without teeth; second kind about the same in length, but much wider in proportion, and with three or five large spiny teeth, altogether very much like a tiny holly leaf in form. The leaf-clusters spring from the bases of triple spines, each prong of which is $\frac{1}{2}$ to $\frac{3}{4}$ in. long, and as they are often less than $\frac{1}{2}$ in. apart on the branchlet, the shrub is formidably armed. Flowers solitary, on a stalk $\frac{1}{2}$ in. long; orange-yellow, with sepals and petals so incurved as to make each flower a little ball. Berry about the size of a pea, black, covered with blue bloom, but not seen by me in this country.

Discovered originally in the Straits of Magellan by Commerson, but said also to occur wild in other parts of Chile and Patagonia. It is a curious and very rare barberry, flowering at Kew in April. It produces sucker growths from the base, by which means it can be propagated. *B. ilicifolia*, *Forster*, another species with holly-like leaves, bears some resemblance to this, but has short, many-flowered racemes.

B. HETEROPODA, *Schrenk*.

(Garden and Forest, 1895, p. 455.)

A deciduous shrub, up to about 8 ft. high, of loose, spreading habit; branchlets glossy, smooth, brown, either armed with simple or three-parted spines 1 in. long, or unarmed. Leaves grey green, broadly ovate or oval, rounded at the apex; the blade 1 to 1½ ins. long, tapering at the base to a long, slender, reddish stalk, $\frac{2}{3}$ to 1 in. long; margin sometimes almost or quite entire, more often set with fine teeth. Inflorescences drooping, long-stalked, three of which often issue from one tuft of leaves; one being large, racemose, with as many as fifteen flowers, the other two smaller, umbellate, with about three flowers. Each flower is on a slender stalk, fragrant, orange-yellow, opening in May. Fruit oblong or egg-shaped, $\frac{1}{3}$ in. long, black, covered with blue bloom.

Native of Turkestan; introduced to Kew in 1886 from the St Petersburg Botanic Garden through Mr Albert Regel. It is distinct by reason of its long, slender leaf-stalks, and long, drooping, many-flowered raceme, often flanked on either side by a few-flowered umbel.

B. HOOKERI, *Lemaire*. HOOKER'S BARBERRY.(B. Jamesoni, *Hort.*; B. Wallichiana, *Hort.* (not *De Candolle*).)

An evergreen shrub, 3 to 5 ft. high, producing a dense thicket of erect, angled stems, which branch near the top; young twigs not downy; thorns usually three-forked, each fork slender, rigid, from $\frac{3}{8}$ to 1 in. long. Leaves in tufts, lanceolate to obovate; 1 to 3 ins. long, $\frac{1}{2}$ to 1 in. wide; leathery, almost stalkless; dark green above, glaucous white beneath; the margins armed with slender teeth. Flowers solitary on their stalks, borne in clusters at each tuft of leaves; $\frac{3}{8}$ in. across, pale yellow, the sepals tinged with red. Berries narrow, cylindrical, $\frac{1}{2}$ in. long, tapering towards the end; black-purple, often remaining on the plant until the following spring.

Native of the Himalaya. This shrub has been so much confused with B. WALLICHIANA, *De Candolle*, that it is difficult to disentangle the histories of the two. The true B. Wallichiana is probably not in cultivation; it differs from B. Hookeri in the larger leaves (3 to 4 $\frac{3}{4}$ ins. long), and especially in their veining; the veins branch out from the midrib, parallel with each other, but never reach the margin, becoming merged in a vein which runs parallel with it. In B. Hookeri, the veins fork near the margin, but do not merge into one another. B. Hookeri flowers in April and May, and as a rule is quite hardy. The only time I have known it suffer much was during the trying winter of 1908-9, when it lost most of its leaves, and the upper portion of the stems was killed.

Var. LATIFOLIA.—A much taller and more robust shrub. A specimen at Kew was 10 ft. high and 12 ft. through, until killed to the ground during the winter of 1908-9. The leaves are green and glossy on both surfaces, and they are considerably longer (sometimes over 4 ins.) and broader than in ordinary B. Hookeri. It is known in gardens as B. Knightii, and is, perhaps, not quite so hardy as the type.

Var. VIRIDIS.—Leaves uniformly bright green beneath. Although a marked characteristic of some plants, the white under-surface of typical B. Hookeri is not a wholly reliable distinctive character. I have seen young plants partly bright green and partly blue-white beneath.

The best way to increase this species and its varieties is by the seeds it so plentifully bears; they may be sown in shallow boxes or in pots, and the young plants pricked out the following year into nursery rows. The type and the variety viridis are useful shrubs for planting in places where an evergreen is wanted that will keep fairly dwarf without pruning.

B. ILICIFOLIA, *Forster*. HOLLY-LEAVED BARBERRY.

(Bot. Mag., t. 4308.)

An evergreen, straggling bush, with deeply grooved branches; said to grow 8 ft. high in Chile, but has not been more than half as high in cultivation. Leaves holly-like, from 1 to 2 ins. long, dark glossy green, obovate, with a few spiny teeth towards the apex. Flowers $\frac{3}{8}$ in. across, orange-yellow, densely crowded on short racemes.

First introduced to Kew from S. Chile by Sir Joseph Hooker, whilst he was attached to Sir John Ross's antarctic expedition, 1839-43, this striking barberry has always been one of the rarest in cultivation. It may not exist in this country at all at the present time, although it flowered at Kew in 1847. It is probably better suited for the south-western maritime counties than inland ones. A form of the hybrid B. Neubertii (*q.v.*) is usually offered by nurserymen as B. ilicifolia.

B. JAPONICA, *R. Brown.* JAPANESE MAHONIA.(*Mahonia japonica*, *De Candolle.*)

An evergreen shrub of very stiff, sturdy, erect habit; its thick, unbranched stems, 10 ft. or perhaps more high, bearing a few leaves at the top. Leaves 1 to 1½ ft. long, composed of seven, nine, eleven, or thirteen leaflets, which are 2 to 5 ins. long, 1½ to 3½ ins. wide, obliquely ovate, very hard and stiff; dark dull green, armed on each margin with four to six large spiny teeth; the lowest and smallest pair situated at, or very close to, the base of the leaf-stalk (a good distinction from *B. nepalensis*). Flowers lemon-yellow, delightfully fragrant, borne in a cluster of numerous slender, erect racemes 6 to 9 ins. long, terminating the stem; the fragrance resembles that of the lily of the valley. Berries oblong, as much as ½ in. long, purple.

Var. *BEALEI* (*Mahonia Bealei*, *Carrière*).—A distinct variety of great vigour, the leaflets larger, broader, more rounded, and with fewer spines; the bases of each pair often overlap. The racemes also are finer, the flower-stalks shorter. It is the most striking of all the Mahonias, the leaflets being sometimes 8 ins. long and 6 ins. wide. Introduced from China in 1845, by Fortune, who regarded it as a distinct species; it was figured as *B. Bealei* in the *Botanical Magazine*, t. 4852.

These two Mahonias, with others of an intermediate character, are the most striking of all the group to which they belong. Their flower-clusters commence to open in February, and continue in beauty for several weeks. Allied to *B. nepalensis*, *B. japonica* is readily distinguished in its typical form by its duller leaves, having the lowest pair of leaflets close to the base of the leaf-stalk. The variety *Bealei* is much hardier, and will thrive (as at Kew) where *B. nepalensis* fails. It should, all the same, be given a sheltered spot, and settled in its permanent position as early as possible, for few shrubs suffer more from transplanting. This operation may be successfully done during a showery time in May.

Var. *GRACILLIMA* is described as having smaller leaflets than the type—about 2 ins. long and ¾ in. wide—but I do not know that it is in cultivation in Britain.

B. LEVIS, *Franchet.*

An evergreen shrub of bushy habit, 5 or 6 ft. high, its branchlets stiff, smooth, armed with slender, stiff triple spines ½ to 1½ ins. long. Leaves oblanceolate, tapering more gradually towards the base, often widest above the middle; 1½ to 3½ ins. long, ¼ to ⅝ in. wide; not wavy at the margins but set there with sharp, bristle-like spines; dark, rather glossy green above, paler beneath and very smooth, the veins scarcely visible. Flowers in clusters of usually six to twelve, sometimes more, ½ to ⅓ in. wide, yellow. Fruit described by Wilson as at first red, finally jet-black, without bloom.

Native of W. Szechuen, China; introduced in 1909. A promising vigorous evergreen. It has been confused with *B. Gagnepainii*, but as seen growing side by side the two are very distinct. The latter differs from *B. levis* in its leaves being very wavy, duller, and broadest below the middle, the stems more clustered, erect, and less branched.

B. LYCIUM, *Royle.*

(Bot. Mag., t. 7075.)

A deciduous or semi-evergreen shrub, of spreading habit, 6 or 8 ft. high; young shoots furnished with fine down. Leaves narrowly obovate, light green above, glaucous beneath, varying in length in each tuft from ¾ to 2 ins.

with a few teeth towards the apex, or with none, but always spine-tipped. Thorns three-parted, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Racemes 2 to 3 ins. in length, carrying from twelve to thirty flowers, each $\frac{1}{2}$ in. across, bright yellow. Berries $\frac{2}{3}$ in. long, oblong, covered with a fine blue-purple bloom.

Native of the Himalaya, and quite hardy at Kew, where it flowers in May and June. It was in cultivation there in 1853, and had probably been introduced by Sir Joseph Hooker a few years previously. This plant yields the drug known as "Lycium," used for ages in inflammatory affections of the eyes. The beautiful purplish berries are eaten in N. India. It is a species distinct in the hard, pale green leaves, conspicuously net-veined above, glaucous beneath, and almost entire.

B. NEPALENSIS, *Sprengel*. NEPAL BARBERRY.

(*Mahonia nepalensis*, *De Candolle*.)

An evergreen shrub, sometimes 20 ft. high in the Himalaya, but rarely more than one-third as high in Britain. Leaves with as many as twenty-five leaflets, usually about fifteen. Leaflets dark glossy green, obliquely ovate, lanceolate, $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, the lowest pair broader and shorter than the others, spine-toothed, of firm, leathery texture. Flowers yellow, borne in slender racemes 6 to 12 ins. long. Berries oval or nearly globose, about $\frac{1}{4}$ in. diameter, covered with blue-white bloom.

Native of the Himalaya, this barberry is too tender to thrive well except in the milder parts of Britain, or in exceptionally sheltered spots. At Kew it lives but a short time out-of-doors, although it has succeeded well in a sheltered spot in the gardens of Belvoir Castle for a good many years. It has by some authorities been united with *B. japonica*, but is sufficiently distinguished by its more numerous, smaller, even-sized and more tapering leaflets, and the brilliantly polished upper surface. For the milder counties it is a most desirable shrub, commencing to flower as early as October, but at its best in March and April. Several forms of it exist, some of which approach *B. japonica*.

B. NERVOSA, *Pursh*.

(*Bot. Mag.*, t. 3949; *B. glumacea*, *Sprengel*; *Mahonia nervosa*, *Nuttall*.)

A low, evergreen shrub, with stems rarely more than 12 or 15 ins. high, and handsome pinnate leaves up to 18 ins. long, composed of usually eleven to fifteen leaflets. Leaflets stalkless, $1\frac{1}{2}$ to 3 ins. long, obliquely ovate, very firm and leathery in texture, prominently three-veined beneath, the margins armed with large, spiny teeth. Racemes erect, 8 ins. or even more in length, with short-stalked, yellow flowers. Fruit roundish oblong, $\frac{1}{4}$ in. diameter, purplish blue.

Native of Western N. America, especially of the State of Washington; introduced in 1822. It is a handsome and striking barberry, but does not appear to thrive very well in this country generally; it always has been and still remains rare. It can only be propagated readily by seeds, and these do not appear to ripen freely in the English climate. The foliage most nearly resembles that of *B. nepalensis*, but *B. nervosa* is readily distinguished by its dwarf habit, and the greater distance of the lowest pair of leaflets from the base of the common leaf-stalk.

B. NEUBERTII, *Baumann*. NEUBERT'S HYBRID BARBERRY.

(*B. ilicifolia*—of gardens, not of *Forster*.)

An evergreen, or partially evergreen shrub, of loose, open habit, 4 to 6 ft. high. Leaves very variable; sometimes simple, obovate, $1\frac{1}{2}$ to 3 ins. long, with

fine marginal teeth like those of *B. vulgaris*; others stiff, hard, and holly-like, with a few large spiny teeth resembling the leaflets of *Mahonia*; others trifoliate or pinnate. Flowers and fruits not seen.

A hybrid between *B. Aquifolium* (the seed-bearer) and *B. vulgaris*, which appeared in Baumann's once famous nursery at Bolwiller, in Alsace, about 1850. It has but little to recommend it as a garden plant, being in my experience a sterile, flowerless mule. As a scientific curiosity it is interesting, for it unites the two sections of the genus, although remarkably distinct from either of its parents. The form with spiny-toothed leaves like holly is usually and erroneously called "*ilicifolia*" in nurseries.

B. PINNATA, *Lagasca*.

(*B. fascicularis*, *Sims*, Bot. Mag., t. 2396; *Mahonia fasc.*, *De Candolle*.)

This very distinct *Mahonia* has been regarded by some authorities as a variety of *B. Aquifolium*, but there is little doubt that it deserves to rank as a species. In stature alone it is very different, for in favourable situations it is 12 to 16 ft. high. A beautiful specimen stands near the entrance door to the vicarage at Bitton, 12 ft. high, and a still taller one in Phoenix Park, Dublin, is 16 ft. In foliage it differs in being of a dull greyish green, and the narrower leaflets number sometimes thirteen or fifteen to each leaf. Flowers yellow, produced in erect racemes about 3 ins. long, not confined, as in *B. Aquifolium*, to the top, but developed in leaf-axils down the stem.

Native of Western N. America (California, New Mexico, etc.), and thus having a more southern distribution than *B. Aquifolium*; introduced in 1819. It is not so hardy as *B. Aquifolium*, but thrives very well at Kew, being altogether about the most desirable of the *Mahonia* group.

B. POLYANTHA, *Hemsley*.

A deciduous shrub, 6 to 10 ft. high, the young shoots reddish brown, ribbed, not downy; thorns solitary or three-pronged, $\frac{1}{2}$ to 1 in. long. Leaves obovate and mostly rounded at the end, the larger ones toothed at the terminal half, the smaller ones frequently entire, all tapered and wedge-shaped at the base; $\frac{1}{2}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide; finely net-veined on both sides, not downy; stalk $\frac{1}{4}$ in. or less long. Flowers yellow; produced during June and July in drooping panicles 3 to 4 ins. long, 1 to 1½ ins. wide, carrying twenty to over fifty blossoms. Fruit red.

Discovered in 1899 by Mr A. E. Pratt, near Tatien-lu, Szechuen, W. China; introduced from the same region by Wilson in 1904. A very fine species, remarkable for the large and abundant flower-panicles.

B. PRUINOSA, *Franchet*.

An evergreen shrub at present 4 to 8 ft. high in this country, but probably 8 to 12 ft. eventually; branchlets round, smooth; spines three-parted, up to 1 in. long. Leaves three to five together in tufts, smooth, leathery, 1 to 2½ ins. long, oval or obovate, lustrous green above, often grey-white beneath, the apex and upper two-thirds set with slender, spiny teeth. Flowers variously arranged at each leaf-cluster, some being solitary on their stalks and in fascicles, others on an umbel 1 in. long; they are citron-yellow, and about the average size of barberry flowers. Fruit black, but covered with an abundant plum-coloured bloom.

Introduced to France from Yunnan, China, by the Abbé Delavay in 1894, this species reached Kew three years later. It is a promising shrub, somewhat similar in general appearance to *B. aristata*, but quite distinct in the arrangement of its flowers. It commences to bloom at the end of April.

B. REPENS, *Lindley*. CREEPING BARBERRY.(Bot. Reg., t. 1176; *Mahonia repens*, *G. Don*.)

An evergreen shrub of dwarf, stiff habit, usually less than 1 ft. high, spreading by underground stems. Leaves pinnate, consisting of three, five, or seven leaflets, which are ovate, pointed, 1 to 2½ ins. long, spine-toothed, of a dull bluish green. Racemes 1½ to 3 ins. long, produced in a cluster at the end of the branch. Flowers deep yellow, open in April and May. Fruit black, covered with a blue bloom.

Native of Western N. America; originally discovered during the famous expedition under Lewis and Clarke, who crossed the North American continent for the first time, 1804-1806. It ought to be useful in positions where a close evergreen covering is desired, but it has never been extensively grown. It can be propagated by removing the creeping shoots, but has never adapted itself to our conditions as *B. Aquifolium* has, for instance. From that species it differs markedly in its dull bluish foliage, which also shows itself in some hybrids between the two species. *B. nervosa* has glossy foliage, and twice as many leaflets.

B. SANGUINEA, *Franchet*.

An evergreen shrub, 6 to 9 ft. high, with smooth, pale greyish branches armed with very slender three-forked spines, each fork up to 1½ ins. long. Leaves in clusters of two to five, deep green, linear-lanceolate, tapering to a fine point, the margins armed with forward-pointing, spiny teeth; the leaf has a very short stalk, and is 1½ to 3 ins. long and from ¼ to ⅜ in. wide. Flowers crowded in the leaf-axils at each joint, golden yellow, on reddish stalks of unequal length, the longest ¾ in. long. The outside of the sepals is reddish. Berries ⅓ in. long, blue-black.

Native of the mountains of Szechuen, China; introduced to France by Mr Maurice de Vilmorin in 1898. It is an elegant shrub; the specific name refers to the colour of the flower-stalks and sepals. The species is distinct in its narrow leaves, and long, slender spines. I saw it first in 1904, in the nursery of Messrs Simon-Louis, near Metz, where it was apparently quite hardy.

B. SARGENTIANA, *C. K. Schneider*. SARGENT'S BARBERRY.

An evergreen shrub up to 6 ft. high, forming thickets of erect stems; young shoots smooth, reddish, becoming grey; armed with three-pronged spines that are ½ to 1¼ ins. long, very sharp and rigid, grooved beneath. Leaves narrowly oval or obovate-lanceolate, slender-pointed, 1½ to 5 ins. long, ½ to 1¼ ins. wide, edged with forward-pointing spiny teeth (sometimes double); dark green above, paler and distinctly veined beneath, quite smooth on both surfaces. Flowers described as pale yellow, about ⅓ in. across, borne in stalkless clusters of two to six; petals broadly obovate, notched at the apex; individual flower-stalk up to ¾ in. long. Fruit black when ripe, broadly egg-shaped, ⅓ in. long.

Native of W. Hupeh, China; introduced by Wilson in 1907. It is allied to *B. Hookeri* and similar in habit, but hardier. In the Arnold Arboretum it is described as the only evergreen barberry known to be hardy there. At Kew it has withstood, quite unaffected, weather which injured *B. Hookeri*.

B. SIBIRICA, *Pallas*. SIBERIAN BARBERRY.

A low, deciduous bush, usually 1½ to 2 ft. high, with short, twiggy branches; young shoots smooth, or minutely downy, angled; thorns with three or five,

sometimes nine or eleven, prongs, each $\frac{1}{3}$ to $\frac{2}{8}$ in. long, slender. Leaves produced in dense rosettes; small, obovate, $\frac{1}{2}$ to 1 in. long, thin, with teeth directed outwards, and proportionately large. Flowers solitary, rarely in pairs, $\frac{1}{2}$ in. across, bright yellow, drooping. Fruit dark red.

Native of Siberia and Mongolia, where it grows in crevices of rocks and similar places. Resembling *B. ætensis* in habit, it differs in its solitary flowers and much divided spines. Pallas, the Russian traveller and naturalist, who introduced this shrub to cultivation in 1790, states that in Mongolia a decoction of the twigs is applied to the eyes as a charm, which recalls the virtues ascribed to *B. Lycium* in eye affections by the natives of N. India.

B. SIEBOLDII, *Miquel*. SIEBOLD'S BARBERRY.

A deciduous shrub of rounded form, with leaves and branches very similar to those of *B. vulgaris*, but dwarfer, and usually below 3 ft. in height. Leaves thin, varying from narrowly obovate to oval, 1 to 2½ ins. long, tapering at the base to a short stalk, the margins crowded with fine bristles. Flowers pale yellow, $\frac{1}{4}$ in. across, in racemes 1½ to 2 ins. long. Fruit globose, yellowish red, shining as if glazed.

Native of Japan; perhaps a Japanese prototype of our common barberry, differing in its dwarfer habit and more distinctly ciliate leaves. We have, however, in cultivation a barberry from Japan still more closely allied to *B. vulgaris*; this is *B. REGELIANA*, *Koehne* (*B. vulgaris* var. *japonica*, *Regel*). It is much confused with *B. Sieboldii* in gardens, and is grown under that name. It is, however, a taller shrub with more angled branches, and the fruit is distinct in being of a bright rosy carmine, covered with bluish bloom, and of oblong or oval shape.

B. SINENSIS, *Desfontaines*.

A very elegant, deciduous shrub, up to 5 or 6 ft. high, with slender, pendulous branches; young shoots smooth, somewhat angled, glossy; spines weak,



BERBERIS SINENSIS.

sometimes three-parted at the base of the shoot, but mostly simple. Leaves green on both surfaces, oblanceolate or narrowly obovate, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{3}$ in. wide; on the flowering shoots they are smaller and without teeth, but on the sterile shoots are more or less toothed; sometimes rounded, sometimes spine-tipped. Racemes 2 to 3 ins. long, one of them pendent from each leaf-cluster. Flowers pale yellow, $\frac{1}{4}$ in. diameter, each one borne on a thread-like stalk. Berries bright red, slender, nearly $\frac{1}{2}$ in. long.

Native of China and Corea, and if not indigenous to Japan, cultivated there. It is said to have been first found near Pekin during Lord Macartney's mission to China, and to have been introduced in 1800. It is one of the most attractive and graceful of deciduous barberries, flowering with remarkable profusion towards the end of May. The *Berberis* figured in the *Botanical Magazine*, t. 6573, under this name, is not true *B. sinensis*, but probably a hybrid between it and some other barberry.

B. STAFFIANA, C. K. Schneider.

A deciduous or partially evergreen, glabrous shrub, probably 5 or 6 ft. high, of elegant habit, the stems spreading and arching; leaf-clusters $\frac{1}{2}$ in. apart; spines three-pronged, very slender and needle-like, brown, $\frac{1}{8}$ to $\frac{3}{4}$ in. long. Leaves oblanceolate, rounded to pointed at the apex, mostly entire, but sometimes toothed near the end, tapered at the base; $\frac{1}{2}$ to 1 in. long, $\frac{1}{12}$ to $\frac{3}{16}$ in. wide; scarcely stalked, of hard texture. Flowers pale yellow, globose, $\frac{1}{8}$ in. wide, borne four to seven together in axillary, stalkless, or very shortly stalked clusters. The stalk of the individual flower is $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Fruit oval, carmine-red with a slight bloom, $\frac{1}{4}$ in. long, containing two or three seeds.

Native of W. China; introduced to Kew from St Petersburg in 1896, and later from Wilson's seeds. M. Maurice de Vilmorin has also grown it for some years at Les Barres, in France. It is a charming shrub, of free, graceful growth, allied to *B. Wilsonæ*, but that species is distinguished by its downy shoots. Another species of the same group is *B. SUBCAULIALATA*, C. K. Schneider, but it has globose fruits ripe in November, more distinctly angled branchlets, and larger leaves; the general aspect is otherwise very similar.

B. STENOPHYLLA, Moore.

An evergreen bush, 8 to 10 ft. high, and as much through, consisting of a dense thicket of slender, interlacing stems arching towards the ends. Leaves numerous, in tufts about $\frac{1}{2}$ in. apart on the shoots; hard, spine-tipped, 1 in. or so in length, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, with incurved margins; deep green above, glaucous beneath. Flowers produced either in small fascicles or on short, few-flowered racemes, golden yellow, small, but very profusely borne. Berries globose, $\frac{1}{4}$ in. across, covered with blue-white bloom.

A hybrid which appeared in the nursery of Messrs Fisher & Holmes of Handsworth, near Sheffield, about 1860, its parents being *B. Darwinii* and *B. empetrifolia*. It is undoubtedly the most beautiful and useful of all the barberries, and to the flower beauty of *B. Darwinii* has united the greater hardiness of *B. empetrifolia*. The combination, moreover, has produced a grace of habit neither of the parents possesses. The bush forms an impenetrable mass of branches from out of which it throws every year slender, arching shoots 1 ft. or more long. In the following April and May these are wreathed from end to end with rich golden yellow flowers. A well-grown bush is one of the loveliest of all spring pictures, and is admirable in many positions; it makes a charming bush on a lawn, as a covering for a steep bank, and it may be used as a hedge plant, cutting it back immediately it has flowered. It is best propagated by cuttings put in very sandy soil under a bell-glass or in a frame in August. It ripens good seeds, but they rarely come true, reverting back more or less to one or other of the parents—generally to *B. Darwinii*.

B. REFLEXA is one of these seedling forms sent out by Mr T. Smith of Newry. It is a dwarf shrub, with low spreading branches and very dense leafage, the leaves being dark green, $\frac{3}{4}$ in. long, glaucous beneath; the margins reflexed and armed with three or five large teeth: "*B. Darwinii nana*" is another of similar origin.

B. THUNBERGII, *De Candolle*. THUNBERG'S BARBERRY.

A deciduous shrub, of very close, compact habit, from 3 to 8 ft. high, with stiff, deeply grooved branches, and smooth, reddish brown bark. Leaves crowded in tufts along the branches (the tufts often $\frac{1}{4}$ to $\frac{1}{2}$ in. apart), obovate or spatulate, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, sometimes rounded at the apex, sometimes spine-tipped, never toothed. The thorns on the branches are about $\frac{1}{2}$ in. long, almost invariably single, but occasionally three-pronged. Flowers $\frac{1}{3}$ to $\frac{1}{2}$ in. across, usually solitary in each tuft of leaves, but sometimes in pairs, each one borne on a slender stalk $\frac{1}{2}$ in. long; sepals small, dull red; petals twice as long, pale yellow suffused with red. Berries bright red.

The first European to notice this barberry was Thunberg, who saw it in Japan in 1784, but it did not reach this country until about ninety years later. It has been found wild in China. Latterly it has become popular in gardens, owing to its neat, close habit, its handsome red fruits, but more than all for its brilliant red foliage in autumn. The flowers, although unusual in colour and freely borne, are not showy. In the suburbs of Boston, Mass., in the neighbourhood of the Arnold Arboretum, it thrives remarkably; I have measured bushes there 8 ft. high and 15 ft. across.

Var. DAWSONII.—A variety that originated in the Arnold Arboretum, dwarfer and more compact than the type.

Var. MAXIMOWICZII (B. Maximowiczii, *Regel*) has more twiggy branches, with a purple bark and more pointed leaves.

Var. MINOR, *Rehder*.—A dwarf form usually under 2 ft. high, with small leaves and flowers.

Var. PLURIFLORA, *Koehne*.—Flowers three to seven together in corymbs.

B. TRIFOLIOLATA, *Moricand*. NEW MEXICAN BARBERRY.

(Bot. Reg., vol. 27, t. 10; Mahonia trifoliolata, *Fedde*.)

An erect, rigid shrub, 6 or 8 ft. high, belonging to the Mahonia group, but with only three leaflets to each leaf. Leaflets glaucous or almost white, shaped like a spear-head; 1 to 2 ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in. wide; tapering to a long, spine-tipped point, and bulging at each side into one or two spine-tipped lobes. Flowers yellow, borne in short corymbs. Fruit oval or roundish, black with a blue bloom.

This rare shrub comes from rocky hills in New Mexico, and is only hardy against a sunny wall, or in exceptionally mild districts. Some years ago I saw an old bush, 8 ft. high, growing against the house wall at Bayfordbury. The species differs from all other Mahonias in cultivation in the vividly glaucous-white leaves with only three leaflets.

B. UMBELLATA, *Wallich*.

A deciduous, or semi-evergreen shrub, about 6 or 8 ft. high; twigs greyish, angled, finely downy; spines $\frac{1}{2}$ in. long. Leaves obovate or oblanceolate, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{3}$ to $\frac{2}{3}$ in. wide; the margins mostly entire, or with a few outstanding teeth towards the apex. Flowers yellow, in long-stalked corymbs 1 to $1\frac{1}{2}$ ins. long. Berry red, egg-shaped.

Native of the Himalaya, from Kashmir eastwards, up to 11,000 ft. This species is somewhat obscure; plants received under the name, or raised from seed so-called, usually prove to be some form of *B. aristata*. It is not certain that the true thing is in cultivation. The berries, if correctly described by Brandis as "scarlet, oblong," ought to clearly distinguish it from *aristata*.

B. VERRUCULOSA, *Hemsley and Wilson*. WARTED BARBERRY.(Bot. Mag., t. 8454 $\frac{1}{2}$)

A sturdy, low, evergreen bush, 2 to 4 ft. high, very distinct on account of its branches being covered with dense, dark brown, tiny excrescences, which give the young bark a curiously rough surface. Stem-thorns very slender, three-parted, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Leaves dark lustrous green above, glaucous beneath; oval, tapering towards both ends; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, of leathery texture, margins recurved and set with a few spiny teeth. They are densely arranged in clusters or rosettes along the twigs. Flowers short-stalked, solitary or in small fascicles, golden yellow, $\frac{5}{8}$ to $\frac{3}{4}$ in. across. Berry black covered with blue bloom, nearly $\frac{1}{2}$ in. long, rather bottle-shaped.

Discovered by Wilson in W. China, and introduced by him in 1904. First flowered in the Coombe Wood nursery in May, 1908. One of the most pleasing of recent introductions from China, and evidently hardy near London. Useful for the rock garden because of its neat, compact habit.

B. VIRESCENS, *Hooker fil.*

(Bot. Mag., t. 7116.)

An elegant, deciduous shrub, 6 to 9 ft. high; with smooth, reddish brown, shining branches, armed at each leaf-tuft with a slender, three-parted, or single spine up to $\frac{3}{4}$ in. long. Leaves $\frac{2}{3}$ to $1\frac{1}{4}$ ins. long, obovate, thin, pale but bright green; the apex rounded or tipped with a small spine, the margins toothed or entire. Flowers $\frac{1}{3}$ in. diameter, pale greenish or sulphur yellow, and produced on slender, short stalks, either in panicles or short racemes. Berries slender, nearly $\frac{1}{2}$ in. long, reddish, covered with bloom.

Discovered by Sir Joseph Hooker, at an elevation of 9000 ft., in Sikkim, in 1849, and introduced to Kew about the same time; this barberry was not given specific rank until described forty years after in the place quoted above. It is not one of the most attractive of barberries in regard to its flowers or fruit, but its habit is elegant, and the red tinge of its stems is pleasing in winter. There are two forms of the species at Kew, one, regarded as typical, with red fruits; the other, var. *MACROCARPA*, with large black fruits $\frac{5}{8}$ in. long.

B. VULGARIS, *Linnaeus*. COMMON BARBERRY.

A deciduous shrub, usually seen from 6 to 10 ft. high, but occasionally more than thrice as high; producing a crowded mass of stems erect at the base, branching and spreading outwards at the top into a graceful, arching, or pendulous form; branches greyish, and slightly grooved. Leaves in tufts from the axils of three-parted spines; thin, dull green, oval or obovate, 1 to 2 ins. long, margined with fine teeth. Flowers in pendulous racemes 2 to 3 ins. long, yellow. Berries egg-shaped, up to $\frac{1}{2}$ in. long, bright red.

One of the best known of our native shrubs, the common barberry is found wild also over a large part of Europe, N. Africa, and Temperate Asia. It was introduced to N. America, probably by early settlers, and is now naturalised there, more common in many places than the real American barberry (*B. canadensis*). It is one of the most attractive of all hardy shrubs, beautiful in blossom in May; perhaps even more so later in the year, when laden with heavy masses of coral-like berries. The berries are too acid to be palatable, even to birds, but at one time they were considered a wholesome delicacy, candied or preserved in sugar. According to the old herbalists the slightly acid leaves were once used to season meat with,

and as a salad. A decoction of the bark and yellow wood was formerly celebrated as a remedy for jaundice. It is now discarded from the *Materia Medica*, but in many country places much faith in its virtues still exists.

In gardens, the barberry is useful on account of its accommodating nature and hardy constitution. It may be useful to fill up out-of-the-way corners or other such places, where its vigorous nature will enable it to grow and thrive, and hold its own without attention. But it is beautiful enough to deserve a more prominent position. It has been planted at Kew on the top of the ha-ha wall that divides the gardens from the Thames, and nothing can be more beautiful than are these plants in October, when the branches, drooping over the wall, are laden with masses of scarlet berries. Even on a lawn it will make a fine "specimen" bush; more beautiful often than many rarer things so employed. At Leonardslee, Horsham, there is a specimen 26 ft. high, and 2 ft. 2 ins. in girth of stem.

Innumerable varieties or minor forms of this barberry exist. No good purpose would be served by attempting to describe or even name them; a single sowing of seeds will sometimes produce variations quite as important, both botanically and horticulturally, as many of those to which long names have been given. The following deserve mention:—

Var. ALBO-SPICATA.—Young shoots and leaves creamy white.

Var. ASPERMA.—This remarkable variety produces berries without seeds, and it is, in consequence, more valuable for preserves, etc., than the fertile type. The famous sweetmeats of Rouen, *confitures d'épine vinette*, are made from the fruits of this variety, now very uncommon in this country.

Var. DULCIS.—A quite sweet-fruited kind, found in the Austrian mountains early in the nineteenth century; it does not come true from seed, and is perhaps not now in cultivation in Britain.

Var. PURPUREA.—Purple barberry. Leaves deep purple, one of the handsomest of wholly purple shrubs. It comes partially true from seed.

Var. VARIEGATA.—Leaves margined with yellow.

There are, besides, other varieties with berries differing in colour, such as *fructu albo* (white); *fructu luteo* (yellow); and *fructu nigro* (black). The two last I have not seen, but they are mentioned by Loudon; the first is not uncommon.

B. AMURENSIS, *Ruprecht* (B. vulgaris var. amurensis, *Regel*), is sometimes regarded as a geographical variety of the common barberry, sometimes as a species. It differs in the much larger leaves, which are often $3\frac{1}{2}$ to 4 ins. long, and $1\frac{1}{2}$ to 2 ins. wide, perhaps the largest of all true barberry leaves. They are thin in texture, as in B. vulgaris, but the toothing is proportionately closer and finer. Racemes 3 ins. long, with flowers like those of vulgaris but rather larger, followed by large oblong berries. It has stouter stems than vulgaris, and flowers rather earlier, but is only half its height. Native of Amurland.

B. WILSONÆ, *Hemsley*. MRS WILSON'S BARBERRY.

(Bot. Mag., t. 8414.)

An elegant, deciduous (sometimes partially evergreen) shrub, 2 to 4 ft. high, of spreading habit, and usually more in diameter; branches comparatively thin, reddish brown, slightly downy, armed with slender three-parted spines $\frac{1}{2}$ to $\frac{3}{4}$ in. long, and red when young. Leaves as a rule less than 1 in. long, mostly oblanceolate, and either rounded or sharply pointed at the apex, otherwise entire, or occasionally three-lobed at the apex; smooth, conspicuously veined, grey-green above, somewhat glaucous beneath. Flowers small, pale yellow, borne two to six together in fascicles or short racemes. Berries roundish, coral- or salmon-red, somewhat translucent, borne very abundantly.

Native of W. China; discovered and introduced about 1904 by Mr E. H.

Wilson, after whose wife it is named. This is one of the most charming new introductions from W. China, of neat yet elegant habit, and most noteworthy for its prettily coloured, abundant berries. The leaves are said by Wilson to assume brilliant tints in autumn.

B. YUNNANENSIS, *Franchet.* YUNNAN BARBERRY.

A deciduous shrub, 3 to 6 ft. high of dense, rounded habit, with grey, smooth branchlets, armed with three- or five-parted spines. Leaves obovate, sometimes almost orbicular, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{2}{3}$, rarely 1 in. wide, rounded or pointed at the apex, tapering to a stalk at the base; margins mostly entire on the flowering twigs, more often toothed on the sterile ones. Flowers pale yellow, three to eight in a cluster; $\frac{3}{4}$ in. across; flower-stalks slender, $\frac{3}{4}$ to $1\frac{1}{4}$ in. long. Berries oval, bright red, $\frac{1}{2}$ in. long.

Native of W. China; first discovered in Yunnan by Delavay in 1885, at an altitude of 10,000 ft. It reached cultivation by way of France, and was introduced to Kew in 1904. It is a pretty shrub, and is distinct in regard to the size of its flowers and fruit, both of which are amongst the largest in the genus. It is also one of the most beautiful in its autumn livery of crimson. Closely related to this species and united to it by intermediate forms is—

B. DIAPHANA, *Maximowicz*, a native of N. and W. China. It is figured as *B. yunnanensis* in the *Botanical Magazine*, t. 8224, but differs in its leaves on the flowering shoots being mostly very spiny-toothed, its fewer (one to five) flowers in a cluster, and by the more numerous (six to eight) seeds in each fruit.

BERCHEMIA. RHAMNACEÆ.

A genus of deciduous, unarmed climbers or shrubs, with alternate leaves prominently and numerous parallel-veined. Flowers small, with five sepals and five petals, and not ornamental. Fruit a two-celled, oblong berry. Three species are grown in gardens: one American, two Asiatic. They like a good, moist, loamy soil, and can be propagated by cuttings. Allied to *Zizyphus* and *Paliurus*, both of which differ in having three-nerved leaves.

B. FLAVESCENS, *Wallich.*

A climbing, deciduous shrub, 6 to 10 ft. high, the shoots slender, smooth, or with dark outstanding hairs. Leaves 2 to 6 ins. long, 1 to $2\frac{3}{4}$ ins. wide, rounded or broadly tapered at the base, narrowed at the apex to a short tip, smooth, and rather metallic green above, pale and either smooth, or with a slight down on the midrib and lower ribs beneath; ribs parallel, nine to sixteen pairs; stalk $\frac{1}{2}$ to 1 in. long. Flowers white, $\frac{1}{8}$ in. across, produced in pyramidal panicles $1\frac{1}{2}$ to 4 ins. long, terminal on the leafy shoots of the year; flower-stalks $\frac{1}{8}$ to $\frac{1}{6}$ in. long, either smooth or hairy. Fruit sausage-shaped, $\frac{1}{2}$ in. long.

Native of the Himalaya, Thibet, and W. China; introduced from the last named by Wilson in 1904, now growing in Coombe Wood nursery, where it appears to be quite hardy.

B. RACEMOSA, *Siebold.*

A deciduous shrub, with slender, flexible, round, smooth stems. Leaves ovate with a heart-shaped base, $1\frac{1}{2}$ to 3 ins. long, half as much wide, entire, rather pale or glaucous beneath; veins in seven to nine pairs, parallel. Flowers

in a terminal, pyramidal panicle 2 to 6 ins. long ; very small, greenish, produced in late summer. Fruit oblong, $\frac{1}{4}$ in. long, changing from green to red, then to black.

Native of Japan, where it forms a spreading, tangled shrub, rather than a genuine climber. The foliage is neat and pretty, and when the plant is furnished with its handsome fruits it is both striking and attractive. But it does not produce them with regularity, and I have never seen it so good in this country as in Central France. In Mr de Vilmorin's collection at Les Barres, it bears fruit abundantly. It is a hardier and a better plant than *B. volubilis*. A variegated form is in cultivation, var. *VARIEGATA*, whose leaves, especially towards the end of the shoot, are more creamy white than green.

B. VOLUBILIS, *De Candolle*. SUPPLE JACK.

(*B. scandens*, *K. Koch*.)

A deciduous climber, with smooth, twining branches, growing 10 to 15 ft. high (much higher in milder climates). Leaves smooth, oval, $1\frac{1}{2}$ to 3 ins. long, not heart-shaped but usually rounded, or broadly wedge-shaped at the base, the apex ending in a bristle-like point, the margins wavy ; veins nine to twelve pairs. Flowers small, greenish white, arranged in racemes 1 to 2 ins. long, terminating short, side twigs, and in a terminal panicle. Fruits oblong, $\frac{1}{3}$ in. long, dark blue, or almost black.

Native of the southern United States ; introduced in 1714. It does not fill an important place in English gardens, owing to its flowers having little beauty, and its fruits being rarely seen. From the commoner Japanese species it differs in the shape of the leaves, the more numerous veins, and in the smaller inflorescence. It is also a genuine climber, its stems twisting round each other, or anything of convenient size within reach. Not so hardy as *B. racemosa*.

BETULA. BIRCH. BETULACEÆ.

The birches are deciduous trees and shrubs with alternate leaves and unisexual flowers produced on catkins, both male and female catkins being borne on the same tree. The male catkins are slender and pendulous, nearly always formed in autumn, but expanding in spring ; the flower consists of a calyx and two stamens, and they are produced in threes in the axil of a scale. Female catkins shorter, stiffer ; the flowers consisting of an ovary and pistil only, produced (also in threes) in the axil of a deciduous, three-lobed scale. What is here (and commonly) called the seed, is really a tiny nut containing the true seed. It bears a transparent wing at each side, and usually the remains of the two styles at the top. The only other genus of trees with which the birches are likely to be confused are the alders, and they are readily distinguished by the persisting scales of the female catkin, which does not disintegrate like that of the birches, but falls away whole.

Two of the best known features of the birches are the peculiar bark and frequently white trunks. The bark can often be separated in thin, papery layers, and being impervious to water, is used in other countries for canoe-building and for roofing. The timber, although not as a rule of the best, is put to various minor uses. Some of the Asiatic and American species, however, yield wood of considerable value. An aromatic principle pervades many of the birches, and a fragrant oil is obtained.

As garden trees, the birches are chiefly valued for their striking trunks and graceful branches. The silvery trunks of such species as *verrucosa*, *papyrifera*, and *Ermani* provide some of the most delightful of winter effects. Nor are the darker coloured ones of *lutea* and *Maximowiczii* without their charm. The rugged trunks of *nigra* and *davurica* always attract attention. On the whole, no birch exceeds our native *B. verrucosa* in beauty, not only in its trunk, but in the singular lightness and delicate grace of its branching also. Most people will agree with the oft-quoted words of Coleridge, that it is

"most beautiful
Of forest trees, the Lady of the Woods."

The young branches and twigs of many birches have a rich red brown or orange-brown tint, which makes an admirable contrast in winter with such as have white trunks.

So far as I have seen, the birches thrive best on a deep, well-drained loam, and I do not know that any object to it. But some species, like *verrucosa* and *populifolia*, are amongst the best trees for poor, sandy soils; whilst *B. pubescens*, *nana*, *glandulosa*, *pumila*, and *nigra* thrive well with their roots within reach of water.

Whenever possible the birches should be raised from seed, which most of them develop in plenty. It should be sown on the surface of fine soil, and not buried but simply pressed down. An old and good plan when the seed is sown out-of-doors is to cover it thinly until it germinates with a thin layer of brushwood, which gives shade and shelter and protects it from interference by birds, etc.

The common birches are attacked by a gall-producing insect, *Phytoptus rudis*, which causes an abnormal swelling of the leaf-buds, and distorted, stunted growths.

Several hybrids have appeared in nature between the various birches, amongst which are:—

lenta × *pumila*.
papyrifera × *fontinalis*.
papyrifera × *pumila*.

pubescens × *humilis*.
pubescens × *nana* (see *intermedia*).
pubescens × *verrucosa*.

B. ALASKANA, *Sargent*. YUKON BIRCH.

A tree 30 to 40 ft. high, with the young shoots thickly covered with viscid warts, not downy. Leaves triangular-ovate, wedge-shaped or cut straight across at the base (heart-shaped on strong shoots), taper-pointed, $1\frac{1}{2}$ to 3 ins. long, 1 to 2 ins. wide; coarsely and often doubly toothed; glossy dark green, viscid, and slightly hairy; stalks $\frac{1}{2}$ to 1 in. long, reddish. Fruiting catkins 1 to $1\frac{1}{4}$ ins. long; scales hairy on the margin only, the side-lobes larger, rounder, and broader than the middle one.

Native of Alaska, especially in the Yukon Valley; introduced in 1905. A young tree sent to Kew by Prof. Sargent is thriving very well, and promises to make a handsome tree. It is in some respects like *B. fontinalis*, but differs in its thin, peeling, reddish brown, or dull white bark, and in the broader wing to the seeds. Sargent describes it as the common birch of the Yukon Valley.

B. ALNOIDES, *Buchanan-Hamilton* var. *PYRIFOLIA*, *Franchet*.

A tall tree, the younger branches bright reddish brown; young twigs covered more or less densely with pale hairs or down. Leaves ovate, $2\frac{1}{2}$ to 5 ins. long, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. wide, rounded or slightly heart-shaped at the base; pointed, unequally toothed, each tooth ending in an abrupt, slender point, ciliate, downy on both surfaces, dark dull green above, bright green beneath, covered with minute, lustrous resin-glands; veins nine to twelve; leaf-stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, downy or nearly smooth, reddish. The young, expanding leaves are of a pretty, red tinge. Fruiting catkins have not yet been seen in this country, but as seen in dried native material, are $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, cylindrical, $\frac{1}{4}$ in. diameter; scales very small, the middle lobe several times larger than the side ones. Nutlets with wings broader than themselves.

The typical *B. alnoides* is a Himalayan birch, but the form above described is a native of W. China, whence it was introduced by Wilson in 1901 and again in 1907. Mr Wilson tells me that at 8500 ft. altitude in W. Szechuen he saw it 100 ft. high, with a trunk 12 ft. in girth, so it must be one of the finest of all birches. Our young trees are thriving well, and are curiously distinct in the resinous sheen beneath the leaves, which becomes more apparent as the leaf dries. The young trees introduced by Wilson vary considerably in the downiness of the young shoots. There are numerous plants in cultivation and they are well worth looking after. It is not unlikely this birch may come to be regarded as a distinct species.

B. DAVURICA, *Pallas*.

A tree 60 ft. or more high in nature, the trunk clothed with curling flakes of papery bark, giving it a curious, ragged appearance; bark at first warm brown; young shoots sparsely downy, thickly covered with glandular warts. Leaves ovate, 2 to 4 ins. long, $1\frac{1}{2}$ to 3 ins. wide; broadly wedge-shaped or almost straight across at the base, pointed, coarsely and unequally toothed; dark green and smooth above, downy beneath along the midrib. Veins six to eight pairs; leaf-stalk about $\frac{1}{2}$ in. long.

Native of Manchuria, N. China, and Corea; introduced to Kew by the late Dr Bretschneider in 1882, but not a species of much promise, having a failing common to trees of the same region in starting early into growth and being cut back by frost. In upland country it would, no doubt, thrive better. In the curious ruggedness of its bark it resembles *B. nigra*.

B. ERMANI, *Chamisso*.

A tree said to become 100 ft. high; bark of the trunk peeling, creamy white; that of the branches orange-brown; young shoots not downy, but with numerous glandular warts; buds nearly $\frac{1}{2}$ in. long, viscid, slender-pointed. Leaves broadly ovate, with a straight or slightly heart-shaped base, taper-pointed, coarsely triangular-toothed; 2 to 3 ins. long, $1\frac{1}{2}$ to $2\frac{1}{4}$ ins. broad; freely specked with glands on both surfaces, and nearly smooth except for hairs on the midrib, veins, and vein-axils beneath; veins in eight to eleven pairs; stalk $\frac{1}{2}$ to 1 in. long, warted. Fruiting catkins barrel-shaped, 1 to $1\frac{1}{4}$ ins. long, $\frac{1}{2}$ to $\frac{5}{8}$ in. wide, the three lobes of the scales broadest at the rounded ends.

Native of Manchuria, Corea, Japan, and, like many plants from the same region, very liable to injury by spring frosts, owing to its early start into growth. For this reason it does not form a clean trunk, and is subject to fungoid attacks.

Var. *NIPPONICA*, *Maximowicz*.—A Japanese form with the young shoots leaves, and leaf-stalks less glandular than in the type, the fruiting catkins

narrower and longer (being $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide), and the central lobe of the scale more tapered. This variety thrives better in cultivation through starting later into growth, and makes a clean-grown, handsome birch—one of the most striking of the white-stemmed group.

B. FONTINALIS, *Sargent*. WESTERN BLACK BIRCH.

A shrub up to 15 or 20 ft. high, occasionally a tree twice as high, of elegant form; bark almost black, not peeling; young shoots resinous, warted. Leaves glandular, broadly ovate, rounded or slightly heart-shaped at the base, pointed, double-toothed; 1 to 2 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; dark dull green, slightly hairy above; paler and soon almost smooth beneath; veins in six or seven pairs; stalks $\frac{1}{4}$ to $\frac{1}{2}$ in. long, at first somewhat hairy, then smooth. Male catkins up to 2 ins. long. Fruiting catkins 1 to $1\frac{1}{4}$ ins. long, the lobes of the scales about equal in size, slightly downy or smooth.

Native of Western N. America; introduced in 1897 to Kew, where it thrives very well, and promises to make a graceful small tree. It belongs to the alaskana and kenaica group, but is distinguished by the bark not separating into layers, and in being almost black. The very resinous young twigs and glandular young leaves also mark it.

B. GLANDULOSA, *Michaux*.

A shrub procumbent at high elevations, rarely more than 4 ft. high anywhere; young shoots not downy, but covered with glands. Leaves obovate to roundish or kidney-shaped, usually $\frac{1}{2}$ to $\frac{3}{4}$ in. (sometimes over 1 in.) long, green and smooth both sides, conspicuously round-toothed; stalks up to $\frac{1}{4}$ in. long. Fruiting catkins erect, $\frac{1}{2}$ to $\frac{3}{4}$ in. long.

Native of N. America, where it reaches across the continent at high latitudes and high altitudes; also of Greenland. It is closely allied to, and can only be confused with, *B. nana* (*g.v.*), but is abundantly distinct in its glandular-warted branchlets and longer-stalked leaves. It occupies similar moist positions in nature, and may be planted in similar positions in gardens.

B. HUMILIS, *Schrank*. SHRUBBY BIRCH.

A shrub 2 to 9 ft. high, young shoots hairy and glandular-warty. Leaves ovate, oval, or obovate, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, mostly tapered (sometimes rounded) at the base, pointed, irregularly and rather coarsely toothed (teeth triangular but often bluntish); both surfaces smooth and green; veins in four or five pairs; stalk $\frac{1}{4}$ in. or less long. Fruiting catkins $\frac{1}{2}$ to $\frac{5}{8}$ in. long; scales with minute hairs on the margin, deeply three-lobed, the middle lobe usually thinner and larger than the side ones.

Native of high latitudes in Europe and Asia, or of high altitudes in more southerly regions. This species and *B. FRUTICOSA*, *Pallas*, are very closely allied, and have often been united. The leaves of *B. fruticosa* are more tapered towards the apex, have usually five or six pairs of veins, and the toothing is finer, sharper, and more regular; the wings of the seed are also comparatively broader than in *humilis*. It is a native of N.E. Europe and Siberia, inhabiting boggy places.

B. JACQUEMONTII, *Spach*.

(*B. utilis* var. *Jacquemontii*, *Regel.*)

This tree, a native of the Himalaya, is usually associated with *B. utilis*, but is so distinct in various characters that it will be convenient to regard it as a

species. The bark on the trunk is white and peeling ; the young shoots are both downy and warted. Leaves with seven to nine parallel veins, ovate, rounded at the base, unequally toothed (the terminal ones often doubly toothed) ; $1\frac{1}{2}$ to $2\frac{3}{4}$ ins. long, $\frac{7}{8}$ to 2 in. wide ; both surfaces almost or quite smooth, lower one dotted with glands ; stalks $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Male catkins 2 to $2\frac{1}{2}$ ins. long. Fruiting catkins cylindrical, $1\frac{1}{2}$ ins. long ; scales edged with minute hairs, the middle lobe longer and narrower than the side ones. Trees at Kew raised from seed in 1891 are quite healthy, and the species is no doubt hardier than *B. utilis*, from which it can be distinguished by the fewer veins of the leaf, the warted and less downy young shoots, and the more pointed middle lobe of the fruiting scale. It is hardy in St Petersburg.

B. LENTA, *Linnaeus*. BLACK or CHERRY BIRCH.

A tree up to 70 or 80 ft. high in a wild state ; the bark of the trunk not peeling, dark, almost black ; young shoots silky hairy when very young, soon becoming smooth and shining brown. Leaves ovate or ovate-oblong, mostly heart-shaped at the base, pointed, $2\frac{1}{2}$ to 6 ins. long, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. wide, toothed (often doubly so), dark glossy green and ultimately smooth above, paler green and silky-hairy on the midrib and veins beneath ; veins in ten to thirteen pairs ; leaf-stalk $\frac{1}{4}$ to 1 in. long, hairy. Male catkins 2 to 3 ins. long. Fruiting catkins 1 in. or rather more long, $\frac{1}{2}$ in. in diameter, scarcely stalked ; scales not downy, the lateral lobes rather wider than the middle one.

Native of Eastern N. America, where it yields a valuable timber ; introduced in 1759, according to Aiton. When bruised, the young bark has a sweet, aromatic taste and smell, and by distillation yields an aromatic oil. This birch is allied to *B. lutea*, but differs in the darker bark of the trunk, the sweeter tasted young bark, and especially by the smooth scales of the fruit catkin. In my experience it is not so well-doing a tree as *B. lutea* in this country.

B. LUTEA, *Michaux*. YELLOW BIRCH.

A tree up to 100 ft. high in a wild state ; bark of the trunk yellowish brown when newly revealed by the curling back of the outer layer ; young wood more or less hairy the first summer. Leaves dull green, ovate or ovate-oblong, $2\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, half as wide ; tapered, rounded, or heart-shaped at the base, pointed, doubly toothed ; hairy on the margin, midrib, and chief veins, becoming smooth above by the end of the season ; veins in about twelve pairs. Fruiting catkins 1 to $1\frac{1}{2}$ ins. long, erect, $\frac{3}{4}$ in. thick ; scales conspicuously downy on the outside and margins, the lobes about equal in size, oblong. The young bark has a bitter taste.

Native of Eastern N. America ; introduced in the latter half of the eighteenth century. It is a handsome birch, and might be more extensively planted. It is distinct in the colour of the newly exposed bark of the trunk. It is sometimes confused with *B. lenta*, under which the distinctions are pointed out.

B. LYALLIANA, *Koehne*.

There is a good deal of confusion in regard to this tree, and it has been called *B. occidentalis* (Sargent) ; *B. papyrifera* var. *Lyalliana* (Koehne) ; and *B. papyracea* var. *occidentalis* (Dippel). The name *occidentalis* was founded by the elder Hooker in 1839, on specimens of three distinct birches. As it might with equal propriety be given to any one of them, it is better to drop it altogether. *B. Lyalliana* is one of the very finest of birches, and reaches sometimes 120 ft. in height ; bark reddish brown to whitish, peeling. Young shoots warted, downy, yellowish brown. Leaves ovate with a rounded or

heart-shaped base, ordinarily $\frac{3}{4}$ to 4 ins. long, but on young trees often over 5 ins. long; hairy along the midrib and veins beneath; veins in seven to ten pairs. The tree is no doubt closely allied to the paper birch, but Sargent, who regards it as specifically distinct, distinguishes it by its downy, fruiting scales, its brown bark, its larger size and bigger leaves. Trees introduced in recent years are growing admirably. A native of British Columbia and Washington,

inhabiting moist situations. The tree recently put into cultivation as "*B. macrophylla*" is either this species or a form of *B. papyrifera*.

B. MAXIMOWICZII,
Regel.

(Bot. Mag., t. 8337.)

A tree 80 to 100 ft. high; young shoots

brown, warty, not downy; the bark of the older wood and trunk orange-brown, becoming ultimately grey or whitish. Leaves heart-shaped, pointed, $\frac{3}{4}$ to 6 ins. long, three-fourths as wide; doubly toothed, dark green, downy at first, ultimately smooth above, downy in the vein-axils beneath; veins in ten to twelve pairs; stalk $\frac{1}{4}$ to $1\frac{3}{4}$ ins. long. Male catkins 4 or 5 ins. long. Fruiting catkins 2 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. wide, in racemes of two to four; scales smooth, middle lobe longer and narrower than the side lobes. Seed-wings large.

Native of Japan; introduced by Prof. Sargent in 1893. This fine birch is distinguished by the leaves being larger than those of any other species. I have measured them 7 ins. long by 5 ins. wide. The habit of young trees is rather open, and the branching stiff. It is a quick grower, very hardy, and altogether one of the best of its kind. Very distinct in its large leaves and racemose female catkins.

B. MEDWEDIEWI, *Regel.*

Little is known of this birch in cultivation as yet. It was introduced to Kew from Tiflis in 1897, and put into commerce by Spath of Berlin in 1906. It comes from the region south of the Caucasus range, and first came under botanical notice about 1886. It is a tree of goodly height, erect-branched, young shoots partially hairy, with a few long, narrow lenticels. Winter buds

very large and distinct, bright glossy green, narrowly ovoid and pointed, with ciliate scales; on vigorous shoots the buds are $\frac{1}{2}$ in. long. Leaves ovate to roundish, 2 to 4 ins. long, 1 to 3 ins. wide; rounded or slightly heart-shaped at the base, pointed, irregularly toothed; dark green above, and smooth or with a few hairs only on the midrib and the eight to eleven pairs of sunken veins, which are also slightly hairy beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, hairy. Fruit-catkins stalked, erect, 1 to $1\frac{1}{2}$ ins. long; scales $\frac{1}{2}$ in. long, with some hairs on the margins, the middle lobe twice as long as the side ones. Seeds with narrow wings. Young cultivated specimens have probably larger and



BETULA MAXIMOWICZII.
(Male catkins.)

broader leaves than in adults, but at present they are very distinct and striking in their stiff habit, fine foliage, and big buds.

B. NANA, *Linnaeus*. DWARF BIRCH.

A dwarf, neat-habited bush, 2 to 4 ft. high, branches erect, not warted, clothed the first two years with minute down. Leaves round or occasionally broader than long, never pointed, $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter, conspicuously round-toothed except at the base; shining dark green above, prettily net-veined beneath, smooth on both surfaces; stalk $\frac{1}{12}$ in. or less long, with a fringed stipule at each side; veins in two to four pairs. Fruiting catkins erect, $\frac{1}{3}$ in. long, shortly but distinctly stalked; scales smooth, with lobes of about equal length, the middle one the broadest.

Native of northern latitudes in Europe (including N. Britain) and N. America, usually inhabiting moist places on mountains. In gardens it is useful for planting on the margins of streams and in moist places generally. Among shrubby birches it is distinguished by its round-toothed, orbicular leaves, and the absence of warts or glands on the shoots.

B. INTERMEDIA, *Thomas* (*B. alpestris*, *Fries*), is regarded as a hybrid between *B. nana* and *B. verrucosa*. The leaves are much larger than in *nana*, and more ovate, but retain much of the characteristic toothing of that species.

B. NIGRA, *Linnaeus*. RIVER BIRCH.

A tree of pyramidal form, 50 to 90 ft. high, with a trunk often forked low down and, like the older branches, covered with large flakes of curling, blackish bark, which gives it a picturesque ruggedness of aspect seen in no other species except *B. davurica*; bark of young trees whitish; young shoots furnished with pale, round warts, and very downy. Leaves diamond-shaped to ovate, always wedge-shaped at the base, pointed, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide, conspicuously double-toothed or small-lobed; glossy green above, glaucous beneath; downy only on the midrib and chief veins, finally smooth above; veins in six to nine pairs; leaf-stalk downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Male catkins 2 to 3 ins. long. Fruiting catkins 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. thick, erect; scales downy.

Native of the eastern United States; introduced by Peter Collinson, in 1736. This is one of the most striking of birches, and its dark rugged trunk affords a remarkable contrast to those of our native and other white species. Although the trunk is sometimes undivided, a characteristic feature of the tree, both wild and cultivated, is its division low down into two or three erect limbs. In the south-eastern United States this birch inhabits the banks of ponds and water-courses, often where the ground is inundated for several weeks at a time. Sargent remarks that the seeds ripen early in the summer, and fall when the water is at its lowest; they immediately germinate in the moist, rich soil, and thus secure a foothold by the time the waters return. It thrives quite well in ordinary soil; there is a tree 60 ft. high at Kew, far away from any water.

B. PAPYRIFERA, *Marshall*. PAPER BIRCH.

(*B. papyracea*, *Aiton*.)

A tree 60 to 70 ft. high, with a rather thin, open head of branches, sometimes pendulous at the ends. Bark of the trunk one of the whitest among birches, mostly very smooth, but coming away in thin, paper-like layers; young shoots warty, the hairs with which they are furnished when quite young soon falling away. Leaves ovate, rounded, sometimes heart-shaped at the base,

slender-pointed ; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, two-thirds as wide ; margins irregularly, often doubly toothed, and hairy ; upper surface dull dark green, with scattered hairs ; lower surface pale, downy in the axils of the veins, dotted with small black glands ; stalks up to 1 in. long ; veins in six to ten pairs. Male catkins up to 4 ins. long. Fruiting catkins drooping, about $1\frac{1}{2}$ in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. thick ; scales usually smooth, the lateral lobes broader than the middle one.

Native of N. America, where it stretches right across the upper latitudes as far north as Labrador and Hudson's Bay, and south to Iowa and Nebraska ; introduced in 1750. It is the most widely spread of all American birches, and the most useful tree of the inclement far north, providing the dwellers in those regions with fuel. The bark is used for roofing, to make drinking utensils, and especially canoes. In gardens it is valuable for the effect the vivid white trunk produces. In this respect it is not more attractive than our native white birch, nor has it the same delicate grace, its leaves being larger and less numerous ; but the trunk remains white to a greater size. It varies very much, as might be expected from its wide distribution, some trees having drooping branches, others erect.

Var. *CORDIFOLIA*, *Fernald*.—A dwarf, even shrubby, form found on the mountains of Eastern N. America. Leaves uniformly heart-shaped.

B. *KENAICA*, *Evans* (*B. papyrifera* var. *kenaica*, *Henry*).—This is an ally of the paper birch, with small ovate leaves $1\frac{1}{2}$ to 2 ins. long ; irregularly, coarsely, often doubly toothed, tapered at the base ; at first minutely downy above, becoming smooth ; veins in five or six pairs ; stalk slender, $\frac{3}{4}$ to 1 in. long. The bark of the trunk is creamy white to reddish brown, and separates into layers. The tree grows 30 or 40 ft. high, and is a native of the coast of Alaska. Introduced to Kew in 1891. It differs from *B. papyrifera* in the fruit scales being hairy on the margin, and in the smaller leaves.

B. POPULIFOLIA, *Marshall*. GREY BIRCH.

A tree 20 to 40 ft. high, with a rather thin, pyramidal head of branches, often pendulous at the ends ; bark of the trunk grey-white, young shoots rough with many warts, not downy. Leaves broadly ovate or triangular, broadly wedge-shaped or truncate at the base, drawn out at the apex into a long, slender point ; 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide ; smooth and shining on both surfaces, glandular above ; veins in six to nine pairs ; leaf-stalk slender, dotted with black glands, $\frac{3}{4}$ to 1 in. long. Male catkins 2 to $3\frac{1}{2}$ ins. long. Fruiting catkins $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. diameter ; scales downy, with the side lobes broader and more rounded than the middle one.

Native of Eastern N. America ; introduced in 1750. The grey birch in its own region plays much the same part as its ally the white birch does in Europe. It occupies sterile and inclement regions, and is one of the first trees to find its way back to land stripped, either by man or by fire, of its original forest covering. It is short-lived, but according to Sargent performs a valuable function in acting as a nurse for the seedlings of more durable trees. It has little to recommend it for gardens except its interest, having no merit that our native birch does not possess in higher degree. The long stalk and drawn-out apex of the leaf, and the absence of down from the younger parts, amply distinguish it.

B. PUBESCENS, *Ehrhart*. WHITE BIRCH.

(*B. alba*, *Linnaeus*, in part.)

A tree of small or medium size, occasionally 70 ft. or more high ; bark of trunk white, peeling off in papery layers, eventually dark and rugged at the

base ; young shoots downy, not warted. Leaves broadly ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, 1 to 2 ins. wide ; usually tapered, sometimes rounded or slightly heart-shaped at the base ; pointed, coarsely toothed ; upper surface thinly downy at first ; lower one downy on the midrib and veins, sometimes only in the vein-axils, sometimes over the whole surface ; veins in five to seven pairs ; stalk more or less downy, $\frac{1}{3}$ to $\frac{2}{3}$ in. long. Fruiting catkins about 1 in. long ; lobes of scale minutely downy, side ones rounded, terminal one ovate.

Native of Europe (including Britain) and N. Asia, and one of the two birches (the other is *B. verrucosa*) which make up the *B. alba* of Linnæus. This is not so attractive a tree for the garden as *B. verrucosa* ; its bark is darker, and its branching being more erect, it lacks the graceful, pendulous habit of that species. It affects moister places than *B. verrucosa*, and is especially abundant in Highland glens. Easily distinguished from typical *B. verrucosa* by its downy, not warted twigs. Numerous forms ascribed to this species have appeared, and there are some intermediate, perhaps hybrids, between it and *B. verrucosa*.

Var. *AUREA*.—Leaves yellow when young ; shoots very downy.

Var. *CRENATA NANA*.—A dwarf round bush growing at the rate of 2 or 3 ins. only annually.

Var. *MURITHII, Gremli*.—A dwarf tree up to 10 or 15 ft. high, or a shrub. It was discovered near Mauvoisin, Val de Bagne (Valais), and is only known there and in one or two other localities in Switzerland. Dr Christ describes it as a very pretty little tree.

Var. *PONTICA, Watson*.—Leaves distinctly tapered at the base, and smooth, except for tufts in the vein-axils beneath ; young shoots slightly warted.

Var. *UNDULATA*.—Leaf-margins wavy ; shoots slightly warted.

Var. *URTICIFOLIA, Spach (B. virgultosa, Fries)*.—A small tree, native of Sweden ; its leaves have a drawn-out apex, and are sharply double-toothed, very dull green, densely downy above when young. Fruiting catkins up to $1\frac{1}{2}$ ins. long, and more slender than in *B. pubescens* itself.

The common birch produces its seeds very freely, and is, as a rule, one of the first trees to find its way back to deforested areas. Like the grey birch in N. America, it is sometimes useful in affording shelter for young timber trees of better class. The wood is of very little value in this country except as fuel, although, like alder, it is largely used to make the clogs and clog-soles worn in the manufacturing towns of Yorkshire and Lancashire. A fragrant oil is obtained from it that is used in the manufacture of Russian leather. The bark is water-tight, and is used in the construction of roofs in Sweden, etc. Under certain conditions it is curiously indestructible. I have seen pieces unearthed during peat-cutting in the Highlands, which must have been buried some centuries, but was still quite silvery.

B. PUMILA, Linnæus. LOW BIRCH.

An erect-habited shrub, 2 to 9 (sometimes more) ft. high ; the young shoots downy or felted, but not warty. Leaves roundish, oval or obovate, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, pointed or bluntish at the apex, coarsely toothed, more or less downy on both sides, often thickly so ; pale or greyish beneath ; chief veins in five or six pairs, the smaller ones in between them finely netted ; leaf-stalk $\frac{1}{8}$ in. or less long. Fruiting catkins $\frac{1}{2}$ to 1 in. long, middle lobe of scales longer than the side ones.

Native of Eastern N. America, where it inhabits boggy places from Labrador to Ohio. It is only likely to be confused in gardens with *B. humilis* and *B. fruticosa*, both of which have warted, glandular branchlets. It has little merit in the garden.

B. ULMIFOLIA, Siebold and Zuccarini.

A tree 50 to 70 ft. high; young shoots slightly hairy, and with a few scattered, whitish lenticels; buds ovate, slender-pointed, of a pale shining green, not viscid. Leaves ovate-oblong, mostly heart-shaped, often unequal at the base, slenderly pointed, irregularly toothed, the teeth finely pointed and often incurved; 2 to 3 ins. long, half as wide; dull green with flattened, silky hairs all over the upper surface, but confined to the veins and midrib beneath; the lower surface is also dotted with glands; veins in about twelve pairs; stalk $\frac{1}{3}$ to $\frac{1}{2}$ in. long, hairy. Fruiting catkins egg-shaped, $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. wide; scales downy, the middle lobe blunt, and about twice as long as the side ones.

Native of Japan; very rare in cultivation. The above description is made from a tree at Kew received from Tokyo in 1896, as *B. grossa*. Prof. Henry, however, compared it with Zuccarini's type specimen of *B. ulmifolia* preserved at Munich and found them identical (see *Trees of Great Britain and Ireland*, p. 979). Except for a certain liability to injury by late spring frost, it is apparently hardy, and distinct in its leaf-buds and heart-shaped, many-ribbed leaves.

B. UTILIS, D. Don. HIMALAYAN BIRCH.

(*B. Bhojpattra, Wallich.*)

A tree 60 ft. high, with a creamy white trunk and branches; bark peeling off in papery flakes; young shoots densely covered with grey down, becoming reddish brown. Leaves ovate, rounded at the base, pointed, 2 to 3½ ins. long, about two-thirds as wide, rather coarsely and irregularly toothed; upper surface dark green, with scattered down; lower surface pale, downy on the midrib and veins, the latter in nine to twelve pairs; leaf-stalk $\frac{3}{4}$ in. long, downy; fruiting catkins 1½ ins. long, $\frac{1}{3}$ in. diameter, cylindrical; scales downy on the margins, the middle one considerably the longer, and rounded at the end.

Native of the Himalaya; introduced by Sir Joseph Hooker in 1849; perhaps before, certainly several times since, from which, judging by its rarity, it would seem that it is not very hardy. A tree over 30 ft. high, planted by the late Mr Chambers at Grayswood in 1882, is the best I know. Young plants have been raised at Kew from its seed, but have not yet had to withstand hard frost. In a letter Mr Chambers remarked that the bark of his tree "even to the branches is creamy white, the young twigs of an orange-chocolate, very pretty in winter." Some trees also exist in Trinity College Botanic Gardens, Dublin. (See also *B. JACQUEMONTII*.)

B. VERRUCOSA, Ehrhart. SILVER BIRCH.

(*B. alba, Linnæus*, in part; *B. pendula, Roth.*)

A tree ordinarily from 40 to 60, occasionally over 100 ft. high, with a silvery white trunk; branches pendulous at the ends; young wood not downy, but furnished with glandular warts. Leaves broadly ovate, sometimes rather diamond-shaped; 1 to 2½ ins. long, $\frac{3}{4}$ to 1½ ins. wide; broadly wedge-shaped or truncate at the base, slenderly tapered at the apex, doubly toothed; not downy, but dotted with glands on both surfaces; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Fruiting catkins $\frac{3}{4}$ to 1¼ ins. long, $\frac{1}{3}$ in. wide, cylindrical; scales smooth except on the margin; middle lobes the smallest.

Native of Europe (including Britain), especially of high latitudes; also of parts of N. Asia. This birch, with *B. pubescens* (*g.v.*), forms the *B. alba* of Linnæus, but most authorities now concur in separating them. The species

is easily distinguished from *B. pubescens* by the warts on the young branchlets and by the absence of down on all the younger vegetative parts. In the latter respect it differs from all the other cultivated birches except *B. populifolia*. (For timber value, etc., see *PUBESCENS*.)

Var. *DALECARLICA*, *Linnaeus fil.* (*B. laciniata*, *Wahlenberg*). Swedish birch.—A very distinct form, the leaves being lobed to within $\frac{1}{4}$ to $\frac{1}{2}$ in. of the midrib, the lobes themselves lanceolate, coarsely toothed, and with long, slender points; leaf-stalks from 1 to $1\frac{3}{4}$ ins. long. Branches and leaves pendulous, and the whole tree very elegant. Found wild in Sweden.

Var. *DENTATA VISCOSA*.—A bushy, small tree of close, twiggy habit; branchlets and leaves very viscid; leaves closely set on the twig, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, coarsely double-toothed or even small-lobed; leaf-stalks $\frac{1}{2}$ in. long.

Var. *FASTIGIATA*, *Scheele*.—Branches erect-growing; the tree being of columnar habit, and resembling a Lombardy poplar.

Var. *OYCOWIENSIS*, *Regel*.—A shrubby form. Leaves mostly diamond-shaped and smaller than in the type; found wild in N.E. Hungary.

Var. *PENDULA YOUNGI*.—Young's weeping birch. An extremely elegant tree, suitable for small gardens. The branches are slender and perfectly pendulous. This is the best of several weeping forms.

Var. *PURPUREA*.—Purple birch. Leaves purple.

B. WILSONI, *Bean*. WILSON'S BIRCH.

A deciduous shrub, 6 to 10 ft. high, its lower branches prostrate; branchlets thickly clothed the first season with forward-pointing, somewhat appressed, pale brown hairs, glabrous and slightly warted the second season. Stipules triangular-ovate, silky. Leaves ovate, pointed, rounded or wedge-shaped at the base, irregularly, often doubly, toothed; $\frac{3}{4}$ to $1\frac{3}{4}$ ins. long, $\frac{3}{8}$ to 1 in. wide; veins deeply sunken and forming parallel grooves above, prominent beneath, in twelve to twenty-two pairs; dark green, becoming smooth except on the hairy veins above, clothed beneath with long, brown, silky hairs, especially on the veins and midrib; leaf-stalk $\frac{1}{2}$ to $\frac{1}{3}$ in. long, silky. Female catkins $\frac{3}{4}$ in. long; scales three-lobed, $\frac{1}{10}$ in. long, the central lobe twice or more than twice as long as the rounded side-lobes, ciliate. Nutlet $\frac{1}{18}$ in. diameter, ovate-orbicular, the wing narrow, ciliate towards the end. Male catkins $\frac{1}{2}$ in. long.

Native of W. China at altitudes of 7000 to 9000 feet. Introduced by Wilson in 1909, who describes it as often hanging down over cliffs. It is very distinct from other dwarf birches in its silky-hairy leaves with numerous veins. (Wilson, No. 1140.)

BIGELOWIA GRAVEOLENS, *A. Gray*. COMPOSITÆ.

(Bot. Mag., t. 8155.)

An evergreen shrub, 6 to 8 ft. high, much branched; branches erect, and white when young. Leaves alternate, crowded on the branch, linear, 1 to 3 ins. long, $\frac{1}{3}$ in. wide or less, long-pointed, smooth. Flower-heads bright yellow, very numerous, forming flattish corymbs 1 to 4 ins. across; each head is composed of about five florets, each of which is very slender, tubular, $\frac{1}{3}$ in. long, the pointed teeth of the corolla erect, the base slightly downy. When crushed the plant emits a not unpleasant, somewhat pungent odour.

Native of Western N. America, inhabiting dry situations. It is not hardy in the open at Kew, but thrives remarkably well on a south wall,

where it flowers abundantly during the latter end of September and during October, producing heavy masses of corymbs often 9 to 12 ins. across. It does not need a rich or heavy soil, but a well-drained, sandy loam, and all the sunshine possible. The above description is made from the plant at Kew, figured in the *Botanical Magazine*; but in a wild state the species is spread over a wide extent of country, and is said to vary much.

Var. *ALBICAULIS*, *Nuttall*, differs from the above in having the branches clothed with woolly down, and the tube of the corolla clothed with long hairs.

BIGNONIA CAPREOLATA, *Linnaeus*. CROSS VINE.

BIGNONIACEÆ.

(Bot. Mag., t. 864.)

An evergreen or semi-deciduous climber (according to climate); in nature ascending trees to a height of 40 to 50 ft.; stems long, slender, smooth except at the joints. Leaves opposite, composed of two leaflets on a common stalk $\frac{1}{2}$ in. long, which is prolonged into a branched tendril. Leaflets oblong-lanceolate or ovate-lanceolate, 2 to 5 ins. long, $\frac{1}{2}$ to 2 ins. wide; heart-shaped at the base, tapered at the apex, smooth and deep green; stalk $\frac{1}{2}$ in. long, hairy on the upper side. Flowers orange-red, clustered in the leaf-axils, each on a stalk 1 to $1\frac{1}{4}$ ins. long. Corolla between tube- and funnel-shaped, $1\frac{1}{2}$ to 2 ins. long, $1\frac{1}{4}$ ins. wide at the mouth, where it spreads into five ovate, rounded lobes. Calyx bell-shaped, $\frac{3}{8}$ in. long, shallowly five-toothed. Pod about 6 ins. long, slender, flattened. Blossoms in June.

Native of the south-eastern United States; introduced in 1710. In order to succeed near London this handsome climber must have a sheltered, sunny wall. It is the only member of a very large and ornamental genus of climbers confined to the New World that can be grown out-of-doors by us. The popular name refers to the cross-like appearance of the wood when cut through transversely.

Var. *ATROSANGUINEA* (Bot. Mag., t. 6501) has darker, red-purple flowers, and longer, narrower leaves.

BILLARDIERA LONGIFLORA, *Labillardière*. PITTOSPORACEÆ.

(Bot. Mag., t. 1507.)

A climbing, evergreen shrub, with slender, smooth stems and narrow, lanceolate, entire leaves, 1 to $1\frac{1}{2}$ ins. long. Flowers solitary in the leaf-axils, each one on a slender stalk, $\frac{1}{2}$ in. long, pendulous; the five petals are oblanceolate, $\frac{3}{4}$ in. long, free but not spreading, greenish yellow. Fruit an oblong-globular, dry capsule, of a beautiful dark blue, $\frac{3}{4}$ to 1 in. long.

A native of Tasmania; introduced in 1810. Unfortunately this delightful climber can only be grown out-of-doors in the milder parts of Great Britain. The finest plants I have seen are in the garden of Sir John Ross of Bladensburg, at Rostrevor, Ireland, and in that of Mr

Osgood H. Mackenzie at Inverewe, in the county of Ross. Here it flowers freely in July, and is then very pretty, but its greatest beauty comes in October and November, when the fruits acquire their charming colour. The fruit contains abundant seed, which germinates readily. There is said to be a white-fruited form in cultivation. The generic name commemorates Labillardière, a French botanist who travelled in Australia, and published a work on its flora in Paris in 1804.

BOWKERIA GERRARDIANA, *Harvey*. SCROPHULARIACEÆ.

(Bot. Mag., t. 8021; *B. triphylla*, of gardens.)

An evergreen shrub, 8, 10, or more ft. high; stems covered with fine grey hairs. Leaves stalkless, arranged in threes at each joint, 4 to 7 ins. long, $1\frac{1}{2}$ to $2\frac{1}{4}$ ins. wide; ovate-lanceolate, toothed, long-pointed; dull green, somewhat downy on both surfaces. Flowers produced in August in lax, three- to ten-flowered cymes; the shaggy flower-stalks springing from the leaf-axils. Corolla pure white, $\frac{3}{4}$ in. across, similar to a calceolaria, two-lipped, flattened at the mouth of the tube to a broad slit; upper lip broadly two-lobed, lower one three-lobed. The inflorescence is very viscid.

Native of Natal, and rare in cultivation. It has long been grown under glass at Kew, but my first knowledge of its existence in the open air was obtained in August 1903, when flowering shoots were sent to Kew from Mrs Gwytherne Williams' garden at Belvedere, St Lawrence, Isle of Wight. The shrub was then 7 ft. high, and flowered freely without protection. It is not only a beautiful shrub, but interesting as one of the comparatively few South African ones that can be grown outside in the south of England. Near London it is not possible to grow it out-of-doors. The name under which it is usually grown—"B. triphylla"—belongs to a plant not apparently in cultivation at present.

BROUSSONETIA. URTICACEÆ.

The Broussonetias are closely allied to the mulberries, but are less woody, and the plants are unisexual. Two species are in cultivation, both from N.E. Asia. They have alternate leaves, and are rather rank-growing shrubs or small trees, deciduous, and with abundant pith in the young shoots. They grow well in any soil of moderate quality, and are easily increased by summer cuttings. These should be made in July or August, of short shoots with a heel of older wood attached. Female trees sometimes produce fruit under cultivation.

B. KAZINOKI, *Siebold*.

(*B. Kaempferi*, *Siebold*; *B. Sieboldii*, *Blume*.)

A deciduous shrub, 10 to 15 ft. high, of open, spreading habit, with very pithy, purplish red young shoots, whose bark is slightly downy at first, soon quite smooth. Leaves ovate, occasionally two- or three-lobed, rounded or

slightly heart-shaped at the base, long and taper-pointed, toothed; extremely variable in size, three-nerved at the base; slightly downy when young, soon afterwards smooth; upper surface rather rough. On strong growths they may be 6 to 10 ins. long, 3 to 5 ins. wide; on weaker shoots as small as 2 ins. long; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers of the male plant in clusters $\frac{1}{2}$ in. long, on a slender, downy stalk about the same length; female flowers in a smaller, globose head, with long, slender, downy styles. Neither has any beauty. Fruits in a globose head, woolly.

Native of Japan and Corea. This species is distinguished from *B. papyrifera* by its smooth young wood and leaves, by its shorter male inflorescence, and by the usually shorter leaf-stalks. It is not so striking or vigorous a shrub. Often met with in gardens as *B. Kaempferi*; the plant first described under that name, however, is a climbing shrub probably not in cultivation.

B. PAPYRIFERA, *Ventenat.* PAPER MULBERRY.

(Bot. Mag., t. 2358.)

A coarse-growing, vigorous shrub, or a tree up to 30 ft. high, forming a roundish, spreading head of branches; young wood thickly downy, soft and pithy. Leaves very variable in size and form, ovate or variously lobed, often shaped like fig leaves; rounded, or more or less tapered at the base, pointed, toothed, three-nerved at the base; upper surface dull green and rough, lower surface densely woolly till they fall; stalk 1 to 4 ins. long. Flowers of the male plant in cylindrical, often curly, woolly catkins, $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{4}$ in. wide; female flowers in ball-like heads $\frac{1}{2}$ in. in diameter. Fruit red.



BROUSSONETIA PAPYRIFERA. (Male catkins.)

Native of China; introduced early in the eighteenth century. It is now widely cultivated in Eastern countries; in Japan chiefly for the manufacture of paper from the bark, and in the Polynesian islands for the fibre, which is made into a cloth. Capt. Cook noticed in Otaheite that the finest and whitest cloth worn by the principal inhabitants was made from this material. In some of the Dalmatian towns, especially at Spalato, I have seen it as a street tree of neat, rounded shape. The lobed leaves mostly occur on young vigorous trees, the unlobed ones on flowering specimens.

Var. *CUCULLATA*, *Seringe*.—A male tree with curious leaves whose margins are curled upwards, so as to give the leaf the shape of a boat.

Var. *LACINIATA*, *Seringe* (*B. dissecta*, *Senéclause*).—In this remarkable variety, which is quite dwarf, the leaf is reduced to the stalk and the three main veins, the ends of which have each a small, narrow, variously shaped

blade. The leaf has thus a trifoliate aspect. When in foliage the whole shrub is a tangle of these slender leaf-stalks. I have not seen this variety in flower.

Both the varieties here mentioned are merely curious freaks, but the type itself makes a handsome shrub; the male plant when freely furnished with its yellowish, drooping catkins is striking.

BRUCKENTHALIA SPICULIFOLIA, *Reichenbach.* ERICACEÆ.

(Bot. Mag., t. 8148.)

A dwarf evergreen shrub, about 6 ins. high, forming dense tufts of erect, very leafy twigs, heath-like in appearance; branches slender, downy.



BRUCKENTHALIA SPICULIFOLIA.

Leaves spreading, much crowded, linear, $\frac{1}{8}$ to $\frac{1}{6}$ in. long, ending in a bristle; the margins recurved and more or less glandular-hairy; lower surface white, but nearly hidden by the recurved margins. Flowers densely packed in a terminal, erect raceme 1 in. or less long. Corolla bell-shaped, $\frac{1}{8}$ in. long, with four-rounded lobes, rosy; calyx similarly coloured but much smaller, and with pointed lobes. Stamens eight; seed-vessel globular, with the style and calyx persisting; flower-stalk $\frac{1}{8}$ in. long.

Native of the mountains of E. Europe and Asia Minor, discovered by Sibthorp in 1802, near Brussa; introduced to Kew in 1888. It differs from hardy *Ericas* in the open-mouthed corolla. Commencing to bloom early in June, it

continues for about a month. It is a dainty little plant, not particularly showy, but suitable for a nook with peaty soil in the rock garden. At Kew it has proved perfectly hardy, and is used as a dwarf ground-covering beneath other sparse-habited peat-lovers. It may be increased by seed, which it ripens freely, and by cuttings treated as advised for hardy heaths (see *ERICA*).

BRUNNICHIA CIRRHOSA, *Banks.* POLYGONACEÆ.

A deciduous climber, growing 15 ft. or more high, with slender, grooved stems, smooth except at the joints, and supporting itself by means of forked tendrils terminating the branches. Leaves alternate, ovate, truncate or heart-shaped at the base, pointed; 2 to $4\frac{1}{2}$ ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide; not toothed, dark glossy green, almost or quite smooth; stalk $\frac{1}{2}$ to 1 in. long. Flowers small, greenish, arranged in clusters of two to five on slender terminal and axillary racemes $1\frac{1}{2}$ to 6 ins. long, the whole forming a loose panicle 12 to 18 ins. high. Calyx persistent and surrounding the seed-vessel, enlarging and becoming leathery as the seed ripens; there is a wing $\frac{1}{8}$ in. wide on one side extending down the flower-stalk, the whole ultimately about 1 in. long. Only a proportion of the flowers ripen seed and develop in this curious way.

Native of the south-eastern United States; introduced in 1787. This curious and interesting climber has not sufficient flower beauty to gain it much recognition in gardens, and although introduced so long ago, is very uncommon. It is perfectly hardy at Kew, where it has lived without protection in the open for at least twenty years. It is the only hardy species, and somewhat resembles *Smilax* in leaf and growth. The name commemorates M. T. Brunnich, a Scandinavian eighteenth-century naturalist.

BUCKLEYA DISTICHOPHYLLA, *Torrey.* SANTALACEÆ.

(Garden and Forest, 1890, fig. 37.)

A unisexual, deciduous, privet-like shrub, 6 to 12 ft. high, of lax, wide-spreading habit; young shoots downy. Leaves opposite or nearly so, arranged in two rows, lance-shaped or approaching ovate, rounded or broadly wedge-shaped at the base, long and taper-pointed; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{7}{8}$ in. wide; downy on the midrib and margins. Flowers small, greenish, terminal on young shoots; the males $\frac{1}{8}$ in. across, in a small umbel; the females solitary, much larger than the males, $\frac{1}{2}$ in. long, with four spreading, narrowly lanceolate sepals. Nuts hard, one-seeded, oblong, $\frac{3}{4}$ in. long, furrowed.

Native of N. Carolina and Tennessee; discovered by Nuttall in 1816; introduced to Kew in 1897. Naturally it is a parasite on the roots of other trees, most frequently *Tsuga canadensis*. Very little success has been attained in its cultivation here, although the seeds that are occasionally offered by nurserymen in the south-eastern United States germinate freely. A young plant parasitic on *Tsuga* lived for ten years at Kew, but usually there is a difficulty in getting it thoroughly attached to a host plant. Those who take an interest in remarkable plants of this kind may like to experiment with it. The seeds may be sown in pots under glass, and after germination planted near a host plant. They can live for some time on their own stored-up food. Other methods

may be adopted, such as sowing seeds near the roots of *Tsuga* out-of-door, protecting by a handlight at first. Perhaps this shrub needs more sun than it gets here, but it is capable of withstanding intense frost. I remember a vigorous bush, 8 or 10 ft. high, in the botanic garden of Harvard University, Cambridge, Mass., where the winter cold is much more intense than what we experience.

BUDDLEIA. LOGANIACEÆ.

The genus *Buddleia* was named in honour of the Rev. Adam Buddle, one time vicar of Farnbridge, in Essex. The species are small trees and shrubs (rarely herbs) with often angled or winged stems; opposite, usually downy or woolly leaves; they are found in S. America, S. Africa, and N. Asia. In the cultivated species the flowers are produced in terminal and axillary racemes or panicles, on which they are grouped densely in close clusters, except in *B. globosa*, where they appear in globular heads. The calyx is bell-shaped, four- or five-toothed, or lobed; the corolla tubular, with four lobes, often withering on the stalk and persisting. Stamens four. Seed-vessel a capsule of two valves splitting from the top.

The *Buddleias*, provided the climate is suitable for them, are easily cultivated. They all like a rich, loamy soil and a sunny position, and are easily propagated by cuttings of late summer growths, or by seeds. The following species, with the exception of *B. globosa*, flower on the growths of the year, and may be pruned back in spring before growth commences. For those of the *variabilis* type this pruning is necessary in order to get strong shoots and panicles.

Buddleia not described in the following notes are:—*B. ASIATICA*, *Loureiro*, a slender, graceful shrub with long panicles of white, exquisitely fragrant flowers produced in winter, but only hardy enough to grow out-of-doors in summer. *B. INTERMEDIA*, *Carrière*, said to be a hybrid between *japonica* and *Lindleyana*. *B. LINDLEYANA*, *Fortune*, too tender for any but the mildest counties, but 10 to 12 ft. high in the Bath Botanic Garden.

B. ALBIFLORA, *Hemsley*.

A strong-growing deciduous shrub, said by Henry to be sometimes a small tree 20 to 30 ft. high; branches erect, soon quite smooth. Leaves narrow lanceolate, with a long tapered point and wedge-shaped base; 4 to 9 ins. long, $\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide, toothed, dark green, and soon becoming smooth above; covered beneath with a close, fine, silvery grey felt. Flowers fragrant, lilac (not white), with orange-coloured centres, produced from July onwards in slender, tapering panicles 8 to 18 ins. long, 2 ins. wide at the base, terminating the main shoots, with smaller ones on lateral shoots. Corolla tube $\frac{1}{2}$ in. long; persisting as in other species until burst off by the swelling seed-vessel beneath it. Calyx smooth, bell-shaped, with pointed narrow lobes.

Native of China; discovered by Henry, and introduced in 1900 by Wilson, who observes that it is fairly common on the shrub-clad mountains of Central China at 3000 to 6000 ft. altitude. With the general aspect of *B. variabilis*, it

is not so good a shrub ; the branchlets are not so square, the leaves are more distinctly stalked and the calyx differs in being smooth.

B. HEMSLEYANA, *Koehne*, is nearly allied to, perhaps only an inferior form of, *B. albiflora*. It is only worth growing in collections. The flowers have not the orange-coloured eye seen in those of *albiflora* or *variabilis*.

B. COLVILEI, *Hooker fil.*

(Bot. Mag., t. 7449.)*

A shrub or small tree, 30 to 40 ft. high in the Himalaya, of vigorous growth, producing long arching shoots in one season ; all the younger parts of the plant are at first covered with red-brown wool. Leaves 3 to 10 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide ; oval lance-shaped, shallowly toothed, tapered at both ends ; dark green, at first downy above and felted beneath, but becoming nearly smooth on both surfaces. Flowers produced in June in a terminal pendulous panicle, 6 to 8 ins. long, about 3 ins. wide. Corolla of a beautiful rose colour, white in the throat, the tube $\frac{3}{4}$ to 1 in. long, as much or more across the limb ; the four lobes rounded, recurved. Calyx bell-shaped, with short lobes.

Native of the Sikkim Himalaya, up to 12,000 ft. ; discovered by Sir Joseph Hooker in 1849. It first flowered with the late Mr W. E. Gumbleton at Belgrove, near Cork, in 1892, where, growing against a wall, it has only been injured by the frosts of early 1895. In several places on the west coast of Scotland also it succeeds admirably. The nearest locality to London where it has flowered well out-of-doors is in the garden of Grayswood, Haslemere. No other *Buddleia* capable of living out-of-doors in the British Isles has such large individual flowers, and it is undoubtedly the handsomest in the genus ; Sir J. Hooker even said, "the handsomest of all Himalayan shrubs."



BUDDLEIA COLVILEI.

B. GLOBOSA, *Hope.*

(Bot. Mag., t. 174.)

A partially evergreen, or, in hard winters, deciduous shrub, 15 ft. high in the open, still more on walls and in favoured places ; of rather open, gaunt habit ; stems angular, covered with a tawny, loose felt. Leaves lance-shaped,

ordinarily 5 to 8 ins. long, about one-fourth as wide (occasionally considerably larger), tapered at both ends, but more gradually towards the point; round-toothed, dark green and wrinkled but not downy above, covered beneath with a tawny felt; stalk $\frac{1}{4}$ in. or less long. Flowers fragrant, bright yellow, produced in June in balls $\frac{3}{4}$ in. diameter, eight or ten of these globose heads are arranged in a terminal panicle in opposite pairs, each on a stalk 1 to $1\frac{1}{2}$ ins. long; the whole panicle 6 to 8 ins. long.

Native of Chile and Peru; introduced by Messrs Kennedy and Lee in 1774. This singularly handsome and striking shrub is hardy at Kew; the only time I have seen it injured was in February 1895, when three out of four plants were cut to the ground, but sprang up again the following summer. It is distinct among cultivated Buddleias in the yellow of its flowers and their arrangement in globular heads.

B. JAPONICA, *Hemsley*.

A deciduous shrub, usually 3 to 5 ft. high, open in habit, and sparsely branched; branches stiff, four-angled, the angles much winged. Leaves narrow-lanceolate, 3 to 8 ins. long, 1 to 2 ins. wide; minutely and sparsely toothed; dark green and smooth above, at first tawny-felted beneath. Flowers crowded densely in terminal branched panicles, 4 to 8 ins. long. Corolla pale lilac, woolly outside, the tube $\frac{1}{2}$ in. long; the four lobes small. Calyx woolly, pitcher-shaped, with slender-pointed lobes; both calyx and corolla are persistent on the seed-vessels, which are egg-shaped, $\frac{1}{4}$ in. long, and very freely borne.

Native of Japan. This is not one of the best of the Buddleias, although rather striking in autumn with the long, dense, drooping panicles of fruit. It bears these in such abundance, that they appear to shorten the life of the shrub. At any rate, after a few years it becomes weak and thin in growth, and should be renewed (by seed rather than by cuttings). It has been cultivated on the Continent as *B. curviflora*, but is not the true plant of that name. Several forms have been raised from seed, the best of which is var. *INSIGNIS* (*Revue Horticole*, 1878, fig. 76), a plant of more compact habit and brighter coloured flowers than the type.

B. NIVEA, *Duthie*.

(Gardeners' Chronicle, 1905, ii., fig. 102.)

A deciduous shrub, 6 to 9 (perhaps more) ft. high, with the young branchlets covered thickly with a pure white wool. Leaves of variable size, from the largest, 10 ins. long by 4 ins. wide, down to others 3 to 4 ins. long and 1 in. wide; they are long-pointed, rounded at the base, angularly toothed except at the end; dark green and ultimately smooth above except on the midrib; covered beneath with a thick wool, at first pure white, then tawny. Panicles branched, terminal on the main shoots, and supplemented by others at the end of short axillary branches. Each portion of the panicle is slender, $\frac{3}{4}$ to 1 in. in diameter, and 3 to 6 ins. long. Flowers $\frac{1}{4}$ in. long, pale purple, only showing colour at the tip, the corolla-tube and calyx being covered with wool.

Native of China; discovered by Wilson in Western China, at altitudes of 7000 to 8000 ft., and introduced in 1901. It is a vigorous plant, but its chief attraction is the snowy covering of the leaves, shoots, and panicles. It flowers in August.

B. PANICULATA, *Wallich*.

(Bot. Mag., t. 4793, as *B. crispa*, *Benth.*)

A deciduous shrub, of bushy habit, 6 to 12 ft. high, more in diameter; the branchlets covered with a white or tawny, loose felt. Leaves lanceolate, 2 to 5

ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide ; slightly heart-shaped or cut nearly square at the base, tapering thence to the point, coarsely and angularly toothed, covered above, and more so below, with a whitish or tawny down ; stalk $\frac{1}{4}$ to 1 in. long. Flowers fragrant, produced in June or later in a terminal panicle 3 ins. high and 2 ins. wide, formed of axillary whorls. Corolla lilac-coloured ; the tube $\frac{1}{2}$ in. long, downy outside ; the four-lobed limb about as much in diameter, white near the orifice of the tube. Calyx with erect, ovate lobes, woolly like the stem.

Native of Afghanistan and the Himalaya, where it is occasionally a small



BUDDLEIA NIVEA.

tree ; a similar but not identical plant is found in W. China. At Kew, a plant raised from seed sent home by Dr Aitchison from Afghanistan in 1879 is perfectly hardy, having received no protection during the last thirty years.

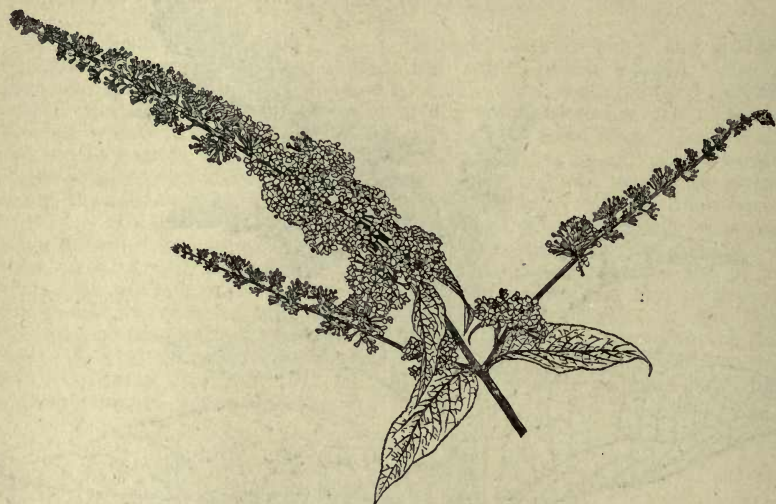
B. VARIABILIS, *Hemsley*.

(*Bot. Mag.*, t. 7609 ; *B. Daviddii*, *Franchet.*)

A deciduous shrub, very variable in habit and flower, the largest forms 10 to 15 ft. high and wide-spreading bushes of open growth ; branchlets four-angled, downy. Leaves 4 to 12 ins. long, 1 to 3 ins. wide ; lanceolate or

linear-lanceolate, finely toothed, with very long, tapered points; dark green and soon becoming smooth above, white-felted beneath; stalks very short. Flowers slightly fragrant, arranged densely in short, rounded clusters on slender panicles 6 to 30 ins. long, according to the vigour of the plant and the variety, and appearing from July to October, or later. Corolla varying in colour from lilac to purple, orange-yellow at the mouth, the tube $\frac{1}{3}$ to $\frac{1}{2}$ in. long, the limb $\frac{1}{4}$ to $\frac{1}{3}$ in. wide, flower-stalks and calyx more or less felted. Seed-vessel smooth $\frac{1}{4}$ to $\frac{1}{3}$ in long, cylindrical, pointed

Native of Central and W. China up to 9000 ft. first discovered near Ichang by Prof. Henry, about 1887, and originally introduced by way of St Petersburg. Of the many forms of *B. variabilis* this, the earliest one, is the poorest, being of comparatively weak, low, semi-prostrate habit, and poor in colour of flower. Nowadays it is not worth growing. A second and much superior form



BUDDLEIA VARIABILIS var. MAGNIFICA.

was raised in France in 1893, by Mr Maurice de Vilmorin, this having a more erect habit, arching branches, with denser clusters and longer panicles of lilac flowers. It is var. VEITCHIANA, afterwards introduced by Wilson.

Var. MAGNIFICA is similar in habit to var. Veitchiana, but commences to flower rather later. It has bright violet-purple flowers, the divisions of the corolla being reflexed at the margin

Var. WILSONI has flowers of a rosy lilac with a deep orange centre, the divisions of the corolla being erect. Both these were originally introduced by Wilson for Messrs Veitch.

B. variabilis in all its forms needs a rich, loamy soil; the more robust its growth, the finer the flower panicles. The previous year's growth should be pruned hard back every spring. Vigorous young plants treated in this way will make shoots 8 ft. long in a season, terminated in due time by panicles 2 to $2\frac{1}{2}$ ft. long. Its best forms are probably the most effective of all late summer-flowering shrubs.

BUMELIA LYCIOIDES, *Gaertner*. SOUTHERN BUCKTHORN.
SAPOTACEÆ.

A deciduous, small tree over 20 ft. high in a wild state, but usually a shrub little more than half that height in cultivation; branchlets smooth, and on young specimens usually armed with spines $\frac{3}{4}$ in. or less long. Leaves firm and rather hard in texture, varying in shape from narrow oval to obovate (the former shape more characteristic of young plants), 1 to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; always tapered to the base, pointed or rounded at the apex, not toothed, and quite smooth except for a few silky hairs about the midrib beneath; conspicuously veined; stalk $\frac{1}{6}$ to $\frac{1}{3}$ in. long. Flowers $\frac{1}{8}$ in. in diameter, produced in August and September each on a smooth stalk $\frac{1}{2}$ in. or less long, crowded numerously in hemispherical clusters in the leaf-axils. Corolla white; calyx comparatively large, green. Fruit egg-shaped, $\frac{1}{2}$ in. long, black, rarely or never seen in this country.

Native of the south-eastern United States, and known in England since 1752, but not ornamental enough to be generally cultivated. It is quite hardy at Kew, but appears to be the only one of the genus of which so much can be said. The leaves on young sterile plants resemble those of a peach in size and shape. Several other species have at times been introduced, but they need at least the warmth of the south-western counties to thrive. Amongst them *B. TENAX*, *Willdenow*, whose leaves are covered beneath with a tawny yellow, silky down; and *B. LANUGINOSA*, *Persoon*, with a more or less woolly down, are the most interesting.

BUPLEURUM FRUTICOSUM, *Linnaeus*. UMBELLIFERÆ.

An evergreen or semi-evergreen shrub, of lax habit, 5 to 8 ft. high, with slender, not much divided branches, and smooth, purplish young shoots. Leaves alternate, firm, narrowly obovate, stalkless, tapering at the base, rounded or with a short, bristle-like tip at the apex, entire; 2 to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; quite smooth, and of a bluish green. Flowers small, yellow, produced in a terminal umbel 3 or 4 ins. across.

Native of S. Europe and the Mediterranean region; introduced more than three hundred years ago. This shrub is of interest as being the sole shrubby representative of the great natural order of Umbellifers that can be cultivated in the open air in Britain. Four herbaceous members of the same genus are natives of chalky districts in Britain, and are known in country places as "buplevers." This introduced shrub is not particularly hardy. At Kew it can only be kept safely by growing it against a wall, where it is 8 to 10 ft. high. In most maritime districts and in the south-western counties it succeeds admirably, and its yellow flower-clusters and blue-green foliage make a very effective contrast. It flowers from July to September, and is propagated easily by cuttings. It is one of the best shrubs for planting on exposed cliffs near the sea, and is very well adapted for chalky districts.

BURSARIA SPINOSA, *Cavanilles*. PITTOSPORACEÆ.

(Bot. Mag., t. 1767.)

An evergreen, glabrous shrub, 4 to 8 ft. high, with both spiny and unarmed branches. Leaves alternate, obovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{3}{16}$ to $\frac{3}{8}$ in. wide; notched or rounded at the apex, tapering towards the base, but scarcely stalked. Flowers produced in panicles that terminate the twigs towards the end of the branch, and vary in size according to the strength of the shoot that bears them, the largest 5 or 6 ins. high by 3 to 4 ins. through; each flower is about $\frac{1}{4}$ in. across, with narrow, white petals. Although the individual flower is so small, the entire bush makes a pretty display when in bloom, on account of its profusion. The fruit is a dry, flat, pouch-like capsule about $\frac{1}{3}$ in. across, reddish brown, resembling in shape that of common shepherd's purse.

Native of New South Wales, and only suitable for the milder parts of the British Isles. In the garden of Canon Ellacombe at Bitton, near Bristol, it thrives exceedingly well against a wall, flowering during August, when but few other shrubs are in bloom. The great crop of reddish fruits is also decidedly striking. The generic name refers to their shape. This shrub can be increased by cuttings made of half-ripened wood placed in gentle heat.

BUXUS. BOX. EUPHORBIACEÆ.

Evergreen shrubs or trees, of which about twenty species are known, inhabiting all three continents of the Old World. The leaves are opposite, not toothed or lobed, leathery in texture, easily separated into two layers. Flowers unisexual, small and inconspicuous, produced in short dense clusters in the leaf-axils in spring, the males and females in the same cluster, the former the more numerous. They have no petals; but the male has four sepals and four stamens, the female six sepals and three pistils. Fruit a three-celled capsule, each valve two-horned; seeds black and shining. Wood of hard, bony texture.

The boxes succeed in almost any soil, and are often found wild on a limestone formation. They are useful for semi-shaded positions. Cuttings of all the cultivated species and varieties except *B. Wallichiana* strike root freely. The most famous site of naturally grown box trees in England is Box Hill, near Dorking; but several other place-names in England indicate a more extended habitat in former times. It has been stated that £10,000 worth of box timber was taken from Box Hill in 1815.

B. BALEARICA, *Lamarck*. BALEARIC BOX.

An evergreen shrub, or small tree up to 30 ft. high, densely branched; young stems square, and at first slightly downy. Leaves roundish oval to ovate oblong; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide, wedge-shaped at the base, usually notched at the apex (or the terminal leaves sometimes minutely and abruptly pointed); thick and leathery, dark glossy green above, but

not so shining as in *B. sempervirens*, pale green beneath; stalk slightly downy, $\frac{1}{12}$ in. long. Flowers yellowish green, of no beauty; males shortly stalked.

Native of the Balearic Islands and the south-west of Spain. The species is easily distinguished from the common box by the duller, larger leaves, the thicker, more robust shoots, and the sturdier habit. The largest specimen I know in this country is at Kew, near the Temple of the Sun, and now about 24 ft. high, its trunk $2\frac{1}{2}$ ft. in girth. It grows slowly, and is probably the oldest in the country. Loudon mentioned this tree, which once grew on the wall of a house, as being 13 ft. high in 1836. Aiton gives 1780 as the date of its introduction. In the gardens of S. Europe it takes the place that *B. sempervirens* does here.

B. HARLANDII, *Hance*. HARLAND'S BOX.

(*B. chinensis*, *Hort.*)

A dwarf evergreen bush, of rounded, compact habit, not likely, so far as one is at present able to judge, to get more than 2 or 3 ft. high; shoots slender, mostly erect, slightly downy when young. Leaves standing erect, narrowly oblong or obovate, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide, tapering at the base, rounded at the apex, smooth.

Native of China. This is one of the dwarfest of the boxes, and somewhat similar to *B. sempervirens* var. *suffruticosa*, the "Edging Box," but its leaves are longer. Its neat and slow growth would make it useful in positions where a dwarf evergreen is needed, but Wilson says the true thing is quite tender.

B. JAPONICA, *Mueller*. JAPANESE BOX.

A loose-habited evergreen shrub, 3 or 4 ft. high; young stems smooth, square, conspicuously winged. Leaves $\frac{1}{3}$ to $\frac{3}{4}$ in. long, roundish obovate or inversely heart-shaped, sometimes as broad as long, tapered at the base, rounded or notched at the apex, smooth except for a slight down on the stalk when young. Flowers produced very freely in March and April, but of no beauty.

Native of Japan, and in my experience the least ornamental of the boxes. It has an ungainly habit, and has not the healthy, vigorous aspect one associates with the genus. The roundish leaves, winged stems, and absence of down are its distinguishing features. It also flowers more freely than any other species.

B. MICROPHYLLA, *Siebold*. SMALL-LEAVED BOX.

This pleasing little box resembles one of the small forms of *B. sempervirens*, but its stems and leaves are quite smooth. It is a compact shrub, probably not more than 3 or 4 ft. high, and slow-growing; stems square. Leaves $\frac{1}{3}$ to $\frac{1}{2}$ in. wide; obovate or oval, notched or rounded at the apex, tapering at the base. Compared with *B. Harlandii* the habit is more open, the leaves more spreading. The typical *B. microphylla* has smooth young shoots, but a box from China, very similar, has downy shoots and is probably the var. *SINICA*, *Rehd. and Wils.*

Native of Japan, and in most of its botanical characters similar to *B. japonica*, but a better garden plant.

B. SEMPERVIRENS, *Linnaeus*. COMMON BOX.

An evergreen bush usually wider than it is high, or a small tree 15 to 20 (or even 30) ft. high; young stems square, slightly winged, minutely hairy. Leaves ovate, oval or oblong, notched at the apex, $\frac{1}{2}$ to 1 in. long, about half

as wide (considerably larger in some of the garden forms; very dark green above, pale below; shining on both sides; stalk very short, minutely hairy. Flowers produced in April, pale green with yellow anthers, and of no beauty. Seed-vessel $\frac{1}{3}$ in. long, with six beaks.

Native of Europe, N. Africa and W. Asia, and very probably indigenous to Britain, although this is doubted by some authorities. In gardens the box shares with the holly and the yew the distinction of being the most useful (as distinct from the most beautiful) of hardy evergreens. Some of the more pendulous forms make handsome lawn specimens, and the ordinary type makes an admirable shelter, or a screen for hiding unsightly objects, especially in half-shaded places. Its use for topiary work is well known, also for planting in formal arrangements, where it is kept low and flat by clipping. For the latter purpose the var. *suffruticosa*, used so extensively for "box-edging," is also employed. The adaptability of the ordinary form to pruning makes it useful in positions where space is strictly limited, for it can be kept permanently about 6 ft. in height by a judicious removal of prominent shoots, and this without rendering it unduly formal.

Like the holly and the yew, the box was in earlier times associated with certain festivals and ceremonies. The wood is of a hard, almost bony consistence, and before wood-engraving became an almost lost art was a favourite medium for the purpose. Large quantities were formerly imported from S.E. Europe and Persia. Even now, so useful is the wood, the world's supply is not equal to the demand.

Of numerous named varieties cultivated in gardens, some of which scarcely differ from each other, the following are the most distinct:—

Var. *ARGENTEA*.—Leaves with a white border of varying depth.

Var. *AUREA PENDULA*. Golden Weeping Box.—Branches pendulous. Leaves margined with, or almost wholly, yellow.

Var. *ELEGANTISSIMA*.—Habit dwarfer than the type. Leaves narrow, bordered with silver.

Var. *HANDSWORTHII*.—Habit vigorous, densely bushy, but somewhat erect. Leaves large and broad.

Var. *LATIFOLIA*.—The broadest-leaved variety; leaves as much as $\frac{3}{4}$ in. wide. Habit stiff.

Var. *LONGIFOLIA*.—Leaves long and proportionately narrow, being $1\frac{1}{2}$ ins. long, and scarcely $\frac{1}{2}$ in. wide. Habit bushy.

Var. *MYOSOTIFOLIA*.—A curious dwarf, very slow-growing variety, of dense, compact habit. Leaves green, very small, and the largest about $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide.

Var. *MYRTIFOLIA*. Myrtle-leaved Box.—Habit dwarf. Leaves green, narrow, $\frac{1}{3}$ to $\frac{3}{4}$ in. long, $\frac{1}{12}$ to $\frac{1}{6}$ in. wide.

Var. *PENDULA*.—A very elegant form with pendent branches, but growing naturally into a small tree.

Var. *PROSTRATA*.—Low horizontal-branched shrub, rarely more than 2 or 3 ft. high.

Var. *PYRAMIDALIS*.—Branches erect, may be used for hedges, but too ungraceful for common use.

Var. *ROSMARINIFOLIA*. Rosemary-leaved Box.—Leaves long and very narrow, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide.

Var. *SUFFRUTICOSA* (*Buxus suffruticosa*, *Miller*). Edging Box.—For centuries this variety, distinguished by its dwarf habit and small obovate leaves, has been valued in formal gardening for making neat edgings to flower-beds, walks, etc. It can be kept a few inches high by persistent clipping, but left to itself as one may occasionally see it in old or neglected gardens, it becomes 4 or 5 ft. high. It can be increased by division or by cuttings.

B. WALLICHIANA, *Baillon*. HIMALAYAN BOX.

An evergreen shrub not more than 6 or 8 ft. high in cultivation, but no doubt considerably taller in its native country; shoots very downy. Leaves 1 to 2½ ins. long, ¼ to ⅜ in. wide; linear lanceolate, tapered at both ends, dark green, not so glossy as *B. sempervirens*; the base of the leaf, the midrib, and the short stalk are all downy. Flowers in dense axillary clusters, opening in April, and only noticeable for the yellow anthers of the males.

Native of the north-western Himalaya; very rare in cultivation. There is a bush 6 ft. high and as much through at Kew, which is perfectly hardy, and has been in its present position for over thirty years. Although it grows very slowly, it is quite healthy. It is difficult to propagate by cuttings. This species is readily distinguished from *B. sempervirens* and *B. balearica* by the long, narrow leaves, blunt or pointed but not notched at the apex, and by the much more abundant down on the stems, which persists for more than a year. The timber is equal to, or greater in value than, that of the common box.

CÆSALPINIA. LEGUMINOSÆ.

Of the forty or so species of *Cæsalpinia* known, two or three can be grown in the milder parts of the kingdom, but even as far south as Kew they need some shelter in the open air. Among hardy trees and shrubs they are most nearly allied to *Gymnocladus* and *Gleditschia*. The flowers are very dissimilar to those of the commoner pea-flowered type of Leguminosæ, the petals being almost equal in size and shape. The other essential features are, the tubular, five-toothed calyx, the ten free stamens, and the thick, compressed, leathery pod.

C. GILLIESII, *Wallich*.

(*Poinciana Gilliesii*, *Hooker*, *Bot. Mag.*, t. 4006.)

A deciduous shrub or small tree, with slender erect branches; young shoots covered with gland-tipped hairs. Leaves doubly pinnate, about 8 ins. long, composed of about nine to eleven pairs of primary divisions 1½ ins. long, each of which carries numerous small, smooth, oblong leaflets, about ¼ in. long and ⅛ in. wide. Racemes terminal, stiffly erect, 1 ft. or more long, carrying from thirty to forty flowers. Each flower is borne on a downy stalk, 1 in. or more long, the petals rich yellow, 1¼ ins. long, forming a rather saucer-shaped corolla. Sepals ¾ in. long; stamens scarlet, 2½ to 3 ins. long; pod 3 ins. long, ⅝ in. wide.

Native of the Argentine Republic, especially in the province of Mendoza; introduced in 1829, but too tender to have become generally cultivated. It succeeds quite well on a south wall at Kew, where it has grown 25 ft. high, and flowered nearly every year in July and August. It has no chance there in the open ground, but in the late Rev. Mr. Ewbank's garden at Ryde, Isle of Wight, it succeeded admirably. The rich yellow flowers with long scarlet stamens give a singularly brilliant effect.

C. JAPONICA, *Siebold*.

(*Bot. Mag.*, t. 8207.)

A deciduous, very thorny shrub, of straggling or scandent habit, not more than about 8 ft. high when left to itself, but growing at least twice as high when trained up a wall. Branches not downy, armed with strong decurved thorns ¼

to $\frac{3}{8}$ in. long. Leaves doubly pinnate, 12 ins. or rather more long, each of the three to eight pairs of main divisions (pinnæ) carrying six to ten pairs of leaflets; the common leaf-stalk is armed at each joint with one erect and two decurved prickles, and irregularly in between. Leaflets oblong or obovate, rounded at the apex; $\frac{1}{2}$ to 1 in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; almost or quite smooth. Racemes up to 12 ins. long, 4 ins. through, carrying twenty to over thirty flowers, each on a smooth, slender stalk $1\frac{1}{4}$ ins. long. Flowers canary yellow, $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. across, the upper one of the five petals the smallest, and striped with red. Stamens ten, red, $\frac{5}{8}$ in. long, forming a conspicuous cluster in the centre of the flower. Pod 3 ins. long, 1 in. or more wide, flat, carrying six to nine seeds.

Native of Japan and China; introduced by Messrs Veitch, who first flowered it in their Coombe Wood nursery in 1887. It still thrives well there on a sunny slope, and occasionally produces seed; but at Kew, in the open ground, it has always been a failure, although it may live for some years. It has grown well on a west wall, and in one of the bays outside the Temperate House. There are few shrubs more beautiful either in leaf or flower, and it would be well worth growing in a sunny recess where it could be covered in winter. Propagated by layers. Flowers in June and July. Nearly allied to this is

C. SEPIARIA, *Roxburgh*.—The two may be forms of one species, but *C. sepiaria* differs in having very downy wood and less lax racemes. Mr Sprague says (*Botanical Magazine*, loc. cit.) that the uppermost petal has no red markings.

CALLICARPA JAPONICA, *Thunberg*. VERBENACEÆ.

(Gardeners' Chronicle, 1871, fig. 39.)

A deciduous shrub, 3 to 5 ft. high, with erect, semi-woody stems furnished at first with a pale tufted felt, which soon falls away. Leaves narrowly oval or ovate-lanceolate; 3 to 5 ins. long, $1\frac{1}{2}$ to 2 ins. wide; tapering at both ends, often long and slender-pointed, the central part only toothed; almost or quite smooth, with numerous yellowish glands beneath; stalk $\frac{1}{6}$ to $\frac{1}{3}$ in. long. Flowers pale pink, crowded in axillary cymes which are 1 to $1\frac{1}{2}$ ins. across, and expand in August. Fruit globular, about the size of peppercorns, violet.

Native of Japan. Although this plant lives in the open ground at Kew, and is only killed in very severe winters, it really needs some sheltered, sunny corner, such as the angle of a house facing south-west, to be seen at its best. As it flowers and fruits on the shoots of the year, a mere cutting back by frost does not matter; some such pruning is necessary. A loamy soil, not enriched, is best for it.

Closely allied to this is *C. PURPUREA*, *Jussieu*, a native of China and Japan, introduced by Fortune about 1857. It is not so hardy, and is really a cool greenhouse plant. It is not so vigorous a grower as *C. japonica*, but is of the same half-woody nature; it has thinner stems, and smaller leaves and berries, the latter deep lilac colour, and about $\frac{1}{12}$ in. across. Another species sometimes seen in gardens is

C. AMERICANA, *Linnaeus*. French Mulberry.—This is a shrub 3 to 6 ft. high, with the flowers and fruits arranged as in *C. japonica*, the flowers bluish, the fruit violet, but very distinct in leaf and stem, both of which have more persistent down than in the Japanese species; the leaf, too, is much larger and broader, and $1\frac{1}{2}$ to 4 ins. in diameter. This species is native of the south-eastern and south-central United States, and is too tender for any but the mildest parts of the Kingdom.

CALLUNA VULGARIS, *Salisbury*. HEATHER, LING. ERICACEÆ.(Erica vulgaris, *Linnaeus*.)

An evergreen shrub up to 3 ft. high (usually from 9 to 24 ins.), of straggling habit, much branched; branches densely leafy, and either downy or smooth. Leaves opposite, arranged in four rows, giving a quadrangular shape to the twig, $\frac{1}{20}$ to $\frac{1}{10}$ in. long, closely packed and scale-like. Flowers in slender, one-sided racemes, 1 to 6, or as much as 12 ins. long, purplish pink, varying in depth of shade in different plants. The calyx is the chief ornamental part of the flower, and consists of four nearly separate, narrowly oval sepals $\frac{3}{16}$ in. long; the corolla is about half as long. Stamens eight.

This is the shrub which covers so many thousands of acres of the moors and mountains of the north of England and Scotland, and makes them so beautiful in late summer and autumn. Among native woody plants it is the most abundant and covers the greatest area. In good soil it is apt to grow too quickly and become gaunt and bare, and short-lived; this can be remedied to some extent by cutting over the plants in early spring before growth recommences and removing all the old flower-stems. A poor soil, with peat mixed, keeps the plants dwarf and in better habit. The named varieties, of which there are many, are increased by cuttings or by division. They are useful for planting in masses on dry banks, which, with a little attention at first to weeding and perhaps watering, they will soon take complete possession of, giving beautiful patches of colour from July onwards for many years. Calluna, of which there is only this species, differs chiefly from Erica in the large, coloured calyx with four tiny bracts at its base, which is sometimes known as the "outer calyx."

Bees are particularly fond of the flowers, and the honey they give is regarded as of special quality. In my native village in Yorkshire it used to be, and probably still is, the practice for the beehives of the cottagers to be laden on vans and taken every summer to the moors, ten or more miles away, for the bees to collect honey there from the heather. They were brought back in autumn. Branches of heather are much used in the north also for making besoms—in the same way that birch twigs are used in the south.

Many varieties have been named, of which the following are a selection. For the descriptive notes I am indebted to Mr Smith of the Darley Dale nurseries, near Matlock—an establishment famous for hardy heaths of all kinds:—

Var. ALBA.—Medium growth; foliage light green; flowers white.

Var. ALBA AUREA.—Dwarf; foliage golden; flowers white.

Var. ALBA MINOR.—Rather dwarf; flowers white.

Var. ALBA PILOSA.—Tall; foliage greyish; flowers white.

Var. ALBA PUMILA.—Dwarf; flowers white.

Var. ALBA RIGIDA.—Dwarf; leaves green, blunt; flowers white.

Var. ALBA SERLEI.—Tall; growth feathery; flowers white.

Var. ALBA TENELLA.—Tall, straggly; white.

Var. ALPORTII.—Tall; foliage dark or greyish; flowers crimson.

Var. ARGENTEA.—Rather dwarf; foliage silvery; flowers purple.

Var. AUREA.—Dwarf; foliage bright gold; flowers purple.

Var. COCCINEA.—Medium height; foliage greyish; flowers crimson.

Var. CUPREA.—Tall; foliage golden in summer, rich red-bronze in winter; flowers purple.

Var. FLORE PLENO.—Rather dwarf; foliage dark green; flowers double, pale pink.

Var. FOXII.—Very dwarf, forming close, cushion-like tufts; flowers pink.

Var. HAMMONDII.—Tall; foliage light green; flowers white.

Var. HYPNOIDES.—Rather dwarf; flowers purple.

Var. MINIMA.—Four or five ins. high; foliage pale green; flowers purple.

Var. PYGMÆA.—Same as minima, but with darker foliage.

Var. TENUIS.—Four or five ins. high; foliage dark green; flowers purple.

CALOPHACA WOLGARICA, *Fischer*. LEGUMINOSÆ.

A deciduous shrub, said to become 6 ft. high, but rarely more than half as high in this country; bark of branches downy when quite young, peeling when old. Leaves pinnate, 2 to 3 ins. long, composed of eleven to seventeen leaflets. Leaflets oval to orbicular, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the main-stalk of the leaf and the under-surface of the leaflets covered with down. Racemes produced from the leaf-axils of the current year's growth, 3 to 5 ins. long, very downy, carrying four to nine flowers towards the end. Flowers yellow, pea-shaped, $\frac{3}{4}$ to 1 in. long, each on a stalk $\frac{1}{8}$ in. long; calyx downy, $\frac{1}{8}$ in. long, with slender pointed teeth. Pod $\frac{3}{4}$ to 1 $\frac{1}{4}$ ins. long, cylindrical, covered with glandular hairs, one- or two-seeded. Blossoms in June and July.

Natives of the south-eastern part of European Russia, in the regions of the rivers Volga (from which it take its name) and Don. It is frequently found in arid places and on dry hillsides. Introduced in 1756. It is quite hardy in the south of England, but may need the protection of a wall in the north. It likes abundant sunshine, and during hot summers flowers profusely. It is only after such seasons that seeds ripen. As a rule it is grafted on standards of laburnum or Caragana, when it forms a big, mop-headed plant with semi-pendent branches. Plants raised in that way are sometimes short-lived, but it is probably the best and easiest way, for plants raised from seed are not easy to rear. They are very liable to decay through damp during the winter, and should for two years be kept in pots, then planted out on a well-drained site. When grafted on the laburnum, no special precautions are needed.

CALYCANTHUS. CALYCANTHACEÆ.

A genus of North American shrubs with fragrant wood, three coming from the south-eastern United States, the other from California. They have opposite, deciduous leaves, minutely warted on the upper side. Flowers solitary on short shoots of the year, or from the nodes of the previous year's growth. Sepals and petals numerous. Fruits hard, and shaped like a small fig, retaining the seeds for a long time. From the

closely allied winter-sweets (*Chimonanthus*) these differ in their more numerous stamens and brown-purple or brown-red flowers produced on leafy shoots.

The species of *Calycanthus* are easily accommodated; they like a sunny position in order that the wood may ripen and flowers be freely borne. Any open, loamy, or peaty soil will suit them, provided it is sufficiently deep and moist. They are most easily propagated by layers in this country, where seeds do not usually ripen. Sucker-growths are sent up from the base, and these sometimes afford opportunities for propagating by division. These shrubs flower from July to September.

C. FERTILIS, *Walter*.

(Bot. Reg., t. 404; *C. glaucus*, *Willdenow*.)

A shrub of bushy habit, 6 ft. or more high. Leaves 3 to 5 ins. long, ovate or oval, acute or often acuminate; dark glossy green, and rough above, glaucous and slightly downy beneath. Flowers with little or no scent, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. diameter, the strap-shaped sepals and petals chocolate-purple.

Native of the south-eastern United States, covering some of the same area as *C. floridus*, with which species it has been much confused. It was brought to England in 1806. The leaves of this species do not possess the aromatic odour so characteristic of the West American species, and the wood is only slightly fragrant. Summer leaf-buds concealed by base of leaf-stalk.

Var. *LÆVIGATUS* (*C. lævigatus*, *Willdenow*; *C. nanus*, *Loiseleur*).—This shrub, by some considered a distinct species, chiefly differs from typical *C. fertilis* by the leaves being shining green and not downy beneath. Several intermediate forms exist.

C. FLORIDUS, *Linnaeus*. CAROLINA ALLSPICE.

(Bot. Mag., t. 503; *C. sterilis*, *Walter*; *Butneria florida*, *Kearney*.)

A deciduous shrub of rather straggling growth, ultimately 6 to 8 ft. or even more high. Leaves 3 to 5 ins. long, oval, tapered at the base, rough to the touch and dark green above; soft, with a dense covering of short, pale down beneath. Flowers 2 ins. or less in diameter, fragrant, produced in June and July; sepals and petals strap-shaped, numerous, reddish purple, tinged with brown.

Native of the south-east United States, from Virginia southwards; first introduced to England by Mark Catesby, the author of the *Natural History of Carolina*, in 1726. According to old records the original plants were collected "back of Charlestown," in S. Carolina. It is easily distinguished from the other species by the densely pubescent under-surface of the leaves. The leaves, wood, and roots have a pleasant, camphor-like fragrance, which is even more developed in the dried wood. The bark has been used as a substitute for cinnamon. Summer leaf-buds concealed.

C. MOHRII is closely allied to the above, but has ovate rather than oval leaves, rounded or somewhat heart-shaped at the base. Native of S. Tennessee and N. Alabama; distinguished under this name by Dr Small in 1903, and introduced in 1908. It appears probable, however, that it was in cultivation at Kew in 1789 as *C. ovatus*, *Aiton*.

C. OCCIDENTALIS, *Hooker*. CALIFORNIAN ALLSPICE.(Bot. Mag., t. 4808; *C. macrophyllus*, *Hort.*)

A loose habited, deciduous, aromatic shrub of stronger growth than the other species, and sometimes 12 ft. high. Leaves the largest in the genus, varying from 3 to 8 ins. in length, and in shape from heart-shaped and ovate to lanceolate; rough, dark green, and not downy above, paler and bright green beneath. Flowers 2 to 3 ins. across; the sepals and petals purplish red, changing to a more tawny shade near the tips; rather unpleasantly scented.

Native of California, where it commonly grows near the banks of streams; introduced by Douglas in 1831. This is the least desirable of the American allspices, being of rather ungainly habit. Its larger growth, foliage, and flowers distinguish it from the other species; as its leaves beneath are neither very downy like *floridus* nor glaucous like *fertilis*, it is only likely to be confused with the var. *lævigatus* of the latter. But both leaves and wood when bruised have a much stronger aromatic, spicy odour, and the flowers are paler, redder, larger, and longer-stalked. Summer leaf-buds exposed.

CAMELLIA. TERNSTRÆMIACEÆ.

A group of nearly a score evergreen trees and shrubs with usually toothed, alternate leaves. Flowers usually showy, often solitary, never more than a few together; petals five; stamens numerous, the outer ones often uniting at the base and forming a ring or shallow tube. Seeds large and oily, soon decaying. Natives of India, China, and Japan.

All the camellias prefer a peaty soil, but will thrive in a warm, open loam, especially if leaf-soil and a little peat be given them to start with. They can be increased by cuttings of firm wood placed in gentle heat, except the double varieties of *C. japonica* and *C. reticulata*, both of which are grafted on the single varieties of *C. japonica*.

C. CUSPIDATA, *Veitch*.(Thea cuspidata, *Kochs.*)

An evergreen bush, 6 ft. high, of erect, rather slender habit when young; young shoots minutely downy, grey. Leaves quite smooth, ovate-lanceolate, rounded or wedge-shaped at the base, tapered gradually to a long slender apex; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{8}$ to 1 in. wide; finely and shallowly toothed (the teeth gland-tipped); polished, dark, sometimes purplish green above; paler and covered with minute dots beneath; stalks $\frac{1}{8}$ to $\frac{1}{4}$ in. long, hairy at the margins. Flowers solitary at the end of short twigs or in the leaf-axils; pure white, $1\frac{1}{2}$ ins. across; calyx of five green triangular sepals, $\frac{1}{2}$ in. across. Stamens erect in a dense cluster, $\frac{3}{8}$ in. long; anthers yellow. Flower-stalk very short, clothed with overlapping green bracts.

Native of W. China; introduced by Wilson to the Coombe Wood nursery, where it has several times flowered in May. Interesting as a bright-leaved, hardy evergreen (perhaps the hardiest of camellias), it scarcely promises to develop into a high-class flowering shrub.

C. JAPONICA, *Linnaeus*. COMMON CAMELLIA.

An evergreen shrub, or small tree 30 to 40 ft. high, of much-branched habit. Leaves deep glossy green, ovate or oval, 3 to 4 ins. long, tapering to a short

point, shallowly toothed, quite smooth, often speckled with black dots on the lower surface, and of firm, leathery texture. Flowers red, solitary at the end of the branchlets, stalkless, $2\frac{1}{2}$ to 4 ins. across; petals normally five, but usually more in cultivated plants. Stamens numerous, arranged in a ring. Seeds $\frac{3}{4}$ to 1 in. long, half as wide; often flattened on several sides through compression.

Few exotic shrubs have filled a more important place in our greenhouses than the common camellia has in its time, but its merits as a hardy plant have never been fully appreciated. Whilst it is not adapted for exposed, windy positions, it is perfectly hardy near London, in places where there is moderate shelter from north and east. At Kew it has withstood 31 degrees of frost without suffering in the least. It is, indeed, one of the most satisfactory of hardy evergreens, there being no other except, perhaps, the laurels with quite the same lustrous black-green hue. This camellia is a native of Japan and China, and according to Sargent, the flowers in a wild state do not open fully, but remain cup-shaped till they fall. The oil expressed from the seeds is used by the Japanese women for dressing the hair. The species first became known in



CAMELLIA CUSPIDATA.

Europe about the beginning of the eighteenth century, and many fine varieties were imported from China; others were raised in England from eighty to one hundred and twenty years ago. As is generally known, these have flowers pure white, of various shades of red, deep scarlet, striped, and of various degrees of "doubleness." About the middle of the nineteenth century the camellia had become perhaps the most popular of greenhouse flowers; its prim stiffness and solidity was not an inappropriate floral emblem of that period. Afterwards its popularity declined.

In the open air it flowers from April to June, and perhaps the best forms for out-of-doors are the semi-double and single red-flowered ones, which appear to open better than the very double ones, and to suffer less from late spring frosts. But any variety that has become too large for the greenhouse should be tried in the open air, for the sake of its foliage, if its flowers fail. It should be remembered that plants turned out of pots or tubs in which the roots have become matted require careful watering until the roots have spread into the surrounding ground. The single-flowered varieties may be propagated by cuttings made from firm wood about the end of June and placed in heat. It is best to treat them at first as cool greenhouse plants, as they grow more quickly. The fine double varieties are usually grafted on the cuttings of the single ones.

C. RETICULATA, Lindley.

(Bot. Mag., tt. 2784, 4976.)

An evergreen shrub or small tree. Leaves dull green, toothed, 4 to 6 ins. long. Flowers 6 to 7 ins. across, usually semi-double, the undulated petals of a beautiful soft deep rose, surrounding a fine cluster of golden stamens.

Native of China; introduced to the Horticultural Society's garden at Chiswick in 1820. Perhaps the finest flowered of all camellias, this can only be cultivated successfully out-of-doors in the south-western counties and in similar localities. In *Flora and Sylva*, vol. ii., p. 303, there is said to be a bush at Creg, near Fermoy, Co. Cork, that is 60 ft. round. Its dull-surfaced leaves distinguish it from the other red-flowered sorts.

C. SASANQUA, Thunberg.

(Bot. Mag., t. 5152.)

An evergreen shrub or small tree. Leaves shining dark green, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, one-third to half as much wide, obovate or narrowly oval, with rounded teeth on the margin. Flowers $1\frac{1}{2}$ to 2 ins. across, white in a wild state, pale pink to deep rose in cultivated varieties, of which the Japanese have raised a considerable number, some with double flowers. Widely spread in China, and the most popular of camellias in Japan, this species was first introduced to England by one of the East India Company's captains in 1811. It flowers in winter and early spring, and although quite as hardy in itself as *C. japonica*, it is more liable to have its flowers injured. It thrives remarkably well in N. Italy, where bushes approaching 20 ft. in height and not much less in diameter are of very close, dense habit.

C. THEA, Link. TEA PLANT.

(Thea assamica, Masters.)

An evergreen shrub with lance-shaped, short-stalked leaves up to $4\frac{1}{2}$ ins. in length, and about one-third as wide; smooth, dull green, shallowly toothed. Flowers fragrant, dull white, 1 to $1\frac{1}{2}$ ins. across; one to three of them produced in the leaf-axils on stalks $\frac{1}{2}$ in. long. Stamens very numerous, with yellow anthers.

The tea plant is not so hardy as *C. japonica* or *C. Sasanqua*, but may be grown out-of-doors in the mildest counties. It has no particular attraction beyond its interest as one of the most important economic plants of the world. Although cultivated for ages by the Chinese, the tea plant is really a native of Upper Assam. The tea now so largely imported from N. India and Ceylon is produced by cultivated varieties, introduced to those countries from China about 1851.

CARAGANA. LEGUMINOSÆ.

A genus of shrubs, one of which becomes occasionally a small tree, mostly natives of Central Asia, but distributed over the vast tract of land between the Caucasus and Japan. The leaves are alternate and pinnate, the leaflets being of even number, frequently four, but in *C. microphylla* occasionally eighteen or twenty to each leaf. The flower is pea-shaped, with the standard petal curled back at the sides. Most of the species

are armed. In place of a terminal odd leaflet, the leaf-stalk has either a bristle or a short spine. In some species, after the leaflets fall the stalk remains, becomes woody, and is transformed into a slender spine which persists for years. The stipules frequently develop into a pair of spines also. Thus the Caraganas may be armed (1) with single spines, or transformed leaf-stalks; (2) double spines, or stipules with the leaf-stalk fallen away; or (3) triple spines where both leaf-stalk and stipules persist. But generally they are by no means so formidably armed under cultivation as they are in nature. Some of them inhabit dry, half desert regions, and, as frequently happens with such plants introduced to a damp, comparatively sunless country, the spines are neither so long nor so numerous as in the wild state. What is there a spine often becomes a mere bristle with us.

Another distinctive character general to the Caraganas are the curious arrested branches covered with scales. These commence from the joints of the year-old shoots, and produce a cluster of leaves and flowers every year, slowly increasing in length, but making no wood in the proper sense of the term.

Most of the kinds are of easy cultivation. The only ones that do not adapt themselves readily to the British climate are *C. jubata*, *Gerardiana*, *spinosa*, and *tragacanthoides*, especially the two first. The others thrive in sunny places, and do not require a rich soil. They mostly produce seeds which germinate freely; those which do not can be grafted on *C. arborescens*, whilst *aurantiaca*, *pygmæa*, and the thinner-twiggied ones can be increased by cuttings.

I. LEAF WITH FOUR LEAFLETS.

A. *Frutescens*. Unarmed in cultivation.

B. *Aurantica*, *pygmæa*, *Chamlagu*. Stipules persistent, spiny. (The last has leaflets $\frac{3}{4}$ to over 1 in. long.)

2. LEAF WITH MORE THAN FOUR LEAFLETS.

A. *Arborescens*, *microphylla*. Leaf-stalk deciduous; stipules spiny. (The latter has up to eighteen very small leaflets.)

B. *Brevispina*, *Gerardiana*, *jubata*, *spinosa*, *tragacanthoides*. Leaf-stalk persistent and spiny. (*Brevispina* differs from the rest of this section in having three or four flowers on one stalk; the rest have solitary flowers.)

C. ARBORESCENS, *Lamarck*. PEA-TREE.

A deciduous shrub up to 15 and 20 ft. high, of rather erect, sometimes almost fastigiate habit; by pruning away the lower branches and training up a leading shoot, it may be made to take the form of a small tree; bark on young branchlets slightly winged. Leaves $1\frac{1}{2}$ to 3 ins. long, equally pinnate, consisting usually of four to six pairs of leaflets (more on young or exceptionally vigorous shoots). Leaflets oval or obovate, $\frac{1}{3}$ to $\frac{2}{3}$ in. long, becoming nearly or quite smooth; the main-stalk ending in a bristle-like spine. Stipules linear, spine-tipped, developing ultimately into a pair of stiff spines at each joint, $\frac{1}{4}$ in. long. Flowers yellow, produced singly on thin, downy stalks from $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, several coming from each of the enlarged scaly buds on the previous year's wood. Each flower is $\frac{3}{8}$ to $\frac{7}{8}$ in. long; calyx $\frac{1}{4}$ in. long, helmet-shaped, five-toothed, with hairy margins; standard petal not expanded but curled backwards at the sides. Pod $1\frac{1}{2}$ to 2 ins. long on a slender stalk about the same length,

smooth, cylindric, and carrying three to five oblong seeds, the calyx adhering at the base.

Native of Siberia; introduced in 1752. This is the commonest of the Caraganas in gardens, and is a vigorous, free-growing shrub. Its long, sparsely-branched shoots give it a distinct appearance, and although not one of the showiest of the broom family it is very pretty in early May, when the yellow flowers are associated with the tender green, almost fully formed leaves. It produces good seed in abundance. The species shows several different forms, especially in habit, of which the following are the most distinct:—

Var. *CUNEIFOLIA*.—The Caragana sold in continental nurseries as *C. cuneifolia*, *Dippel*, is only a dwarf form of *C. arborescens*. The leaflets are more uniformly wedge-shaped, the flowers are on shorter stalks, and the pod is smaller.

Var. *LORBERGII*, *Koehne*.—A remarkable variety with very narrowly linear, pointed leaflets, $\frac{1}{25}$ to $\frac{1}{12}$ in. wide, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. The wing-petals and the standard one are also much narrowed. In flower beauty this variety is inferior to the type, but the remarkable foliage (resembling the final subdivisions of a fennel leaf) makes it well worth growing. Introduced to cultivation from Germany about 1906.

Var. *NANA*.—A dwarf, stunted bush, with stiff, contorted branches which grow very slowly. It is usually grafted on the type, from which it does not differ in leaf or flower. A quaint-looking shrub.

Var. *PENDULA*.—A variety with stiffly pendent branches, but not ungraceful; usually grafted on standards of the type. Foliage and flower the same.

Var. *REDOWSKI*.—A remarkable shrub, with long, serpentine branches, which will sometimes grow for several years without dividing. It thus acquires a thin and open, but not ungraceful habit, and is altogether a striking plant. Whether the *C. Redowski* mentioned by De Candolle in his *Memoir on Leguminosæ*, published in 1825, is the same as this is uncertain. It never appears to have been properly described. The plant is at Kew, but its history is not known.

C. BOISII, *C. K. Schneider*, was introduced to France by Mr Maurice de Vilmorin, and was figured in his *Fruticetum Vilmorinianum*, p. 57, as *C. microphylla* var. *crasse-aculeata*. It is, however, scarcely specifically distinct from *C. arborescens*, differing chiefly in the longer teeth of the calyx, and in the downy ovary and young fruit. The alleged greater persistence of the leaves is not very apparent in this country. It has about the same garden value as *C. arborescens*.

C. AURANTIACA, *Koehne*.

A deciduous shrub about 4 ft. high, with graceful, ultimately pendulous leafy branches, long, slender, but little divided, and armed with triple spines. Leaves very shortly stalked, consisting of four narrow, linear leaflets, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide. Flowers $\frac{3}{4}$ in. long, produced singly on a stalk $\frac{1}{4}$ in. long, orange yellow; calyx $\frac{1}{8}$ in. long, bell-shaped, with five triangular, minutely ciliated teeth. Pod 1 to $1\frac{1}{2}$ ins. long, smooth, rather cylindrical, pointed, carrying four to six seeds.

Native of Central Asia; introduced in 1887 as a variety of *C. pygmæa*, of which it was at first regarded merely as a deeper coloured form. It differs also in the more taper-pointed leaflets and in the shorter calyx. This and *C. pygmæa* are probably the prettiest of all Caraganas. Its habit is graceful, and it blossoms with great profusion, the flowers hanging thickly from the under-side of the branch in a long row, three or four to the inch. It blossoms in May and June, and can be easily propagated by late summer cuttings.

C. BREVISPIA, Royle.

A deciduous shrub up to 8 ft. high, the young wood covered with fine down. Leaves pinnate; the common stalk (or rachis) is spine-tipped, 1 to 3 ins. long, remaining after the leaflets have fallen, and developing ultimately into a woody thorn; stipules in the form of spines $\frac{1}{4}$ in. long. Leaflets ten to fourteen on each leaf, oblong or oblanceolate; $\frac{1}{3}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{3}$ in. wide; covered when young with flattened silky hairs. Flowers yellow, about $\frac{3}{4}$ in. long, produced three or four together at the end of a common stalk 1 to 2 ins. long. Calyx $\frac{1}{3}$ in. long, bell-shaped, with five narrow, fine-pointed teeth, downy. Pod 2 ins. long, smooth outside, woolly within.

Native of the north-western Himalaya at 5000 to 9000 ft. elevation, distinguished from *arborescens* by the long, fine-pointed spines developed from the leaf-stalks, and by the several (not solitary) flowers on each stalk. It flowers in June.



CARAGANA AURANTIACA.

C. CHAMLAGU, Lamarck.

A deciduous shrub up to 4 ft. high, with angular branches, and of rounded, bushy habit. Leaves composed of two unequal pairs of leaflets, the terminal pair the largest; the common stalk is spine-tipped, and remains after the leaflets have fallen, but it does not develop into the formidable thorn seen in *C. brevispina* or *Gerardiana*; stipules $\frac{1}{4}$ to $\frac{1}{3}$ in. long, becoming stiff thorns. Leaflets very variable in size; in young plants as much as $1\frac{1}{2}$ ins. long and $\frac{3}{4}$ in. wide, usually obovate, but on old flowering shoots $\frac{1}{4}$ to $\frac{3}{4}$ in. long; smooth and lustrous, rounded at the apex. Flower $1\frac{1}{4}$ ins. long, solitary on its slender stalk $\frac{1}{2}$ to $\frac{3}{4}$ ins. long, reddish yellow. Calyx bell-shaped, nearly $\frac{1}{2}$ in. long, with five short, triangular teeth. Pod $1\frac{1}{2}$ ins. long, slender, smooth.

Native of N. China; introduced in 1773. It is distinct for its large, dark green, glossy, membranous leaflets, larger in a young state than those of any other cultivated *Caragana*. The bruised bark smells like liquorice. Often grafted on standards of *C. arborescens*, it makes a handsome bushy-topped small tree. Flowers in May and June.

C. FRUTESCENS, De Candolle.

A deciduous shrub up to 10 ft. in height, with long, often erect, supple branches, not much divided except near the ends. Leaves composed of two pairs of leaflets, which are attached near the end of the common stalk, being themselves stalkless; they are obovate, rounded at the end, $\frac{1}{2}$ to over 1 in. long, smooth, dull green. Flowers bright yellow, $\frac{3}{4}$ to 1 in. long, produced singly on a stalk somewhat shorter than itself. Calyx $\frac{1}{8}$ in. long, bell-shaped, smooth. Pod $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ in. wide; cylindrical, smooth.

In a wild state this species extends from the south of Russia to Japan. It was introduced in 1752. It is a pretty shrub in flower, and is often quite neat and graceful in habit, especially when 3 or 4 ft. high, with its numerous thin twigs, rather pendulous. It is distinct in being unarmed and without down. Of several forms in cultivation the most distinct is var. *MOLLIS*, with leaves downy on both sides; found wild in the Caucasus.

Var. *GRANDIFLORA* has flowers over 1 in. long, with a proportionately short calyx.

C. GERARDIANA, Royle.

A deciduous shrub, naturally of close, compact form, and from 2 to 4 ft. high. Branches close-jointed, covered thickly with whitish, silky hairs. Leaves pinnate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, with four to six pairs of leaflets, the common stalk very downy, spine-tipped, remaining after the leaflets have fallen, and becoming eventually a sharp, slender thorn. Leaflets oval or obovate with a bristle-like tip, $\frac{1}{4}$ to $\frac{1}{8}$ in. long, silky hairy. Stipules not spiny, but broad, thin and papery, $\frac{3}{8}$ in. long. Flowers solitary on their very short stalks, pale yellow or nearly white, $\frac{3}{4}$ in. long; calyx hairy, cylindrical, $\frac{1}{2}$ in. long. Pod hairy outside, downy within, about 1 in. long.

Native of the north-western Himalaya up to 13,000 ft. This shrub is remarkable for its long, slender spines, and the dense woolly covering, which gives the whole plant a greyish white aspect. It is hardy at Kew, but I have never seen it in flower. Essentially a sun-lover, and coming from the dry inner valleys of N.W. India, it finds our climate too wet and dull. On the Continent it thrives better. In Messrs Simon-Louis' nursery at Metz I have seen it in admirable health. It will probably be best suited in this country on a well-drained sunny ledge of the rock garden.

C. JUBATA, Poiret.

A dwarf, deciduous, excessively spiny and hairy shrub, 1 to 2 ft. high, with thick branches completely covered with spines, woolly stipules and leaflets. Leaves 1 to $2\frac{1}{2}$ ins. long, with four to eight pairs of leaflets. The leaf-stalk is downy when young, slender, spine-tipped, persisting after the leaflets have fallen, and hardening, the older branches thereby become thickly furnished with wiry-looking spines 1 to $2\frac{1}{2}$ ins. long. Leaflets oblong, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, hairy; stipules $\frac{1}{2}$ in. wide, each lobe ending in a stiff spine, the whole shaggy with long silky hairs. As the branch is completely covered with these overlapping stipules it has quite a padded appearance. Flowers solitary on short stalks, white, $1\frac{1}{4}$ ins. long; calyx $\frac{1}{2}$ in. long, hairy, with five narrowly triangular teeth. Pod $\frac{3}{4}$ in. long, hairy outside, smooth within. Blossoms in April and May.

Native of Siberia and Mongolia; introduced from near Lake Baikal in 1796. This remarkable shrub comes from dry desert regions, where the summers are extremely hot and the winters extremely cold. In Great Britain it is most successfully grown at the foot of a warm, dry wall, in well-drained, light soil. The flowers are few and the shrub is not showy, yet it is worth growing as a curiosity.

C. MICROPHYLLA, Lamarck. ALTAGANA.

A deciduous shrub from 6 to 10 ft. in height, wider than it is high, with light grey young bark. Leaves pinnate, $1\frac{1}{2}$ to 3 ins. long, composed of six to nine pairs of leaflets; main-stalk ending in a short spine, but not persistent; stipules spiny, $\frac{1}{2}$ in. long. Leaflets $\frac{1}{2}$ to $\frac{3}{4}$ in. long, oval or obovate, dull greyish green, silky hairy at first, then smooth. Flowers yellow, $\frac{3}{4}$ in. long, solitary on rather shorter stalks; calyx $\frac{1}{4}$ in. long, cylindrical, with short, pointed teeth. Pod about $1\frac{1}{4}$ ins. long, $\frac{1}{6}$ in. wide, compressed.

Native of N. Central Asia from Siberia to China; introduced in 1789. It flowers in May and June, and is readily distinguished from all other species by the number and small size of its leaflets, the smallest scarcely $\frac{1}{8}$ in. long. It is a shrub of graceful habit, much wider than high (16 ft. in diameter at Kew), the branches being long, slender, but little divided, and ultimately more or less pendent. Grafted on standards of *C. arborescens* it makes a small tree, but sucker growths from the stock are often troublesome. It is suitable as a specimen for a lawn.

C. PYGMÆA, De Candolle.

(Bot. Reg., t. 1021.)

A deciduous shrub, 3 to 4 ft. high, similar in habit to *C. aurantiaca*, having long, slender, pendulous, or even prostrate branches. Leaves nearly stalkless, composed of four leaflets, each of which is $\frac{1}{2}$ in. long, broadest near the apex, where it is about $\frac{1}{8}$ in. wide, tapering thence towards the base; the apex has a short, wedge-shaped point. Flowers yellow, 1 in. long, produced in May and June at the joints of the previous season's shoots, each on its own stalk $\frac{1}{3}$ in. long, and one flower from each joint; calyx $\frac{1}{2}$ in. long, bell-shaped, triangular-toothed, edged with minute hairs; pod $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, smooth.

In a wild state this species extends over the region between the Caucasus and Siberia and Thibet; introduced in 1751. It is a very pretty plant when in flower, the blossoms being pendulous on their short stalks from the lower side of the branchlets. It is often grafted on standards of *C. arborescens*, but can quite well be struck from cuttings made of half-woody young twigs in July and placed in gentle heat. By growing it on its own roots, the ugly and often diseased union seen on grafted plants is avoided. It is nearly allied to *C. aurantiaca*, under which the differences are pointed out. Its slender, flexible shoots are used for tying in Siberia, and are said to be equal to osiers for that purpose.

Var. *GRANDIFLORA* (*C. grandiflora, De Candolle*) has flowers up to $1\frac{1}{4}$ ins. long, the calyx longer, more sacked and unequal at the base; leaflets rather larger. Native of Armenia.

C. SPINOSA, De Candolle.

A deciduous shrub, 4 to 6 ft. high, of rather gaunt habit, and with long, undivided, spiny branches, hairy when young. Leaves pinnate, composed of two to four pairs of leaflets, which are $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, nearly or quite smooth; common stalk of leaf $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, silky when young, spine-tipped, remaining after the leaves have fallen, and developing into a sharp, slender thorn. Stipules chaffy, lanceolate, $\frac{1}{4}$ in. long. Flowers very shortly stalked, nearly 1 in. long, bright yellow; calyx cylindrical, with short, triangular teeth. Pod $\frac{3}{4}$ in. long, smooth.

Native of Siberia; introduced in 1775. This is a curious shrub of the same type as *C. jubata* and *Gerardiana*, but not so formidably armed nor so downy. According to Pallas, the Russian botanist, in the neighbourhood of Pekin, where this shrub is plentiful, its branches are stuck in clay on

the tops of walls to keep off trespassers, just as broken glass is used here. It is sometimes confused with the following species (*q.v.*).

C. TRAGACANTHOIDES, *Poir.*

A low, spreading, much-branched shrub, 1 to 1½ ft. high, described as having in a wild state much the habit of *Astragalus Tragacantha*. Branches very spiny, downy when young; spines 1 to 1½ ins. long, slender (modified leaf-stalks); stipules narrow, ⅓ in. long, scarcely spiny, silky. Leaves ¾ to 1½ ins. long, composed of three to five pairs of leaflets, which are rather variable in outline, oblanceolate, obovate or oblong, ¼ to ½ in. in length, woolly. Flower 1¼ in. long, yellow, solitary on a downy stalk ⅓ to ½ in. long. Calyx ½ in. long, bell-shaped, downy, and with short, triangular teeth. Pod 1 to 1¼ ins. long, shaggy with silky hairs, the lower half enclosed by the persisting calyx.

Native of Thibet, N. China, Siberia; introduced in 1816. It is doubtful if the true plant be now in cultivation, the shrub commonly seen under the name being *C. spinosa*, which has smaller flowers and a smooth pod and calyx. *C. tragacanthoides* is rather variable, some forms like var. *VILLOSA* having the young branches densely covered with shaggy grey hairs.

CARMICHAELIA FLAGELLIFORMIS, *Colenso*. LEGUMINOSÆ.

A deciduous or often leafless shrub, 4 or 5 ft. high, with numerous erect-growing, slender, grooved branches, flattened or convex when young, round when old. Leaves very small and inconspicuous, consisting of three or five tiny leaflets, which are somewhat larger in young plants than in old ones. Flowers purplish lilac, pea-shaped, produced in axillary downy racemes; there are from one to three racemes at each joint of the twigs, and from three to seven flowers in each raceme, the whole forming a short, dense cluster. The flowers, although small (about ⅓ in. long), are borne in extraordinary profusion. Pod ¼ to ½ in. long, nearly as wide, ending in a stout-pointed beak, and containing usually two seeds.

Native of New Zealand, long grown at Kew in a greenhouse, and for the last twenty years unprotected in the open ground, where, although slightly injured at the younger parts in severe winters, it is on the whole quite hardy, and produces both flowers and seeds in abundance. It is not very showy or ornamental, but its flat, erect branches give it a quaint and unusual aspect. These green shoots perform the usual functions of leaves. It is not so attractive a plant as its ally, *Notospartium Carmichaeliæ*, but is hardier. The *Notospartium* differs in its stouter twigs and more pendulous habit, in its larger pink flowers, and in the longer, narrower, jointed pod containing more seeds.

CARPENTERIA CALIFORNICA, *Torrey*. SAXIFRAGACEÆ.

(*Bot. Mag.*, t. 6911.)

An evergreen shrub, 6 to 8 ft. high, of bushy habit and free growth, branchlets very pithy; young bark pale and minutely downy. Leaves, opposite, lanceolate, 2 to 4½ ins. long, ⅓ to 1 in. wide, tapering at both ends,

not toothed, smooth and bright green above, covered with a pale soft felt beneath; stalk $\frac{1}{4}$ in. long, or almost absent. Flowers fragrant, 2 to 3 ins. in diameter, pure white, produced during June and July in a terminal cluster, three to seven flowers together; petals five, roundish; calyx downy, with five ovate, pointed lobes; stamens very numerous, their yellow anthers making a conspicuous centre to the flower.

Native of California; discovered by Col. Fremont in the "forties" of last century; introduced to Europe about 1880, and first flowered in this country by Miss Jekyll at Godalming in 1885. In places where it thrives, it is one of the most splendid acquisitions from the Californian flora. It is not hardy at Kew except against a wall, and under glass it is one of the most susceptible of all plants to injury by London fog. In the brighter, sunnier parts of England it succeeds, as in the Cambridge Botanic Garden, where, in spite of severe frosts, it thrives admirably on the sunny side of a plant-house. It may not be naturally a very long-lived plant. It should be raised from seed. Most nearly allied to *Philadelphus*, it differs in its evergreen leaves and solitary style.

CARPINUS. HORNBEAM. CORYLACEÆ.

Some sixteen or eighteen species of hornbeam are scattered over the temperate regions of the northern hemisphere, scarcely half of which are in cultivation. They are deciduous trees, rarely of the largest size, with zigzag twigs and alternate, conspicuously parallel-ribbed leaves. The flowers are unisexual, produced on the same tree, but in separate catkins. The pendulous male catkins come on the old wood; the females terminate the young shoots. The male flower consists of numerous stamens produced in the axil of a scale. The female inflorescence is stalked and at first erect, with the flowers in pairs within each bract. In the fruiting state it elongates and becomes pendent, the seed being enclosed in a ribbed nut at the base of the enlarged bract.

Hornbeams are hardy trees, and handsome, especially in summer when laden with pendent fruit clusters. As a park tree none is so valuable as our native species, but for gardens some of the newer Chinese and Japanese hornbeams are very attractive. They thrive in any good loam, and are at home on chalky soils. All the species should be raised from seed, but the rarer ones can be grafted on common hornbeam, as also must its own varieties be. There are two distinct sections of the genus, viz.:—

1. *CARPINUS* proper.—Scales of male flowers ovate, scarcely stalked. Bracts of the fruiting catkins loosely overlapping, and so little infolded as to leave the nut exposed—*C. Betulus*, etc.

2. *DISTEGOCARPUS*.—Scales of male flowers narrower, stalked. Bracts of the fruiting catkins closely packed and overlapping, completely enclosing the nut. Two of the following species belong to this section—*C. cordata* and *C. japonica*.

C. BETULUS, *Linnaeus*. COMMON HORNBEAM.

A tree 50 to 80 ft. high, pyramidal when young, but ultimately forming a rounded or somewhat elongated head with the ends of the branches pendulous; trunk grey and often beautifully fluted; young shoots clothed more or less with pale hairs, which mostly soon fall away. Leaves oval or inclined to ovate, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, 1 to 2 ins. wide; the base rounded or heart-shaped, one side often longer than the other; short-pointed at the apex, unequally or doubly toothed; dark green and at first downy on the midrib above; under-surface more downy, especially on the midrib and the ten to thirteen pairs of veins, both sides becoming nearly or quite smooth by autumn; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Male catkins $1\frac{1}{2}$ ins. long. Fruiting catkins $1\frac{1}{2}$ to 3 ins. long, furnished with large, conspicuous three-lobed bracts, the middle lobe 1 to $1\frac{1}{2}$ ins. long, often toothed. They are produced in pairs facing each other, each with an ovate, ribbed nut at the base, $\frac{1}{4}$ in. long.

Native of Europe and Asia Minor; indigenous to the south-east and east of England. A well-grown hornbeam is one of our handsomest trees, the foliage turning yellow in autumn; more graceful than the beech, for which many people mistake it. It is, of course, distinct in the duller, more conspicuously toothed leaves, and in the ridged or fluted trunk, and the fruiting arrangement is quite different. The timber is hard, almost bony, and is valued for making those intricate parts of the pianoforte which convey the movement from the key to the hammer that strikes the strings. Mr Elwes describes it as "the hardest, heaviest, and toughest" of our native woods. In earlier times hornbeams were largely coppiced and pollarded for the supply of firewood, as may be seen by the old pollards that cover so much of Epping Forest. Sir J. E. Smith says that this tree formed the principal part of that and other forests which once lay to the north and east of London. The hornbeam is a useful hedge plant, and hedges of it may often be seen in old-established nurseries, planted originally for shelter. In this clipped state it retains its dead leaves until spring, like the beech.

Var. *ASPLENIFOLIA* (syn. *laciniata*).—Leaves deeply and regularly double-toothed, the primary teeth large enough to be termed lobes.

Var. *CARPINIZZA* (C. *Carpinizza*, *Kitaibel*).—A wild variety, native of Transylvania, differing in the more distinctly heart-shaped base of the leaf, and in the fewer (seven to nine) veins. Lobes of female bract almost entire.

Var. *COLUMNARIS*.—A slender, spire-like tree, very striking and elegant.

Var. *HORIZONTALIS*.—Discovered growing wild by M. Jouin of the Simon-Louis establishment at Metz, and described by him as flat-topped, like *Cratægus Crus-galli*.

Var. *INCISA*, *Aiton* (*quercifolia*, *Desfontaines*).—With some similarity to var. *asplenifolia*, this differs in having smaller and especially shorter leaves, coarsely and irregularly toothed, and only about six pairs of veins.

Var. *PENDULA*.—A weeping form; the one known as *PENDULA DERVAESII* is still more elegant.

Var. *PYRAMIDALIS*.—This has erect branches like *columnaris*, but is not so slender a tree. With age it acquires much the habit of an old Irish yew. A fine specimen grows in the Solferino Square at Rouen.

Other varieties named "*purpurea*," "*rubra*," "*marmorea*," and "*variegata*" are variously coloured in the way their names imply, but, so far as I have observed, they have little or nothing to recommend them.

C. CAROLINIANA, *Walter*. AMERICAN HORNBEAM.(C. americana, *Michaux.*)

A small, bushy tree, rarely 40 ft. high, with a short, grey, fluted trunk ; young shoots at first furnished with pale hairs. Leaves oval or ovate, 2 to 4 ins. long ; 1 to 2 ins. wide ; rounded or heart-shaped at the base, taper-pointed, sharply, and often doubly toothed ; covered with white silky hairs when quite young, becoming sparsely hairy above, downy on the midrib and vein-axils beneath ; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, downy. Male catkins 1 to $1\frac{1}{2}$ ins. long. Fruiting clusters about 3 ins. long ; the bracts three-lobed, 1 to $1\frac{1}{2}$ ins. long ; the middle lobe much the largest and nearly 1 in. wide, toothed (often on one side only).

Native of Eastern North America ; introduced in 1812. Although very similar in its parts to the European hornbeam it is not so fine a tree, growing more slowly and never attaining to so large a size. Its leaves turn a deeper, more orange yellow, or even scarlet shade in autumn. In winter, the best distinction between the two species is afforded by the buds ; these, in our native hornbeam, are slender and spindle-shaped, $\frac{1}{2}$ in. or more long, and like small beech buds, but they are egg-shaped and only $\frac{1}{8}$ in. long in the American one.

C. CORDATA, *Blume*.

A tree 40 ft. high, with a scaly, furrowed bark ; young shoots slightly hairy at first ; terminal winter buds large, $\frac{5}{8}$ in. long. Leaves $2\frac{1}{2}$ to $5\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $3\frac{1}{4}$ ins. wide ; taper-pointed, deeply heart-shaped at the base, unequally or doubly toothed ; hairy on the midrib above, more so beneath ; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Male catkins 1 to 2 ins. long, the scales linear, $\frac{1}{8}$ in. long, silky hairy. Fruit catkins 3 to 5 ins. long, $1\frac{1}{2}$ ins. wide ; the bracts closely overlapping, ovate, sparsely and sharply toothed, 1 to $1\frac{1}{2}$ ins. long, with one side doubled over. The nut is covered partly by this infolded portion, but more completely by a lobe of the bract attached to the base at the other side.

Native of Japan ; introduced in 1879 by Maries for Messrs Veitch, in whose nursery at Coombe Wood it frequently bears its fruit clusters. This hornbeam, in my experience, grows very slowly, and the finest tree in the country, which is at Tortworth, is only about 20 ft. high. It is very distinct from its ally, C. japonica, in the large, deeply cordate leaves and big winter buds, but is similar in the curious way the nut is protected by basal portions of the bract infolding over it.

Var. CHINENSIS, *Franchet*.—Native of E. Szechuen, China ; introduced by Wilson in 1901. It differs from the Japanese type in having smaller, narrower leaves, and in the young shoots being more hairy.

C. JAPONICA, *Blume*. JAPANESE HORNBEAM.(Bot. Mag., t. 8534 ; Distegocarpus Carpinus, *Siebold.*)

A tree 40 to 50 ft. high, with wide-spreading branches, and scaly, furrowed bark ; young shoots at first clothed with fine hairs. Leaves ovate, or inclined to oblong ; 2 to $4\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide ; long and taper-pointed, mostly heart-shaped at the base, but sometimes rounded or wedge-shaped ; sharply, sometimes double-toothed, but often with a large and a small tooth alternating ; upper surface dark green, and downy only on the midrib, the numerous parallel veins deeply impressed ; lower surface downy on the veins, vein-axils, and midrib ; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, downy. Male catkin 1 to 2 ins. long ; with conspicuous, narrowly ovate, pointed scales $\frac{1}{4}$ in. long. Fruit clusters 2 to $2\frac{1}{2}$ ins. long ; the closely overlapping bracts $\frac{5}{8}$ to $\frac{7}{8}$ in. long, coarsely toothed,

ovate, with the lower portion on one side doubled over. The nut is covered by a small additional roundish bract, $\frac{1}{8}$ in. long.

Native of Japan; introduced in 1895. It makes, in a small state, a sturdy pyramidal tree, and is evidently very hardy. It is distinct and handsome-looking because of the numerous (up to twenty-four pairs), deeply impressed veins of the leaf. It is one of the species (see also *C. cordata*) regarded by some authorities as generically distinct from *Carpinus*, because of the infolded bases of the more crowded bracts of the fruit.



CARPINUS JAPONICA.

C. ORIENTALIS, *Miller*. ORIENTAL HORNBEAM.

(*C. duinensis*, *Scopoli*.)

A small tree, or a large shrub, sometimes found in a wild state as a scrubby bush; young shoots covered with fine silky down. Leaves ovate, 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; rounded or slightly wedge-shaped at the base, pointed; sharply, regularly, and prettily double-toothed; veins in twelve to fifteen pairs; dark glossy green above, with silky down on both surfaces of the midrib; stalk hairy, $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Male catkins $\frac{1}{2}$ to $\frac{3}{4}$ in. long; bracts ovate, unequal-sided; $\frac{5}{8}$ to $\frac{7}{8}$ in. long, $\frac{1}{2}$ in. wide, coarsely and irregularly toothed, but not lobed. Nut $\frac{1}{8}$ in. long, exposed.

Native of S.E. Europe and Asia Minor; introduced in 1735 by P. Miller. It is abundant on some of the battlefields of the Crimea as low scrub, and, as I have been told by an officer who took part in the Crimean war, much impeded some of the advances of our men, made under cover of darkness. It has not much to commend it to the notice of planters in this country except as being an interesting rarity. The largest specimen at Kew, and probably in this country, is 20 ft. high. Its small leaves and the unlobed bracts of the fruit clusters distinguish it from *C. Betulus* and *C. caroliniana*.

C. POLYNEURA, *Franchet.*

A very elegant tree, said to be 30 ft. high in a wild state ; young shoots slightly hairy. Leaves ovate, pointed, rounded or slightly heart-shaped at the base ; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide ; sharply toothed (only occasionally double-toothed) ; dark lustrous green, and soon becoming smooth above ; downy on the midrib and veins beneath ; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, downy. Stipules narrowly linear, downy, persisting through the winter. Male catkins $\frac{3}{4}$ to 1 in. long ; scales ovate, silky hairy. Fruit clusters 1 to 2 ins. long ; the bracts ovate, but very unequal-sided, $\frac{3}{4}$ in. long, pointed, and coarsely toothed. Nut ovate, ribbed, $\frac{1}{2}$ in. long.

Native of W. China ; discovered by Henry, and introduced by means of seed received from him at Kew in 1889. The tree at Kew, now about 20 ft. high, is the only one in cultivation, except a few small plants raised from it. It has flowered and borne clusters of fruit, and the seed has lately proved fertile. This is the most elegant of the small hornbeams, and would be worth while introducing in quantity. Its small leaves resemble those of *C. orientalis* in size, but are flatter, and not markedly double-toothed ; the elegant, clean-growing habit of *C. polyneura* is quite distinct, and the bracts of the male catkins differ in being covered with silky hairs. It is closely allied to *C. TURCZANINOWI*, *Hance*, a species not in cultivation. From all the hornbeams in cultivation it is distinguished by the persistence of the stipules, which remain, one on each side of the buds, after the leaves have fallen and all through the winter. Although *C. orientalis* shows the same character occasionally, it is far from being as marked.

C. YEDOENSIS, *Maximowicz.*

A small tree whose young shoots are covered with hairs, many of which persist through the first winter. Leaves $1\frac{1}{2}$ to 3 ins. long, $\frac{5}{8}$ to $1\frac{1}{2}$ ins. wide, ovate, with a tapered point and a rounded base, unequally or doubly toothed ; upper surface dark green, with flattened hairs on the midrib and between the nine to twelve pairs of veins ; lower surface hairy on the veins ; stalk slender, downy, $\frac{1}{2}$ in. long. Fruit clusters on silky stalks, the bracts $\frac{5}{8}$ to $\frac{3}{4}$ in. long, narrowly ovate, toothed on one side, silky-hairy, especially on the veins and at the base, where they become slightly boat-shaped, holding the ovoid, flattened nut in the hollow, but quite exposed.

Native of China ; discovered by Farges in the mountains of Szechuen, but long cultivated in Japan, where it was first noticed by Maximowicz, the Russian botanist, over thirty years ago. Several plants are cultivated at Kew, and grow promisingly. I first saw it in Messrs Simon-Louis' nursery, near Metz, in 1904, and it is obtainable in the trade. It appears first to have been introduced to the Darmstadt Botanic Garden in 1901.

CARRIEREA CALYCINA, *Franchet.* BIXACEÆ.

A deciduous tree, 20 to 30 ft. (sometimes 40 ft.) high, with a wide-spreading head of branches ; young shoots at first covered with minute down, reddish. Leaves alternate, ovate, with a tapered apex, rounded or cordate at the base, up to 5 ins. long, half as wide ; coarsely round-toothed ; smooth, or nearly so, on both surfaces ; with a stalk about one-third as long as the blade ; at first reddish, then dark glossy green above, paler and also glossy beneath. Flowers in terminal downy panicles 6 ins. long ; each flower cup-shaped, 1 in. in diameter, clear bluish white ;

sepals very downy. A pair of ovate yellowish bracts are set on the flower-stalk. Fruit a spindle-shaped capsule, downy, 3 to 4 ins. long, $\frac{3}{4}$ in. wide at the middle, splitting into three narrowly lanceolate valves. Seeds winged.

Native of West and Central China, at altitudes of 2000 to 3000 ft.; introduced for Harvard University in 1908. Mr Wilson, who introduced it, tells me that it is a tree of singular beauty of flower, and a great acquisition to gardens should it prove hardy. On this point nothing certain can be stated yet, but it would seem to be best adapted for the milder parts of the country. Its nearest allies among hardy trees are *Idesia* and *Poliothyrsis*.

CARYA. HICKORY. JUGLANDACEÆ.

Of the twelve or fourteen species of hickory as yet recognised—there are doubtless many more as yet undistinguished—about half are in cultivation in the British Isles. They are all natives of Eastern North America. From its two allies, *Juglans* and *Pterocarya*, the genus is distinguished by its pith being solid, and not, as in the others, divided into thin transverse plates; and from *Juglans* in particular by the branched male inflorescences and four-valved fruit. The hickories are large, deciduous trees with pinnate leaves; the leaflets rather wide apart on a common stalk, themselves nearly or quite stalkless. Male flowers mostly in three-branched, slender catkins, produced either at the end of the previous year's shoots or at the base of the young ones of the current year; whilst the few-flowered, female inflorescence terminates the young shoot. Nut surrounded by a husk, which is often thick and becomes hard by the time the seed is ripe.

Considering their great beauty of foliage and stately habit—and there is scarcely any tree more striking than a well-grown young hickory—this genus is strangely uncommon in gardens. The reason appears to be their dislike of disturbance at the root, which makes them unsuited to ordinary nursery conditions. The frequent transplanting which is practised by good nurserymen to ensure success at the final removal of their stock is, in my experience, worse than useless with hickories. It induces a stunted, ultimately diseased condition, from which, at the best, it takes them long to recover. The great secret with hickories is to get them in their permanent places early. To anyone desirous of trying these fine trees I would recommend the following procedure. The best species to experiment with are *C. alba*, *amara*, *porcina*, and *tomentosa*. Nuts of these should be obtained in autumn from a reliable American seedsman as early as possible after they are ripe. During the winter they should be kept in a box of moist earth, either inside or out-of-doors. In spring the nuts may be placed singly in 6-in. pots, in a slightly heated frame or greenhouse. After they have germinated, all that is necessary is to protect them from frost until they are planted out about the end of May, if sufficient progress has been made. *Caryas* need a deep, loamy soil if they are to thrive permanently. Previous to planting the seedlings out, the ground should be well worked, and it is wise to put a couple

together to anticipate failures; afterwards the weaker one can be removed. To avoid accidents each plant or plants should be enclosed by small-meshed wire-netting.

The object of all this trouble is to avoid the destruction of the tap-root, which is inevitable if ordinary nursery treatment be adopted. A young tree in deep loam, undisturbed, and with its tap-root preserved, will be a better tree in ten years than another treated in the ordinary way will be in twenty.

C. ALBA, *Nuttall*. SHELL-BARK HICKORY.

(*Hicoria ovata*, *Britton*.)

A tree 70 to 100 ft. high in a wild state, very distinct in its loose grey bark, which comes away from the trunk in broad flakes 1 ft. or more long, each flake attached by its middle; young shoots covered with pale down. Leaves 8 to 14 ins. long (considerably more in young, vigorous trees), composed of five leaflets, the three upper ones of which are obovate, often very narrowly so, and considerably the largest; the lower pair ovate to ovate-lanceolate; all long-pointed and toothed, edged when young with a fringe of hairs; smooth above, downy beneath. The leaflets vary much in size; in adult trees the three terminal ones are 5 to 7 ins. long, 2 to 3 ins. wide, with the lower pair less than half the size; but in young trees I have measured the terminal leaflet 12 ins. long and 5 ins. wide, with the other four in proportion. Male catkins in threes, 3 to 5 ins. long, hairy. Fruit borne singly or in pairs, roundish, flattened at top and bottom, 1 to 2 ins. long. Nut white, four-angled.

Native of Eastern N. America, where it is spread over a large territory; introduced early in the seventeenth century. It thrives very well in England when young, and is one of the most striking of fine-foliaged trees. At Kew, the leaves turn a beautiful yellow in autumn. Of the hickories producing edible nuts, this is the most valuable in the United States, but it has no value in this respect in Britain. The largest tree noted by Mr Elwes is at Botley Hill, Hants, now 75 ft. high, and supposed to have been planted by Wm. Cobbett in 1820.

C. alba is somewhat similar in growth and general aspect to C. tomentosa, and both have large winter buds; but C. alba has only five leaflets, and they are not scented as in C. tomentosa.

C. AMARA, *Nuttall*. BITTER NUT.

(*Hicoria minima*, *Britton*.)

A tree up to 100 ft. high, with brownish bark separating from the trunk in thin scales; young shoots smooth or soon becoming so; winter buds coated with bright yellow scales. Leaves 6 to 10 ins. (occasionally 15 ins.) long, composed usually of seven, but sometimes five or nine leaflets, the lowest pair of which are considerably smaller than the others. Leaflets lance-shaped, narrowly oval, oblong or obovate, tapered at both ends, sharply toothed; 2 to 6 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide; smooth above, downy at first below, especially along the midrib and veins; common stalk downy. Fruits usually in pairs or threes, pear-shaped to roundish, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, with a thin, yellowish husk. Nut thin-shelled, with a bitter kernel. Male catkins usually in threes, $2\frac{1}{2}$ to 3 ins. long, downy.

Native of Eastern N. America; introduced, according to Aiton, in 1766. Of all the cultivated hickories, this appears to be the hardiest and the best grower. It is easily distinguished from all the rest by the bright yellow

winter buds. There is a fine tree at Bute House, Petersham, which, when I saw it a few years ago, was nearly 80 ft. high.

C. OLIVÆFORMIS, *Nuttall*. PECAN.

(*Hicoria Pecan*, *Britton*.)

But little need be said of this tree, for it is ill adapted to our climate. Many times introduced to Kew, it usually lives only a few years. Young trees will make growths 12 or 15 ins. long during the summer, but so badly ripened are they that unless the winter be very mild they are regularly cut back almost to the old wood. This renders them an easy prey to fungoid parasites, usually the "coral-spot" fungus, and makes the species not worth cultivation. It is a native of the south-east and south Central United States, and is the most important of the hickories as a nut-bearing tree. It grows considerably over 100 ft. high, and is distinct from all the cultivated species in the large number of leaflets—usually eleven to fifteen on each leaf. These are 2 to 6 ins. long (sometimes more), curved like a scimitar, pointed, toothed. Fruits clustered, each 1 to 2½ ins. long, about half as wide, oblong, pointed; the nut has a sweet-flavoured kernel. Perhaps the finest tree in Europe is in the Botanic Garden at Padua—about 100 ft. high.

C. PORCINA, *Nuttall*. PIG NUT.

(*Hicoria glabra*, *Britton*.)

A tree 80 to 90 ft. high, with grey, fissured bark; young shoots smooth. Leaves 8 to 12 ins. long, composed of five or seven leaflets, the basal ones of which are ovate-lanceolate, the terminal ones much larger and more or less obovate; all taper-pointed, rounded or tapering at the base, sharply toothed; both surfaces smooth except for some down along the midrib and veins, which mostly falls away by autumn. The large terminal leaflets are 5 to 7 ins. long, and 2 to 3 ins. wide, the lowest pair about one-third the size; common stalk smooth. Male catkins 3 to 5 ins. long, slightly scurfy. Fruit variable in shape and size, mostly rounded or pear-shaped, flattened or even sunk at the apex. Kernel of nut astringent.

Native of Eastern N. America, as far to the north as Maine; introduced in 1799. The pig nut thrives very well in England. There is a specimen nearly 80 ft. high at Kew which often bears good crops of fruit.

Var. MICROCARPA, *Trelease*, has a more shaggy bark and smaller fruit, with a sweet kernel.

C. SULCATA, *Nuttall*. BIG SHELL-BARK.

(*Hicoria laciniosa*, *Sargent*.)

A tree 100 to 120 ft. high; bark separating from the trunk into broad plates often 3 or 4 ft. long; young shoots at first downy; terminal winter bud 1 in. long. Leaves 12 to 22 ins. long, composed of usually seven, sometimes nine, leaflets, the terminal ones of which are obovate, 4 to 8 ins. long, 1½ to 2½ ins. wide, the lower ones ovate and only one-third or one-fourth the size; all long and slender-pointed, toothed; smooth and glossy above, downy beneath. Male catkins 4 ins. or more long. Fruit oblong, 2½ ins. long, 2 ins. wide; nut prominently four- or six-ridged.

Native of the eastern United States from New York and E. Pennsylvania southwards; introduced to England in 1804. It is one of the least



CARYA TOMENTOSA.

satisfactory of the hickories in cultivation. Mr Elwes knows only one of any size, which is 30 ft. high, and grows in Tortworth Churchyard.

C. TOMENTOSA, *Nuttall*. MOCKER NUT.

(*Hicoria alba*, *Britton*.)

A tree 50 to 60, occasionally 100, ft. high; winter buds large, the terminal one broadly egg-shaped, pointed, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, and $\frac{1}{2}$ in. or more wide; the inner scales covered with a soft pale felt; young shoots very downy, especially at first. Leaves fragrant, 8 to 12 ins. (on very vigorous young trees 20 ins.) long; composed usually of seven (sometimes five or nine) leaflets. Terminal leaflet is 5 to 8 ins. long, 2 to $4\frac{1}{2}$ ins. wide, obovate, wedge-shaped at the base; basal pair sometimes only $1\frac{1}{2}$ to 2 ins. long, ovate, rounded at the base; the middle pair or pairs are intermediate in size and shape. All taper-pointed, toothed, upper surface dark green, downy on the midrib; lower surface yellowish, and covered with starry down and glands; common stalk stellately downy. Male catkins 3 to 5 ins. long, very downy. Fruit top-shaped or roundish.

Native of Eastern N. America; rare in cultivation. The species is distinct in its large winter buds (it is sometimes called "big-bud hickory") and in the fragrance of its foliage. This, of course, is most marked when the leaf is rubbed, but on dewy mornings in summer it can be perceived many yards away from the tree. The mocker nut has been too much neglected in gardens, if only on this account. There is a fine specimen at Kew 50 ft. high, remarkable for its stately habit and splendid foliage.

CARYOPTERIS MASTACANTHUS, *Schauer*. VERBENACEÆ.

(*Bot. Mag.*, t. 6799; *C. incana*, *Mique*.)

A deciduous bush, 4 to 8 ft. high, of spreading habit; young stems semi-woody, covered like the flower-stalks, leaf-stalks, and the under-side of the leaves, with a close grey felt. Leaves opposite, ovate; 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; the base more or less broadly wedge-shaped, the apex blunt or pointed; coarsely toothed, almost lobed, dull green and downy on the upper surface; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers bright violet-blue, produced during October in hemispherical cymes from the axils of the uppermost leaves; main flower-stalk $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long. Corolla downy, tubular, $\frac{1}{4}$ in. long, with five lobes at the mouth; the four upper ones ovate, the lower one larger, scoop-shaped, and fringed; stamens four, much protruded; calyx funnel-shaped, with five-pointed teeth.

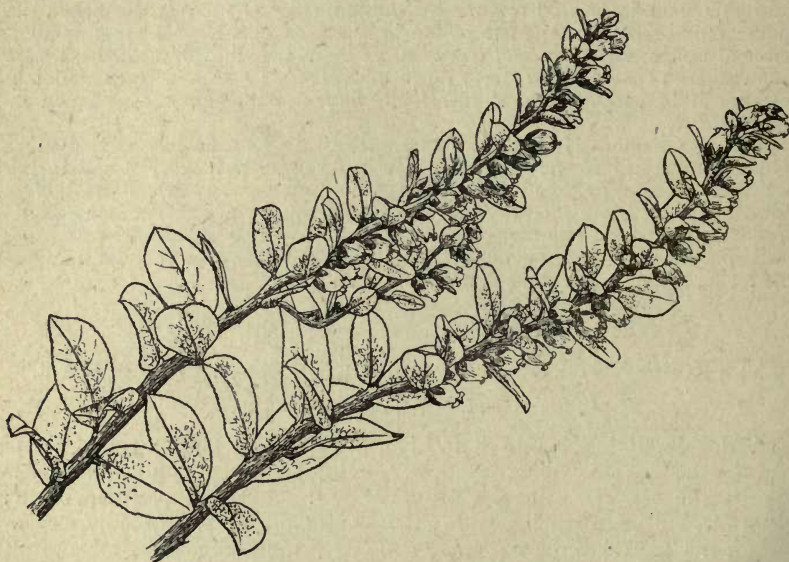
Native of China and Japan; originally introduced in 1844 by Fortune, who found it wild near Canton. It was at first treated as a greenhouse plant, and being scarcely worth its room there, was eventually lost until reintroduced by Maries in 1880. It is hardy at Kew in all but the hardest winters, and during a fine autumn makes a very pretty display. The leaves are pleasantly scented. It is increased with the greatest ease by means of soft cuttings in heat, and should be grown in an open, sandy soil, and given a sunny, sheltered position.

Var. CANDICANS, *Schelle* (syn. *alba*), has whitish flowers, but is not, I think, so hardy as the type.

CASSANDRA CALYCVLATA, *D. Don.* LEATHER LEAF.
ERICACEÆ.

(*Andromeda calyculata*, *Linnaeus*, Bot. Reg., t. 1286.)

An evergreen shrub, usually 2 or 3 (sometimes 4 or 5) ft. high, with thin, wiry branches, and a sparse, gaunt habit; young wood scaly. Leaves alternate, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. long, $\frac{3}{8}$ to $\frac{3}{4}$ in. wide; obovate or narrowly oblong, shallowly toothed, but often only on the terminal half; both surfaces, but especially the lower one, covered with tiny scales. Flowers produced in March and April, singly in the axils of small leaves, at the terminal part,



CASSANDRA CALYCVLATA VAR. NANA.

and on the lower side of the previous year's shoots, the whole forming a leafy raceme 2 to 4 ins. long. The leaves associated with the flowers are much smaller than the ordinary ones described above, and become gradually smaller towards the end, where they are only $\frac{1}{4}$ in. or less in length. Corolla white, $\frac{1}{4}$ in. long, cylindrical, five-toothed at the mouth; calyx lobes five, pointed, persistent, enclosing the base of the seed-vessel, which is a roundish, flattened capsule; flower-stalk scaly, $\frac{1}{8}$ in. long, with two bracts close beneath the calyx.

Native of Eastern N. America, whence it was introduced in 1748; also of N. Europe and N. Asia. It is a rather pretty shrub in flower, although not amongst the *élite* of the Ericaceæ. A better plant for gardens is

Var. NANA, which grows 12 or 18 ins. high, and forms a dwarf, dense thicket, having a more twiggy habit and smaller leaves. It makes a pleasing small

bed. Both are propagated by cuttings or by seeds, and thrive in a moist, peaty soil.

CASSIA MARYLANDICA, *Linnaeus*. WILD SENNA.
LEGUMINOSÆ.

Out of several hundred species of Cassia known (and they occur in all the warmer parts of the globe except Europe), this only has any claim to rank as hardy in Britain, and even it has only semi-woody shoots, which spring from a woody root-stock, and die back to ground-level during winter. A second species, *C. corymbosa*, is genuinely shrubby, and will perhaps succeed in the far south-western counties of England and Ireland; it is a very handsome shrub, with large clusters of rich yellow flowers.

C. marylandica sends up erect, pithy shoots 2 to 3 ft. high each year, furnished with pinnate leaves 6 to 10 ins. long, each composed of an even number of leaflets, usually seven to nine pairs. Leaflets 1 to 2½ ins. long, oblong, the midrib terminating in a bristle. Racemes 2 to 3 ins. long, terminal or springing from the axils of the leaves; the almost regular flowers crowded towards the end, ½ in. across; petals yellow, nearly alike; anthers a conspicuous dark purple. Pod 3 to 4 ins. long, covered with grey hairs when young.

Native of the south-eastern United States; introduced to England in 1723. It flowers from the end of July until October, and is very handsome then. A sheltered position should be found for it, and, as it is not absolutely hardy in all winters, it is wise to cover the root-stock with a few inches of light litter in severe weather. It can be propagated by breaking up the old root-stock just as growth recommences in spring, and if the pieces can be given a mild bottom heat and re-established in pots for planting out later, so much the better. But imported seeds can be obtained, and they, of course, given the best and simplest means of increase. The plant has certain cathartic properties resembling those of senna.

CASSINIA. COMPOSITÆ.

In our open grounds this genus is at present represented by three evergreen shrubs, introduced from New Zealand. Other species are found in Australia and S. Africa. They have a certain resemblance to the heaths in habit and in their small, crowded, narrow leaves, but bear their numerous tiny flowers (or rather flower-heads) in flattish terminal clusters. Such beauty as the flower-heads possess is given by the white, recurved tips of the inner bracts. The three species here included are very much alike in general appearance, and are not easily distinguished on paper. *C. fulvida*, however, the best and hardiest of the three, may generally be recognised in company with *leptophylla* by the yellowish cast of the upturned branch and the viscid leaves and twigs. *C. leptophylla* is grey-white instead of yellow, and not viscid. They can all be propagated easily by late summer cuttings, and will grow in a sandy loam or peaty soil. Even *C. fulvida*, the hardiest of the three, is apt to get browned in winter, and may need pruning back in spring.

C. FULVIDA, Hooker fil.(Diplopappus chrysophyllus, *Koehne*.)

An evergreen, dense-habited shrub up to 6 ft. in height, with erect branches, viscid when young, and clothed with a yellowish down. Leaves very crowded on the branches, $\frac{1}{6}$ to $\frac{1}{3}$ in. long, $\frac{1}{12}$ to $\frac{1}{8}$ in. wide; narrowly oblong-obovate, the margins recurved; dark green, smooth and slightly viscid above, yellowish downy beneath. Flower-heads very small and numerous, white, forming terminal corymbs 1 to 3 ins. across. Blossoms in July.

Native of New Zealand, where it occurs up to 3500 ft. It is an interesting, rather heath-like shrub, with a tawny yellow aspect when the branches are bent over, but of no great value as an ornament. It is closely allied to *C. leptophylla*, differing chiefly in the yellower under-surface of the leaves, in the more glutinous character of the young branches, and in having no scales among the florets, or perhaps one or two only.

C. LEPTOPHYLLA. R. Brown.

An evergreen, heath-like shrub, 4 ft. or more high, with erect, slender branchlets, not viscid, but clothed with a dense greyish down. Leaves $\frac{1}{8}$ to $\frac{1}{6}$ in. long, $\frac{1}{20}$ to $\frac{1}{8}$ in. wide, linear, or slightly wider towards the end; smooth, dark green above, covered beneath with white or yellowish down. Flower-heads white, very small and numerous, forming terminal corymbs 1 to 2 ins. across. Blossoms in August and September.

Native of New Zealand; very similar to *C. fulvida*, but paler beneath the leaves. The whole plant has a whiter cast. It differs also in having the disk (or receptacle) on which the florets are borne furnished with numerous scales; nor is it quite so hardy.

C. VAUVILLIERSII, Hooker fil.(Diplopappus Vauvilliersii, *Hort.*)

An evergreen shrub 2 to 6 ft. high, with erect branchlets, clothed with a tawny yellow, or yellowish white, down. Leaves $\frac{1}{4}$ to $\frac{1}{3}$ in. long, $\frac{1}{12}$ to $\frac{1}{8}$ in. wide; linear-obovate, round at the end, tapering at the base; dark green and smooth above, of the same colour as the branches beneath; margins recurved. Flower-heads white, very small and numerous, in terminal rounded corymbs 1 to 2 ins. across.

Native of New Zealand, and very similar in general aspect to the two preceding, but with larger leaves, less bushy and more elongated shoots. The receptacle on which the florets are borne has numerous scales. In my experience this species does not flower so freely as the two previous ones.

CASSIOPE. ERICACEÆ.

A group of some ten or twelve species of dwarf, evergreen shrubs, with a dense overlapping arrangement of the leaves similar to that of the common heather. Flowers solitary, bell-shaped, white or pink. They are found in Arctic or mountain regions of the northern hemisphere. None of the four species here mentioned is very common, although they have long been known in gardens. They are capable of withstanding intense cold, but do not thrive particularly well in the open in the south of England; they need cooler and moister conditions, and miss more

than anything their natural winter covering of snow. They are excited into premature growth by our mild winters and early spring, only to suffer by severe weather later in the year. For this reason *C. hypnoides* and *C. fastigiata* are frequently grown in cold, damp frames in winter. They should have a peaty soil surfaced with sphagnum moss, and never be allowed to get dry at the root. The Botanic Garden of Edinburgh and the neighbouring nursery of Messrs Cunningham & Fraser have long been famous for their success with these interesting and dainty plants. Propagated by layers and by cuttings. In the open they should have an airy but semi-shaded and damp position.

Sometimes, but rarely, there is seen in cultivation *C. MERTENSIANA*, *Don* (*Andromeda cupressina*, *Hooker*), a native of California and the Pacific coast. It has erect branches 6 to 12 ins. high; leaves smooth, $\frac{1}{8}$ in. long, keeled at the back (not grooved there as in *C. tetragona*), the points incurved but not appressed. Corolla $\frac{1}{4}$ to $\frac{1}{3}$ in. wide.

C. FASTIGIATA, *D. Don*. HIMALAYAN HEATHER.

(*Bot. Mag.*, t. 4796; *Andromeda fastigiata*, *Wallich*.)

A dwarf evergreen, 6 to 12 ins. high, forming dense tufts in a state of nature; stems erect, squarish, densely clothed and completely hidden by four rows of closely overlapping leaves. Leaves stalkless, $\frac{3}{16}$ in. long, lance-shaped, deeply furrowed at the back, dark green, but with thin, silvery, membranous margins edged with fine hairs. Flowers produced in April and May singly from the leaf-axils. Corolla widely bell-shaped, $\frac{3}{8}$ in. across, white; calyx of five narrow, lance-shaped, pointed divisions; flower-stalk decurved, $\frac{1}{4}$ in. long, downy.

Native of the Himalaya, common at elevations of 10,000 to 14,000 ft.; introduced about 1849. It is similar in general aspect to the commoner *C. tetragona*, but its leaves are not so closely flattened to the stem, and its flowers are larger, wider, and more open-mouthed. It is the prettiest of the Cassiopes, but rare.

C. HYPNOIDES, *D. Don*.

(*Andromeda hypnoides*, *Linnaeus*; *Bot. Mag.*, t. 2936.)

A tiny evergreen, heather-like shrub, from 1 to 3 ins. high, with prostrate, slender stems completely covered with closely set leaves. Leaves $\frac{1}{8}$ in. long, linear, overlapping, somewhat erect, but not flattened against the stem. Flowers solitary on slender, erect, reddish stalks $\frac{1}{4}$ to $\frac{1}{3}$ in. long, produced at the end of the shoot; corolla nodding, white, bell-shaped, $\frac{1}{8}$ in. long, with five rather deep, rounded lobes; calyx red.

Native of the Arctic and sub-Arctic parts of Europe and N. America, and of the mountain tops of more southern latitudes; introduced in 1798. It is quite distinct from the other two species here mentioned, being dwarfer in habit and more slender in its stems, and the leaf arrangement is not four-sided. The flower, too, is terminal, and on a proportionately longer stalk.

C. TETRAGONA, *D. Don*.

(*Andromeda tetragona*, *Linnaeus*; *Bot. Mag.*, t. 3181.)

A dwarf, evergreen shrub growing 4 to 10 ins. high in gardens; stems erect, much-branched, quite hidden on the younger parts by closely overlapping

leaves. Leaves $\frac{1}{6}$ in. long, arranged in four rows, so as to give the leaf-clothed stem a four-angled shape; stalkless, concave in front, each one closely appressed to the leaf above it; furrowed behind, slightly downy. Flowers sparsely borne at intervals along the younger parts of the stem during April and May, and produced singly from the leaf-axils. Corolla nodding, white tinged with red, bell-shaped, $\frac{1}{6}$ in. long; calyx of five ovate divisions, green tinged with red; flower-stalk decurved, little more than long enough to hold the flower clear of the leaves.

Native of the northern hemisphere, in Arctic and sub-Arctic regions; said to have been introduced from Lapland in 1810, and later from N. America. It differs from *C. fastigiata* in the smaller flowers, and in the leaves being without the silvery membranous margins, although slightly ciliated.

CASTANEA. CHESTNUTS. CUPULIFERÆ.

There appear to be about six species of chestnut known, but the number varies much in consequence of the varying conception of their specific limits. In any case they constitute a well-marked group of deciduous trees and shrubs, with alternate, parallel-ribbed, conspicuously toothed leaves, always approaching the oblong or narrow oval in shape. The leaves of all the chestnuts have a strong family resemblance, and have nothing like them among hardy trees except a few oaks. The unisexual flowers are produced in long, slender catkins from the leaf-axils of the young shoots during July. The lower catkins are entirely male; but from the axils of the later leaves there come shorter catkins, at the base of which one to three female flowers are borne. The flowers of all the chestnuts are pale yellow, and have little beauty of colour; but a tree well laden with catkins has a striking appearance, the enjoyment of which to many people is spoilt by their heavy, unpleasant odour. The nuts are always enclosed in the well-known prickly burs.

The older botanists made *C. dentata* and *C. crenata* both forms of *C. sativa*, which may have led to their not being introduced, and to their present rarity. They are, however, distinct enough, especially as seen in the living state, although it is not easy to make the distinctions very clear on paper. It does not seem likely that any other than *C. sativa* will be of much value in Britain either for timber or nuts, although the variety "Paragon," sometimes grown, is considered to have the "blood" of *C. dentata* in it. The ordinary *C. sativa* varies extraordinarily in the size and quality of its nuts. There are numerous trees in Kew Gardens, some of which bear large, excellent nuts and others that never produce a nut worth eating. The merit of the better forms seems to be due largely to their being able to suppress all but one of the three or four nuts which each bur normally encloses. This enables the survivor to develop into a fine nut.

The chestnuts like a hot summer. Even during the driest and hottest seasons, like that of 1911, one rarely sees any of this genus suffering. They appear to thrive in any well-drained, loamy soil, even of moderate quality, but are said to be averse to calcareous substances. They should always be raised from seeds except in the case of the fine fruiting forms, which are grafted easily in spring on seedlings of the common sort.

*C. CRENATA, Siebold. JAPANESE CHESTNUT.**(C. japonica, Blume.)*

A small tree, frequently less than 30 ft. high, according to Sargent, but occasionally much larger; young shoots sometimes very downy, with the down persisting through the first winter, sometimes merely scaly. Leaves oblong-lanceolate, 3 to 7 ins. long, $1\frac{1}{2}$ to 2 ins. wide, heart-shaped or rounded at the base, pointed; the teeth small, with bristle-like points; lower surface covered with a close grey down; stalk $\frac{1}{2}$ in. long, downy. Nuts like those of *C. sativa*.

Native of Japan; introduced in 1905, if not before, to Kew, where young plants are thriving very well. This is a valuable food tree in Japan, and Sargent observes that he never saw chestnuts offered in such quantities for sale in Europe and America as there. He saw young trees 10 or 12 ft. high fruiting freely. Ordinarily, the nuts are smaller than those of the European tree, but from selected trees or varieties they are as large as the best European varieties.

*C. DENTATA, Borkhausen. AMERICAN CHESTNUT.**(C. americana, Rafinesque.)*

A tree occasionally 100 ft. high in N. America, with the trunk and habit of the Spanish chestnut, but with, perhaps, scarcely so spreading a head; young shoots smooth except for a dust-like scurf. Leaves dull green, narrowly oblong, tapering about equally at both ends, 6 to 9 ins. long, $1\frac{3}{4}$ to 2 ins. wide, coarsely toothed except at the base; both surfaces smooth; stalk about $\frac{1}{2}$ in. long. Catkins 6 to 8 ins. long. Fruit as in the European species, consisting of a bur of numerous, branched, slender spines enclosing one to three nuts.

Native of Eastern N. America, whose introduction to Britain has not been recorded. It is very rare in cultivation in England, although a young tree at Kew 35 ft. high thrives well. In America the tree is valued for its timber and its nuts, which, although not so large as those of *C. sativa*, are said to be of superior flavour and to have a thinner shell. The leaves differ from those of *C. sativa* in the uniformly tapered base, and in being narrower in proportion to their length. They are never clothed beneath with a thick, close down, as those of *C. sativa* and *C. crenata* often are.

C. PUMILA, Miller. DWARF CHESTNUT.

A deciduous shrub spreading by underground stems, or a small tree; young shoots covered with short hairs, which persist through the winter. Leaves oblong, inclined to oval and obovate, 3 to 5 ins. long, 1 to 2 ins. wide, pointed, wedge-shaped or rounded at the base, coarsely toothed; dark green and soon becoming smooth above, but coated beneath with a persistent, greyish white (at first quite white), close felt. Male catkins 4 ins. or more long. Nut of good flavour, egg-shaped and not flattened, $\frac{3}{4}$ to 1 in. long, usually solitary in a bur $1\frac{1}{2}$ ins. across. (Fig., p. 308.)

Native of Eastern N. America, where it is often known as the "chinquapin"; introduced, according to Aiton, in 1699, but very rare in cultivation. There are shrubby examples at Kew which flower, but have never, in my experience, borne fruit. It probably needs a hotter summer than ours, as a small tree at Verrières, near Paris, in Mr de Vilmorin's garden, often fruits freely. This chestnut is well distinguished from the others by its shrubby habit, and white under-surface of the leaf. In N. America a single plant often forms a thicket through its habit of spreading by suckers.

C. SATIVA, *Miller*. SWEET, OR SPANISH CHESTNUT.*(C. vesca, Gaertner ; C. vulgaris, Lamarck.)*

A tree of the largest size, 100 ft. or more high, with an enormous girth of trunk (sometimes 30 to 40 ft.); young shoots at first covered with a minute down, or smooth. Leaves oblong, with a narrowed, pointed apex, and a rounded, slightly heart-shaped or tapered base; coarsely toothed, 5 to 9 ins. long, 2 to $3\frac{1}{2}$ ins. wide; stalk $\frac{1}{2}$ to 1 in. long. When they first expand, they are covered beneath with a close felt which often rapidly falls away. Nuts red-brown, usually in twos or threes, enclosed in a globose, very prickly fruit, or



CASTANEA PUMILA.

bur $1\frac{1}{2}$ to 2 ins. across. They vary in size, according to the number in each bur, from $\frac{3}{4}$ to $1\frac{1}{4}$ ins. across. Sometimes there are four, sometimes only one, in a fruit.

Native of S. Europe, N. Africa, and Asia Minor. It is supposed to have been introduced to Britain by the Romans, and certainly existed in our islands previous to the Norman Conquest. It may be found springing up naturally in different parts of the country, and no foreign tree except perhaps the sycamore, can be said to have adapted itself better to our climate. In the south of Europe, where the nuts are much more esteemed as food than they are with us, numerous named varieties are in commerce. Of these, "Marron de Lyon," "Gros Merle," and "Paragon" are sometimes cultivated in England; they are

propagated by grafting on seedlings of the common sort. In propagating the type itself, it is worth while to select the nuts from trees that bear them of good size.

With us, however, the tree is grown chiefly as a park ornament, and for coppice. Certainly no tree gives greater distinction to a park or garden than an old finely developed chestnut. For dry, hot soils no tree of its class is better adapted. At Kew, in shallow, sandy soil there are several fine specimens, one over 21 ft. in circumference. There are many splendid chestnuts scattered over the country: the finest I have seen are at Studley Royal, in Yorkshire, and at Shrublands Park, Ipswich. At the latter place, one giant girths about 15 yds. near the base. At Studley Royal is a tree over 100 ft. high, and more than 20 ft. in girth. The timber much resembles oak, but is far from being as valuable, and very liable to "shake" or split at the annual rings. Coffins made of it are frequently supplied as of genuine oak. The sweet chestnut has sported into a number of varieties, of which the following may be mentioned:—

Var. ALBO-MARGINATA.—Leaves margined with creamy white. There is a very fine specimen of this in Mr Anthony Waterer's nursery at Knap Hill.

Var. AUREO-MARGINATA.—Leaves similar to the preceding, but with the variegation yellow; very handsome.

Var. ASPLENIFOLIA (laciniata).—This has the teeth ending in thread-like points.

Var. HETEROPHYLLA.—This name may serve for a group of varieties in which the leaf-blade is much, but irregularly, narrowed, sometimes to $\frac{1}{2}$ in. or less in width, but extraordinarily variable in form and length. I have a leaf of this kind 18 ins. long, and in parts less than $\frac{1}{4}$ in. wide, found on a tree on Esher Common. These curious leaves are usually borne at the end of the summer shoot. The forms with such names as *dissecta*, *dissecta nova*, *filipendula*, and *linearifolia*, may be included here.

Var. PURPUREA.—Growing at Rostrevor, the seat of Sir John Ross of Bladensburg, this has leaves of large size (as much as 5 ins. wide), purple when young, especially on the upper half, coppery in autumn.

Var. PYRAMIDALIS (Holtii).—A pyramidal form growing in the grounds of Mount Mascal, Bexley, Kent.

I know of no pendulous variety; the plant figured by Lavallée in his *Arboretum Segrezianum*, t. 33, as var. *pendulifolia* is, apparently, *C. dentata*, the American Chestnut, whose leaves have a more drooping pose than those of *C. sativa*.

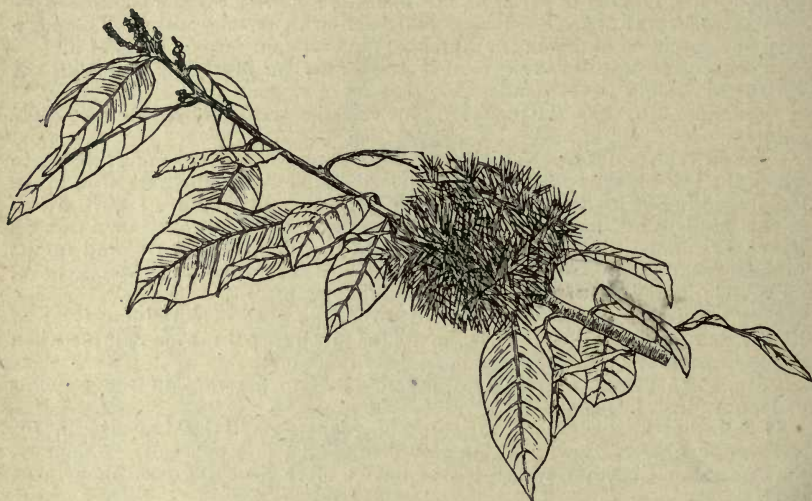
CASTANOPSIS CHRYSOPHYLLA, *De Candolle*. GOLDEN CHESTNUT. CUPULIFERÆ.

(*Castanea chrysophylla*, *Hooker*; Bot. Mag., t. 4953.)

An evergreen tree, described as occasionally over 100 ft. high in California; but hitherto a small tree about 30 ft. high, or a low, dense bush, in Britain; the young shoots and under-surface of the leaves covered with a beautiful, persistent, golden scurf. Leaves ovate, lanceolate, narrowly ovate or obovate, $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{2}$ to 1 in. wide, tapered at both ends, often long-pointed, not toothed, dark glossy green above; stalk $\frac{1}{4}$ in. long. Flowers unisexual; the males produced in erect, cylindrical catkins 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ in. wide; the stamens numerous, yellow, slender. Female flowers produced at the base of the same catkin as the males, or in a small separate catkin. Fruit like that of a sweet chestnut, consisting of a bur 1 to $1\frac{1}{2}$ ins. in diameter, clothed with a mass of

branched, slender spines, enclosing a small, pale brown, shining nut, which is edible.

Native of Oregon and California; introduced in 1844. The above description is based on cultivated English specimens, but in California, where it is sometimes 115 ft. high, with a trunk 6 ft. in diameter, the leaves are occasionally 6 ins. long. Other species of *Castanopsis* have recently been introduced from China, but of them we know little. At present, this West American species, with its leaves golden yellow below, is quite unlike anything in our gardens. Although so long introduced, there appear to be few large specimens in the country. The finest, I believe, is in Lord Ducie's garden at Tortworth; this is now about 30 ft. high, its trunk 15 ins. in thickness.



CASTANOPSIS CHRYSOPHYLLA.

At Kew it thrives best in the sandy soil of the place with peat and leaf-soil mixed. One plant raised from seed of Lord Ducie's tree is now 20 ft. high. In my experience, it is fatal to expose the trunk of this tree to full sunlight, and its lower branches should not be cut away. It can best be raised from seed, which ripens in this country, and germinates freely. Closely allied to *Castanea*, it differs in its evergreen foliage, and in its nuts not ripening until the second season.

CATALPA. BIGNONIACEÆ.

Like many other genera of hardy trees and shrubs, the *Catalpas* are found in both the Old and New Worlds. Although first made known to English cultivators from N. America in the form of *C. bignonioides* (which was introduced in 1726), the genus has been found in later times

to be more abundantly represented in China and Japan, where four to six species occur. In the open ground the Catalpas form low, wide-spreading, bushy-headed, deciduous trees, a habit largely due, no doubt, to the shoots never forming a terminal bud. The young wood is stout, and very pithy. Leaves either opposite or in threes, large, long-stalked. Flowers produced in panicles, corymbs, or racemes at the end of the shoots of the year. Corolla bell-shaped at the base, with five spreading, frilled lobes; calyx two-lipped; stamens five, only two of which as a rule are fertile. Seed-vessel a very slender, cylindrical capsule 1 to 2 ft. long, and $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter. Seeds numerous, flat, with a fringe of long, white hairs at each end.

Several new species have recently been acquired from China, but so far as we know at present, the species first introduced (*C. bignonioides*) remains the best, although Mr Wilson speaks very highly of the new Chinese *C. Fargesii*. The former is undoubtedly one of the most beautiful of all flowering trees, and as an isolated tree on lawns is seen to exceptional advantage. At the same time all the species are worth cultivation.

Catalpas like generous treatment at the root; a deep, moist loam is best, and an open, sunny, but not a bleak spot. Owing to the branches never forming a terminal bud and the annual bi- or tri-furcation this induces, it is advisable when the trees are young to train up a leader high enough to produce a trunk of the desired height, say 10 ft., when the tree may be left to assume the spreading habit natural to it. *C. bignonioides* thrives well in London, and for many years there was a fine specimen in the garden of Gray's Inn. Possibly the others may do as well. For propagation I would prefer seeds to any other means, believing that trees so raised are the longest lived. But when these are unobtainable, and for distinct forms or coloured-leaved varieties, cuttings may be used. These should be made of the young leafy shoots as soon as they are moderately firm, and struck in mild bottom heat.

I. LEAVES GLABROUS.

1. *Bungei*. Flowers white, purple spotted. Leaves lobed.
2. *Duclouxii*. Flowers pink. Leaves mostly unlobed.

II. LEAVES STELLATELY DOWNY.

3. *Fargesii*. Inflorescence usually unbranched. Down on leaves stellate.

III. LEAVES NOT STELLATELY DOWNY OR HAIRY; MORE OR LESS LOBED.

4. *Ovata*. Flowers yellowish; corolla 1 in. across. Leaves mostly lobed.
5. *Bignonioides*. Flowers white, spotted, $1\frac{1}{2}$ in. across, in many-flowered panicles. Leaves ovate, with a short point, rarely lobed, evil-smelling.
6. *Speciosa*. Flowers white, spotted, 2 in. across, in few-flowered panicles. Leaves inodorous, rarely lobed, ovate, with a long point. Seed-pod thicker-walled than in No. 5.

C. BIGNONIOIDES, *Walter*. INDIAN BEAN.

(*C. syringæfolia*, *Sims*; Bot. Mag., t. 1094.)

A tree 25 to 50 ft high, with a rounded, wide-spreading, much branched head when grown apart from other trees. Leaves in adult trees broadly ovate,

with a heart-shaped base; 4 to 10 ins. long, 3 to 8 ins. wide (in young trees considerably larger); with short, slender points, sometimes slightly lobed at the sides; light green and ultimately nearly smooth above, more or less clothed beneath, especially about the midrib and veins, with pale hairs; odour when crushed disagreeable; stalk half to three-fourths as long as the blade. Panicles broadly pyramidal, 8 to 10 ins. long and wide, many-flowered. Corolla $1\frac{1}{2}$ ins. long and across, frilled at the margin, the tube bell-shaped; white with two ridges and two rows of yellow spots, and numerous purple spots on the tube and lower lobe. Fruit slender, 6 to 15 ins. long, round, and about as thick as a lead pencil.

Native of the eastern United States; introduced in 1726. It flowers at the end of July and in August, and is at that season the most beautiful of flowering trees. It is hardy, but is best adapted for the south of England. No garden ought to be without one or more specimens, and young ones from seed ought to be always coming on to succeed the older ones, for the species is not particularly long-lived, and frequently declines when forty to fifty years of age. It bears fruit in hot seasons, and a tree densely hung with the long, pendent seed-pods has a curious aspect.

Var. AUREA.—Those who admire yellow-leaved trees will not find a more striking one than this; its leaves are wholly of a rich yellow, which does not become dull or greenish as the season advances, but rather improves in colour.

Var. KOEHNEL.—Leaves yellowish green in the centre, with a wide margin of yellow.

Var. NANA.—A dwarf form 3 to 6 ft. high, bushy, and with smaller leaves. I have never known this to flower. Often wrongly called *C. Bungei*.

Var. PULVERULENTA (G. Paul & Son).—Leaves densely spotted with white.

Var. VARIEGATA (foliis argenteis).—A worthless variety. Leaves blotched with yellowish white.

C. BUNGEI, *C. A. Meyer.*

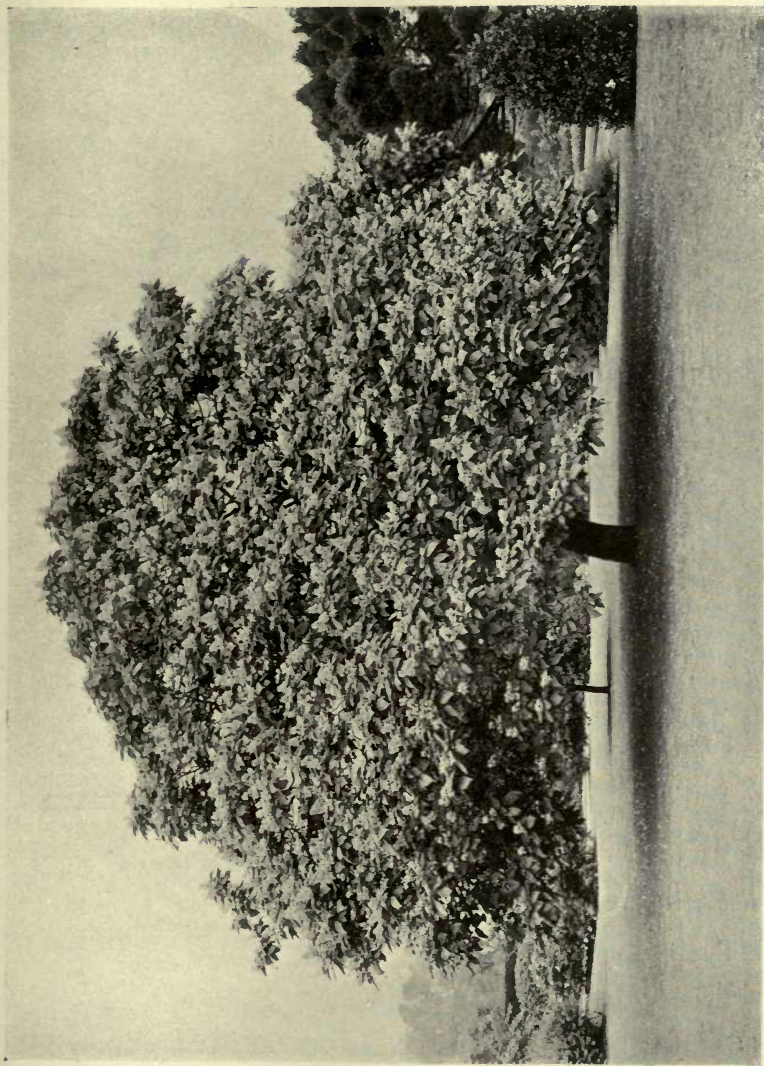
A tree 20 to 30 ft. high, of bushy habit. Leaves 2 to $7\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. wide; ovate or somewhat triangular, with a wedge-shaped or straightly cut base; sometimes entire, but often coarsely scalloped, so as to form one to six large teeth on each side, mostly on the lower half; quite smooth at maturity; stalk half to two-thirds as long as the blade. Flowers not yet seen in this country, but described as "white and purple"; they are produced three to twelve together in a flattish corymb. Corolla $1\frac{1}{2}$ ins. long and wide.

Native of China, and evidently frequent in the neighbourhood of Peking. Although the true species was only introduced in 1905, through Prof. Sargent, plants under the name have long been in cultivation; these, however, are nearly always *C. bignonioides* var. *nana*, but sometimes *C. ovata*. The true *C. Bungei* is still very rare. Of its ornamental qualities little can yet be said, but as represented by dried specimens at Kew, the inflorescence is small. Its quite smooth leaves distinguish it from other cultivated species except the new *C. Duclouxii* (*q.v.*).

C. DUCLOUXII, *Dode.*

(*C. sutchuenensis*, *Dode.*)

This species has only very recently been introduced, and little can yet be said of it. Its leaves are broadly ovate, 2 to 6 ins. long, $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. wide; long and taper-pointed, the base broadly wedge-shaped, truncate, or slightly heart-shaped; quite smooth on both surfaces; stalk $1\frac{1}{2}$ to 4 ins. long. Flowers in perfectly smooth corymbs, with the lower divisions branched, six to fifteen flowers in each corymb. Corolla about $1\frac{1}{2}$ ins. long and wide, said to be pale pink with deeper spots. Seed-pods up to 2 ft. in length.



INDIAN BEAN, *Catalpa bignonioides*.

1.]

[Face p. 812

Native of Yunnan, China; sent to Kew by Mr Maurice de Vilmorin in 1908. It appears to be quite distinct from any other *Catalpa* previously cultivated, in its pink flowers. It resembles *C. Bungei* in its smooth leaves, young wood, and inflorescence; but differs in its usually entire leaves and branching inflorescence. According to Père Ducloux, it is a large tree, frequently planted by the Chinese round pagodas.

C. FARGESII, Bureau.

(? *C. vestita*, Diels.)

A tree 20 to 30 ft. high, the shoots, under-surface of the leaves, and inflorescences covered with velvety, branching hairs which mostly fall away by the end of the season. Leaves broadly ovate, straight or slightly heart-shaped at the base, long and taper-pointed, 3 to 6 ins. long, 2 to 5 ins. wide; stalk $1\frac{1}{2}$ to 4 ins. long. Flowers $1\frac{1}{2}$ ins. long and nearly as wide, pinkish, spotted in and round the throat with brownish red, and produced seven to fifteen together in corymbs. Calyx velvety; corolla bell-shaped, with five rounded, frilled lobes, and about $1\frac{1}{2}$ ins. across. Seed-pod, 12 to 18 ins. long, very slender.

Native of W. China; introduced to France towards the end of last century. It is allied to *C. Duclouxii*, and its leaves are similar in size and shape, but the stellate down on the juvenile parts renders it quite distinct. It was named from specimens collected by Père Farges in Szechuen, where it has also been found by Henry. Wilson found it later in Hupeh. It has not yet flowered in cultivation.

C. OVATA, G. Don.

(*C. Kämpferi*, Siebold; Bot. Mag., t. 66111.)

A tree usually 20 to 30, sometimes 40 ft. high, with a spreading head of branches as much or more in diameter. Leaves 5 to 10 ins. long, and as much wide; broadly ovate with a heart-shaped base, often conspicuously three-lobed, each lobe with a short, slender point; pale green and at first finely downy above, permanently downy especially on the veins beneath; stalk 2 to 6 ins. long. Panicles 4 to 10 ins. high, narrowly pyramidal, produced in July and August. Corolla dull white stained with yellow and spotted with red inside, about 1 in. long and wide, the base bell-shaped; of the spreading lobes the lower one is the largest. Seed-vessel 12 ins. long, $\frac{1}{3}$ in. diameter.

Native of China; introduced from Japan to Europe by Siebold in 1849. If not a native of Japan, it has for centuries been cultivated there; Kämpfer recorded it in 1693. From the two American species it is distinguished by its more conspicuously lobed leaves and smaller flowers, and from *C. Bungei* by the larger, downy leaves and smaller flowers.

Var. *FLAVESCENS* (*C. Wallichii*).—Flowers even smaller than in the type (about $\frac{3}{4}$ in. long and wide), the whole corolla suffused with yellow. The names *Wallichii* and *himalayensis* by which it has been known would suggest a Himalayan origin, but no *Catalpa* is known to be native of that region.

Var. *PURPUREA*.—Leaves and young shoots dark purple, almost black, when quite young. The colour largely disappears with age from the leaf-blade, but it always remains darker than in the type; the leaf-stalks retain it. There is grown in nurseries a *Catalpa* known as

C. JAPONICA, which was introduced from Japan about 1886, closely allied to *C. ovata*, but distinguished by its narrower, more compact and pyramidal

inflorescence, and its less markedly lobed leaves of a clearer, more glossy green, and less downy. The flowers are fragrant, of a purer white than in *C. ovata*, dotted inside with violet. This is a vigorous and quick-growing tree. It may be a hybrid between *ovata* and *bignonioides*.

C. SPECIOSA, *Warder*. WESTERN CATALPA.

(*C. cordifolia*, *Jaume*, in part.)

A tree sometimes over 100 ft. high in a wild state, with a tall trunk 10 ft. or more in circumference. Leaves inodorous, ovate, with a heart-shaped or rounded base, and a long, tapering point; 5 to 12 ins. long, 3 to 8 ins. wide; nearly or quite smooth above when mature, covered beneath with pale brown down. Panicles about 6 ins. long, rather more wide, with comparatively few flowers. Corolla white, 2 ins. long and wide, the tube bell-shaped, the lobes spreading and frilled at the margin; the lower one with yellow spots and ridges as in *C. bignonioides*, but less freely spotted with purple. Seed-vessel 8 to 18 ins. long, $\frac{1}{2}$ in. or little more wide.

Native of the southern Central United States; introduced in 1880. It differs from *C. bignonioides* in its taller growth, its longer more tapering leaves, and in its flowers being larger, fewer in the panicles, and less profusely purple-spotted. At Kew it flowers in July, two weeks in advance of the other. I do not think it will prove so beautiful a tree in our climate as *C. bignonioides*, for it does not appear to flower so freely. Its habitat is considerably more western, and it replaces the other species entirely in the Mississippi Valley. In the United States the timber of this tree is much valued on account of its extraordinary durability, in contact with the ground and with moisture. Sargent mentions in the *Silva of North America*, vol. vi., p. 90, a remarkable proof of this quality:—

The trunks of Catalpa trees killed by the sinking and subsequent submersion of a large tract of land near New Madrid, Missouri, which followed the earthquake of August 1811, were standing and perfectly sound sixty-seven years later, although all their companions in the forest had disappeared long before.

Gate posts, too, have been known to stand in perfect preservation fifty to one hundred years. Railway companies in the United States are now planting it largely, to provide a future supply of railway sleepers.

C. TEASIANA, *Dode*.

(*C. hybrida*, *Hort.*)

A hybrid between *C. ovata* and *C. speciosa*, raised by Mr John C. Teas, about 1874, in Indiana, U.S.A. It is, in most respects, intermediate between the parents, but in habit more nearly approaches the tall, erect *C. speciosa*. Leaves of both the broadly ovate type of *C. speciosa*, as well as the prominently angular-lobed ones of *C. ovata* are borne on the same branch, and even in adult trees the latter are frequently 12 ins. across. Flowers white, stained with yellow and spotted minutely with purple. In the Central United States it has shown an extraordinary vigour; leaves over 2 ft. wide, and panicles carrying over 300 flowers, have been produced. I have seen it making a fine display in the New York Botanic Garden in July, but in the British Isles it appears to be about equal in value to *C. speciosa*, and decidedly inferior to *C. bignonioides* as a flowering tree; the leaves, however, even here, are the largest in the genus. It flowers about the end of July, and was introduced in 1891.

CEANOTHUS. RHAMNACEÆ.

A well-marked genus of evergreen and deciduous shrubs or small trees, confined to N. America. They are peculiarly characteristic of the Pacific coast region, where they constitute a large part of that "almost impenetrably dense brushwood called 'chapparal,' which covers the middle elevations of the coast range, and forms a distinct belt between the herbaceous vegetation of the foot-hills and the forest growth of the highest ridges and summits" (Greene). The flowers, usually of some shade of blue or white, are individually quite small, but they are so plentifully borne in a crowd of fascicles or umbels, that they form as a whole a dense and often showy panicle. Sepals and petals five, the latter of hooded form, narrowing at the base to a slender stalk. The leaves afford useful distinguishing characters: one group has them opposite, the other alternate; and the species of the latter group are again divisible according to the veining, some having three more or less prominent veins, and some being pinnate- or feather-veined. The species here mentioned may be classified as follows:—

I. LEAVES OPPOSITE.

1. *Cuneatus*. Leaves dull green, entire.
2. *Rigidus*. Leaves bright green, often coarsely toothed.

II. LEAVES ALTERNATE, THREE-VEINED, DECIDUOUS.

3. *Americanus*. Leaves bright green, ovate-cordate, downy; flowers white.
4. *Ovatus*. Leaves bright green, narrow oval, glabrous; flowers white.
5. *Azureus*. Leaves very downy; flowers blue.
6. *Integerrimus*. Leaves dull glaucous green, entire.
7. *Fendleri*. Leaves dull green, toothed towards the apex.

III. LEAVES ALTERNATE, THREE-VEINED, EVERGREEN.

8. *Velutinus*. Leaves ovate-cordate, varnished, viscid, resinous; flowers white.
9. *Thyrsoflorus*. Leaves ovate, glossy, branches angled; flowers blue.
10. *Divaricatus*. Leaves dull green, branches round, spinose; flowers pale blue.

IV. LEAVES ALTERNATE, PINNATE-VEINED, EVERGREEN.

11. *Papillosus*. Leaves warted or papillose, narrow oblong.
12. *Dentatus*. Leaves not warted, obovate or oval.

Hybrids.—*Floribundus* (11 × ?); *Lobbianus* (9 × 12), leaves three-veined; *Veitchianus* (9 × 2), leaves pinnate-veined.

The *Ceanothuses* generally are tender, and, except where noted, should be given the protection of a wall. Most of them may be multiplied by means of cuttings put in during July or August in gentle heat. For gardens generally the most useful kinds are the hybrids raised on the Continent in large numbers mainly by crossing *azureus*, *ovatus*, and *americanus*. Most of these are hardy. The following is a selection:—

- Arnoldii*. *Americanus* × *azureus*; pale blue.
Bleu céleste. Clusters broad, compact; sky blue.
Carmen. Pink.
Delileanus. Clusters thinly furnished; pale blue.

Flore pleno albo. Clusters compact; soft pink and white.

Gloire de Versailles. Clusters large, rich blue, one of the best and hardiest.

Indigo. The deepest blue of all these hybrids, but tender.

Le Géant. Clusters 6 to 8 ins. long, narrow; flowers white with reddish stalks.

Leon Simon. Clusters long, pale blue.

Perle rose. Clusters erect, pyramidal, pale rose.

Président Reveil. Clusters long, soft pink.

Sceptre d'Azur. A fine strong grower, deep blue.

Virginal. Pure white.

These hybrids are extremely valuable in gardens because of their flowering from July onwards—some, like *Gloire de Versailles*, until the frosts come.

C. AMERICANUS, *Linnaeus*. NEW JERSEY TEA.

(Bot. Mag., t. 1479.)

A deciduous shrub about 3 ft. high, with slightly downy or smooth young wood and reddish roots. Leaves ovate, sometimes broadly heart-shaped; 2 to 3 ins. long, $\frac{3}{4}$ to 2 ins. wide; finely toothed, downy especially beneath, with three conspicuous veins; leaf-stalks $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers very small and numerous, in a series of long-stalked, dense panicles proceeding from the axils of the uppermost leaves of the current season's growth. The actual cluster of flowers is 1 to 2 ins. long, on a downy stalk about twice its own length, the individual flower very tiny, less than $\frac{1}{8}$ in. diameter, dull white, on a thread-like stalk $\frac{1}{8}$ in. long. Fruit dry, somewhat triangular, $\frac{1}{8}$ in. wide. Flowers in June and July.

Native of the Eastern and Central States of N. America, and the oldest of the genus in gardens, having been introduced to England in 1713. It is not often seen true now, being largely superseded by the prettier and showier hybrids, of which it is one of the parents. It requires no protection, and is, perhaps, the hardiest in the genus. Its popular name is said to have arisen from the leaves being used as a substitute for tea, especially during the American Revolutionary war. Leaves alternate.

C. AZUREUS, *Desfontaines*.

A deciduous shrub, up to 6 ft. high; with the young wood, leaf-stalks, and flower-stalks, also the under-surface of the leaves, covered with a greyish down or felt. Leaves ovate, 1 to 2 ins. long, toothed, thick and felted beneath in a wild state, thinner and less downy under cultivation here. Flowers of a deep blue, and arranged in dense clusters on the upper part of panicles 3 to 6 ins. long, which appear in the leaf-axils towards the end of the current season's growth.

Native of Mexico, whence it was introduced in 1818. It is not thoroughly hardy at Kew except against a wall. One of the parents of the numerous race of garden hybrids, its influence is always traceable in the fine blue flowers, the downy leaves, and often the tender constitution of its progeny. The typical plant, which flowers from July until the first frosts of autumn, is now uncommon. Leaves alternate.

C. CUNEATUS, *Nuttall*.

An evergreen shrub, 4 to 6 ft. high, of rather loose, straggling habit; twigs and leaves at first downy. Leaves entire, opposite, pinnate-veined, leathery in texture, narrowly to broadly obovate, rounded at the apex, tapering to a short stalk at the base; $\frac{1}{2}$ to $\frac{3}{4}$ in. long, dull grey-green, paler beneath. Flowers dull white, or blue-tinted, produced on short axillary twigs, in short, dense, rounded corymbs, $\frac{1}{2}$ to $\frac{3}{4}$ in. across.

Spread over the whole length of California in a wild state, this species is, in some parts, little better than a pest. A Californian writer (Mr G. Hansen) observes that "it clothes hillsides for miles and miles, and gives them a greyish green tint. Wherever man has done any cultivating, cleared an old wood road, cut a trail, ploughed a furrow in years past, or still keeps cultivating, this *Ceanothus* follows him like a nettle or chickweed." For gardens it has little to recommend it, except that it is one of the hardiest species, and flowers freely during May.

C. DENTATUS, Torrey and Gray.

This evergreen shrub, one of the most popular of the *Ceanothuses* in gardens, is by some authorities regarded as a variety merely of *C. papillosus*. The leaves are much smaller, usually $\frac{1}{2}$ to 1 in. long, obovate or oval, the margins decurved and set with gland-tipped teeth; the upper surface is dark shiny green, and rather resinous; the under-surface covered with a close grey felt; venation pinnate. Flowers of a bright blue, in roundish clusters. From *C. papillosus* it differs most markedly in the absence of the warty excrescences to which that species owes its name, but there are intermediate forms, and one may occasionally find a leaf of *C. dentatus* showing traces of papillæ. *C. dentatus* occurs wild in the same region as *C. papillosus* (*q.v.*), namely, the Santa Cruz Mountains of California. A charming wall plant, and in the milder counties hardy in the open ground. Leaves alternate; branchlets round.

C. DIVARICATUS, Nuttall.

An evergreen shrub, with round, spreading, sometimes spinose branchlets. Leaves alternate, ovate or oval, $\frac{3}{4}$ to 1 in. long; three-veined, downy beneath, especially on the veins; margins glandular toothed. Flowers light blue or almost white, in slender panicles 1 to 4 ins. long.

Native of S. California. It is, perhaps, doubtful if this species be at present in cultivation, the plant generally cultivated under the name being one of the several forms of *C. thyrsiflorus*. The true plant is distinguishable by its dull leaves, its round, occasionally spinose branches, and its resinous fruits. It is not so ornamental a shrub as *thyrsiflorus*, and amongst cultivated species is most nearly related to *C. Fendleri*.

C. FENDLERI, A. Gray.

A twiggy, deciduous shrub, 4 to 6 ft. high; with round, downy, spinose branchlets. Leaves alternate, linear-lanceolate to ovate, 1 in. or less long; three-veined, short-stalked, downy especially beneath; glandular-toothed towards the apex, or entire; of a dull grey green. Flowers bluish white, in a cluster of umbels or fascicles at the end of the twigs, each cluster $\frac{1}{2}$ to $\frac{3}{4}$ in. across.

Native of the Rocky Mountains, from Colorado and New Mexico to Arizona, up to 8000 ft. altitude. This *Ceanothus* withstood the winter of 1908-9 better than any other West American species, but it is one of the least showy, its foliage being dull and its flowers of an indeterminate hue. Introduced about 1898.

C. INTEGERRIMUS, Hooker and Arnott. DEER BUSH.

(Bot. Mag., t. 7640.)

A deciduous or sub-evergreen shrub, 10 ft. or more high, with roundish, rather erect, slender branchlets, downy when young, soon becoming smooth.

Leaves alternate, broadly ovate, $1\frac{1}{2}$ to 3 ins. long, more or less conspicuously three-veined, dull glaucous green, and not toothed at the margin; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers rather variable in colour, from white to several shades of pale blue, produced in cylindrical racemes, a large number of which at the end of each branch form a fine panicle of blossom 9 to 12 ins. long and 3 to 4 ins. broad.

Native of California, where it was discovered by David Douglas in 1833, but not introduced till about twenty years later. It flowers in June, and is one of the most elegant wall plants of that season, producing its long, graceful panicles in great profusion. It needs the shelter of a wall. In a wild state it occurs through the entire length of California, and shows considerable variation. The most distinct form is a small-leaved one—var. *PARVIFOLIUS* (*C. parvifolius*, *Trelease*); *C. NEVADENSIS*, *Kellogg*, is probably also a form of this species.

C. OVATUS, *Desfontaines*.

A deciduous shrub, 2 to 3 ft. high, with viscid, slightly downy young stems. Leaves alternate, narrow oval, 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide, bluntish or pointed at the apex, tapered or rounded at the base; smooth and glossy, or slightly hairy beneath; stalk slender, $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers white, produced in short-stalked, rounded clusters, the whole forming a loose panicle.

Native of S.E. and Central United States. It differs from *C. americanus* by its smoother, differently shaped leaves, never heart-shaped at the base, and shorter-stalked flower clusters. It flowers from June onwards, but the true plant is not common in gardens.

Var. *PUBESCENS*, *Torrey* (*C. pubescens*, *Rydberg*), is similar to the type in habit, but the young shoots and the under-surface of the leaves are permanently downy.

C. PAPILLOSUS, *Torrey*.

(Bot. Mag., t. 4815.)

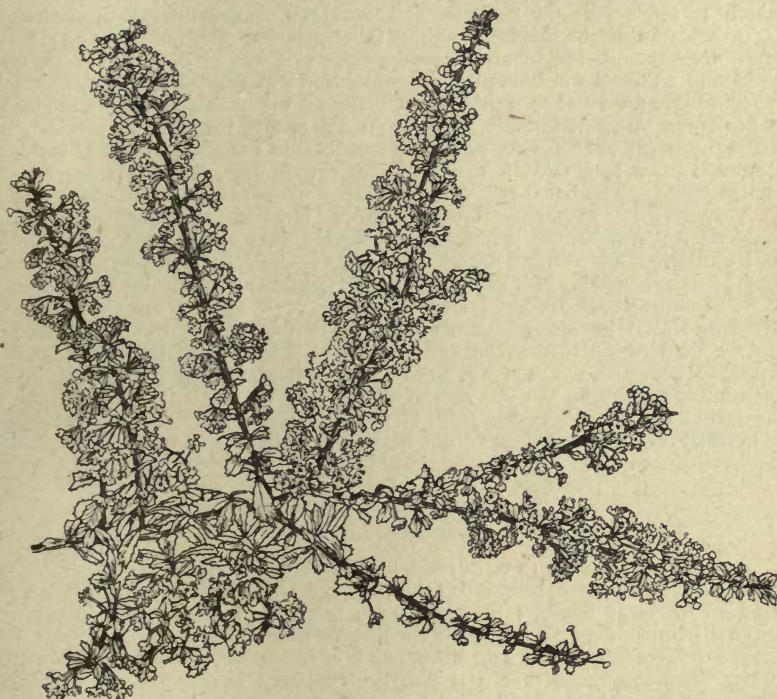
An evergreen shrub, up 10 or 12 ft. high, with round, very downy branchlets. Leaves alternate, pinnately veined, short-stalked, from $\frac{1}{2}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide, narrowly oblong, the margin decurved and set with glandular teeth, the upper surface shining and furnished with conspicuous wart-like excrescences (papillæ), which are also glandular. Flowers in terminal or axillary racemes, 1 to $1\frac{1}{2}$ ins. long, and of a delicate shade of blue.

Discovered in 1833 by David Douglas in California; introduced by W. Lobb about 1850. It attains its fullest development in the Santa Cruz Mountains, forming on the lower parts of that range a densely branched shrub with very papillose leaves. Whilst this papillose surface of the leaves furnishes the most noticeable character of the species in its typical form, it does not appear to be a constant one. Higher up the same mountains other *Ceanothuses* appear with much smaller leaves, more decurved at the margins, and without papillæ on the surface; the flowers, too, are deeper blue. These are considered to be forms of *C. papillosus*, one of them possibly that mysterious plant figured in September 1854, in the *Botanical Magazine*, t. 4806, with dense, globular corymbs of mazarine-blue flowers, under the name of *C. FLORIBUNDUS*, *Hooker*. It was introduced by W. Lobb, but has never since apparently been found wild; the only specimen in the Kew Herbarium is the one from Messrs Veitch's nursery at Exeter, from which the above-mentioned plate was made in 1854. Descendants of the original plant may be still in cultivation, but it is doubtful.

C. RIGIDUS, Nuttall.

(Bot. Mag., t. 4664.)

An evergreen shrub, 6 to 12 ft. high in this country, with numerous stiff, downy branchlets, and abundant, closely packed foliage. Leaves opposite, $\frac{1}{4}$ to $\frac{1}{2}$ in. long; wedge-shaped, coarsely toothed, and decurved at the apex; dark glossy green above, greyish and downy between the veins beneath. Flowers deep purplish blue in short-stalked axillary umbels about $\frac{1}{2}$ in. across, but so plentiful as to transform the whole shoot into a stiff panicle of blossom.



CEANOTHUS RIGIDUS.

Native of the coast ranges of Central and S. California, and of Monterey, where it was found by Hartweg, and introduced for the Horticultural Society in 1847. One of the most beautiful of the Ceanothuses, this, unfortunately, is also one of the tenderest. Against a wall at Kew it grows and flowers well every season, but in very hard winters is injured or killed even with that protection. It has no chance at all in the open. Like some other species, it is not long-lived, and the stock should be renewed occasionally by means of cuttings. The plants are better in pots until finally planted out. It flowers from April to June. Nuttall's type differs from the plant commonest in cultivation in having scarcely toothed leaves and shorter flower-stalks.

C. THYRSIFLORUS, *Eschscholtz.* CALIFORNIAN LILAC.

An evergreen shrub or small tree, 15 to 30 ft. high in this country, but half as high again in a wild state. Young branchlets angled, slightly downy or smooth. Leaves alternate, three-veined, smooth and glossy green above; green and either smooth or downy on the three veins beneath; glandular-toothed, ovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long; leaf-stalk about one-third the length of the blade. Flowers pale blue, in roundish stalked clusters 1 to 3 ins. long, produced from the leaf-axils of the previous season's growth, and surmounted by the growing leafy shoots of the current season.

Native of California; introduced in 1837. According to Sargent it attains its greatest size in the redwood forests of the Santa Cruz Mountains. This, which is often seen in gardens and nurseries under the wrong name of *C. divaricatus*, is the hardiest of the taller-growing *Ceanothuses*. At Kew, quite unprotected, and in an exposed position, it has grown 20 ft. high, and withstood all but the severest winters uninjured; at Warley Place, in Essex, it is 10 ft. higher. Farther north it will make an admirable evergreen for walls. It flowers in May and June in great profusion, and is the most striking among the really hardy species. It exhibits considerable variation in a wild state, in stature, size of leaf, and in the colour of the flowers, which are sometimes almost white. The basal pair of veins extend almost to the apex of the leaf.

Var. *GRISEUS*, *Trelease*.—A very vigorous, large-leaved variety, found only in Monterey, California; it has broader leaves, very glossy deep green above, dull and grey beneath. Flowers pale lilac. The largest leaves are $1\frac{3}{4}$ ins. long by $1\frac{1}{4}$ ins. wide. Not so hardy as the type, but an admirable wall plant.

C. LOBBIANUS, *Hooker* (Bot. Mag., t. 4811), appears to be near *C. thyrsiflorus*. It has been suggested that it is a hybrid between that species and *C. dentatus*, a theory the combination of three-veined leaves and round branches supports. I am not aware that it has ever been reintroduced or even found again since it was first sent home by W. Lobb from California in the early "fifties" of last century. It is cultivated sometimes as "*dentatus*," sometimes as "*Veitchianus*," from both of which its distinctly three-nerved leaves distinguish it. Flowers bright blue.

C. VEITCHIANUS, *Hooker*.

(Bot. Mag., t. 5127.)

An evergreen shrub, 10 ft. or more high, with green glossy leaves, which are obovate, wedge-shaped, rounded at the apex, glandular toothed, greyish beneath. Flowers in dense heads 1 to 2 ins. long, bright deep blue. This plant was originally introduced from California by W. Lobb about 1853. It does not appear to have been found wild since, and is of somewhat uncertain relationship. It has been suggested that it is a hybrid between *C. thyrsiflorus* and some other species, probably *rigidus*; the pinnate veins of the leaf and the greyish under-surface support this view. There is often a suggestion of the triple nerves of *C. thyrsiflorus* at the base of the leaf. The identity of the plant is also clouded by Hooker's original description in the *Botanical Magazine*, loc. cit., which alludes to the branchlets as "terete and perfectly glabrous," whereas his own type specimen in the Kew Herbarium has them downy. It is still found in nurseries, sometimes as "*C. dentatus*," and is a handsome wall shrub; in sheltered spots it is hardy in the open.

C. VELUTINUS, *Douglas*.

(Bot. Mag., t. 5165.)

An evergreen shrub, 8 to 10 ft. high (probably more in a wild state), with stout, smooth branchlets. Leaves prominently three-veined, $1\frac{1}{2}$ to 3 ins. long,

two-thirds as much wide; broadly ovate or roundish, often with a slightly heart-shaped base, finely toothed; very shiny and dark green above, downy and much paler beneath. Flowers dull white, crowded on stout panicles which are 4 to 5 ins. long, and spring from the leaf-axils.

Native of California; first discovered by Douglas; introduced by W. Lobb about 1853. Its most distinctive feature is its large, dark green foliage, so glossy as to appear varnished; the flowers are not very showy, and appear late in the season. It requires the protection of a wall.

Var. *LÆVIGATUS*.—This, which has leaves quite smooth, is represented by a plant growing on a wall at Kew. It flowers every year in October and November, and is at all times striking for its large, leathery, varnished green leaves, which, as in the type, are quite viscous during the summer, and have a distinct resinous odour.



CEANOTHUS VELUTINUS VAR. LÆVIGATUS.

CEDRELA SINENSIS, *Jussieu*. CHINESE "CEDAR."

MELIACEÆ.

(*Ailanthus flavescens*, *Carrière*; *Toona sinensis*, *Roemer*.)

A handsome deciduous tree, reaching 60 to 70 ft. in height in China, but at present not much more than half as high anywhere in Britain; young branchlets downy; old bark peeling off in long strips. Leaves pinnate, 1 to 2 ft. long, composed of from five to twelve pairs of leaflets, often of even numbers on one leaf (pari-pinnate). Leaflets very shortly stalked, $2\frac{1}{2}$ to 4 ins. long, ovate-lanceolate, the apex drawn out into a long fine point, the base unequal at each side the midrib, ultimately nearly or quite smooth. Flowers in terminal panicles 1 ft. long, whitish, fragrant,

short-stalked (not yet seen in this country). Fruit a capsule about 1 in. long; seeds winged.

Although known to botanists since 1743, this tree was not introduced to Europe until 1862. It was at first called *Ailanthus flavescens*, by which name it is still sometimes known, but is easily distinguished from true *Ailanthus* by the entire margins of the leaflets and the absence of glandular teeth there. It is a native of North and West China, and in the latter region many seeds were collected by Wilson on his last journey, so the tree is likely to become more common in future. At present it is rather rare except for newly raised plants. As is the case with nearly all trees of timber-producing size, this is best raised from seed, but failing them, root-cuttings may be employed. The popular name of "Chinese Cedar" refers to its relationship with the "cedar" of the West Indies (*Cedrela odorata*); but it has, of course, no affinity with the true cedars. It is said to thrive well in calcareous soils. The young shoots and leaves are boiled and eaten as a vegetable by the Chinese.

CEDRUS. CEDARS. CONIFERÆ.

A group of three, or, if the Cyprian cedar be regarded as more than a variety, four species of evergreen trees, forming a very homogeneous group. They are as closely allied to each other as they are markedly distinct from other coniferous trees. Sir Joseph Hooker and other authorities regarded them all as geographical forms of one species. Most closely allied to them are the larches, deciduous though these are. Given space for lateral development, old cedars become flat-topped, and their branches grow horizontally. As in the larches and some other conifers, the branchlets are of two kinds: (1) leading ones, which grow considerably (at least several inches) during the summer, and bear the leaves singly and spirally arranged; and, (2) short, spur-like ones, which lengthen a fraction of an inch only per annum, and have the leaves crowded in a dense tuft at the end. The latter kind are capable of developing into the former. Flowers of both sexes appear on the same tree, usually on the upper side of the branches. Males very densely set in erect, finger-shaped cones, 2 to 3 ins. long; $\frac{1}{2}$ to $\frac{5}{8}$ in. wide, shedding clouds of yellow pollen when ripe. Females in stout, erect cones, purplish at first, ultimately 3 to 5 ins. long, flat or depressed at the top, the scales broad and closely overlapping; seeds winged.

The cedars all like a deep, loamy soil, well-drained but moist. They are admirably adapted for growing as specimen trees on lawns, and for this purpose should be planted when not more than 4 to 6 ft. high. It is necessary to propagate some of the garden varieties by grafting on their typical forms, but they are of little importance. Trees raised from seed will always grow better and give the greater pleasure.

The timber of all the cedars as produced on their native mountains is valuable, but as grown in our milder, softer climate, it is not so hard and durable. The timber of English-grown Lebanon cedar is sometimes handsomely grained, and may be used for indoor purposes.

C. ATLANTICA, *Manetti*. ATLAS CEDAR.

A tree up to 120 ft. high, pyramidal when young, ultimately assuming, at least in a wild state, the flat-topped shape with horizontally spreading branches, characteristic of the cedar of Lebanon; young shoots downy. Leaves $\frac{1}{2}$ to 1 in. long, needle-like, stouter than in *C. Libani*, curved towards the tip; varying in colour from green to silvery. Cones 3 ins. long, $1\frac{1}{2}$ to 2 ins. wide, cylindrical.

Native of Algeria and Morocco on the Atlas Mountains; introduced about 1844. This cedar is very hardy, and is thriving splendidly in various parts of the British Isles. At Kew, on dry, hot soil it grows more quickly and withstands London smoke better than either the Lebanon cedar or the deodar. It is difficult to distinguish it in a young state from *C. Libani*, but its twigs are always downy, and more so than those of the Lebanon species. Its cones, too, do not taper above the middle so much. The leading shoot of *C. atlantica* is always stiffly erect, and this has been considered to furnish another distinction from *C. Libani*, by reason of the latter having a drooping one (see J. D. Hooker in *Natural History Review*, January 1862). The Atlas cedar varies much in the hue of its foliage; the following varieties are distinguished:—

Var. AUREA.—Leaves of a yellowish colour. This is only propagated by grafting, and is not so vigorous as seedling trees.

Var. GLAUCA.—Leaves of a more or less silvery hue; the most striking form has been named “argentea,” in which the whole tree is of a beautiful pale grey-blue colour. Ordinary var. glauca can often be selected among batches of seedlings, and there is every gradation between it and what we regard as the green type—in nature as well as in gardens.

Var. PENDULA.—A curious form, with long, slender, whip-like branches.

C. DEODARA, *Lawson*. DEODAR.

A tree up to 250 ft. high in a wild state, forming in age, like the Lebanon and Atlas cedars, a flat, spreading top where there is room for lateral expansion; of broadly pyramidal form when young. Leading shoot arching; branchlets pendulous at the ends, always downy. Leaves 1 to $1\frac{1}{2}$ (occasionally 2) ins. long, needle-like. Cones about 4 ins. long, 3 ins. wide, broadly egg-shaped, as yet infrequently borne with us.

Native of the Himalaya; introduced by the Hon. Leslie Melville in 1831. Whilst the deodar is undoubtedly the tenderest of the cedars, it is the most elegant in a young state. Few coniferous trees are, indeed, so graceful. It is on this account (as well as by its longer leaves) easily distinguished from the other two, which have more or less erect leading shoots and stiff branchlets. The young twigs of the deodar, too, are as a rule distinctly more downy. Like the other cedars, it varies considerably in the hue of its foliage, which usually is of a grey or glaucous green. Numerous variations have appeared in cultivation, the more important ones being as follows:—

Var. ALBO-SPICA.—Tips of young shoots white.

Var. CRASSIFOLIA.—Stiff-habited tree; leaves thicker and shorter.

Var. PENDULA.—Leading shoot very pendulous, and needing support if the tree is desired to increase in height.

Var. ROBUSTA.—A very distinct form easily distinguished by the stoutness and length (2 ins.) of its leaves; rather pendulous.

Var. VIRIDIS.—Foliage grass green.

C. LIBANI, *Barrelier*. CEDAR OF LEBANON.

A tree 80 to 120 ft. high and 4 ft. to 8 ft. in diameter of trunk, pyramidal when young, ultimately flat and spreading at the top, and developing huge horizontal branches; young shoots usually furnished with a minute down. Leaves $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, needle-like, but thickest towards the end. Cones 3 to 5 ins. long, 2 to $2\frac{1}{2}$ ins. wide, barrel-shaped.

Native of Mount Lebanon in Palestine, and of the Cilician Taurus in Asia Minor; introduced in the latter half of the seventeenth century, probably between 1670 and 1680. Irrespective of its sacred and historical associations, no tree ever introduced to our islands has added more to the charm of gardens than the cedar of Lebanon. Its thick, stately trunk and noble crown of wide-spreading, horizontal branches give to it an air of distinction no other tree at present can rival, although in course of time, perhaps, the Atlas cedar will assume a similar form. The largest specimen on Mount Lebanon is over 40 ft. in girth of trunk. The finest tree known to Mr Elwes in the British Isles is at Pains Hill, near Cobham; in 1904 it was found by him to be 115 to 120 ft. high and 26 ft. 5 ins. in girth. There are still numerous stately trees in the suburbs of London, but they are, alas! steadily becoming fewer and less vigorous; and until there is a revolution in the methods of consuming coal in the metropolis, the gaps will never be filled. It appears to thrive best in the warmer, drier parts of the country, and likes a deep, loamy soil. All the finest specimens are in the south of England. (See *atlantica* for distinctions between the two.)

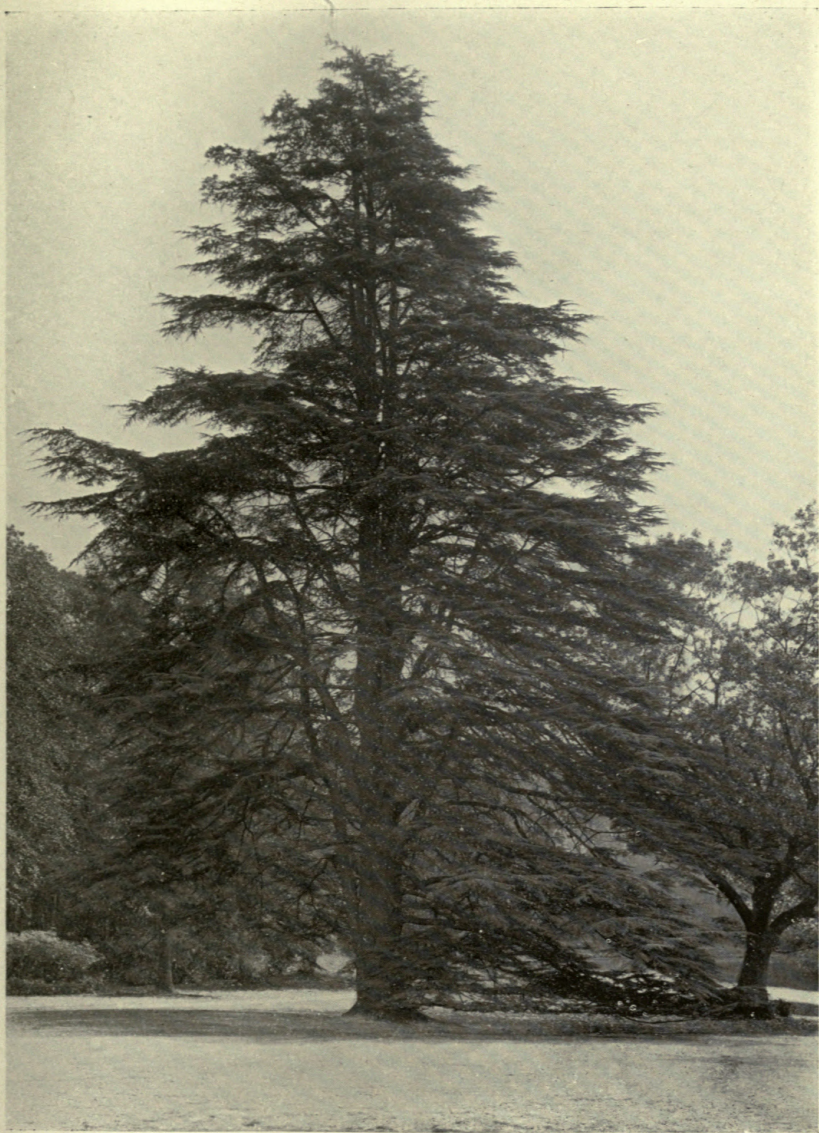
Var. ARGENTEA, *Antoine*.—Leaves of a very glaucous hue. Native of Cilicia.

Var. BREVIFOLIA, *Hooker fil.* (*C. brevifolia*, *Henry*). Cyprian Cedar.—This differs from the Lebanon cedar in its shorter leaves ($\frac{1}{4}$ to $\frac{1}{2}$ in. long), and smaller cylindrical cones. Discovered in Cyprus in 1879; introduced to Kew two years later. It does not promise to be of so much garden value as the other cedars, having much the aspect of a very starved *C. atlantica* or *C. Libani*. The trees on the mountains of Cyprus average about 40 ft. in height.

Var. DECIDUA, *Carrière*.—Both in the Atlas and Lebanon cedars one occasionally sees forms that lose all or most of their leaves in winter. They are usually stiff in habit, short-leaved, and slow-growing. It is questionable whether these characters are not merely due to inferior vigour.

CELASTRUS. CELASTRACEÆ.

Vigorous climbers, or shrubs of a loose, spreading habit, with alternate, deciduous leaves. Flowers small, greenish yellow or white, of little beauty; in terminal or axillary clusters, with the sexes sometimes on separate plants. Fruit very handsome; usually a three-lobed capsule, which when ripe splits open, revealing its highly coloured inner surface and the fleshy covering of the seeds, also highly coloured and known as the aril. The climbing species are admirable for covering rough oak branches 10 to 15 ft. high set in the ground, old trees, or for planting anywhere where the twining shoots may firmly attach themselves and secure the plant, yet at the same time allow many of the long, slender shoots to hang unrestrained in free air. No systematic pruning is required except such as is necessary out of considerations of space, and this should be done as soon as the fruits have fallen in winter. Seeds afford an



CEDAR OF LEBANON, *Cedrus Libani*.

abundant means of propagation, and the plants also layer very freely. All of them are gross feeders, and like a deep, loamy soil.

C. ARTICULATUS, Thunberg.

(Garden and Forest, 1890, fig. 73; *C. orbiculatus, Thunberg.*)

A strong, vigorous climber, growing 30 to 40 ft. high, young stems twining, armed with a pair of spines at each bud in a young state, which become almost obsolete later. Leaves shallow-toothed, 2 to 5 ins. long, variable in shape, but usually either obovate or nearly orbicular; with a long, slender apex, or a short, abrupt one, narrowing at the base to stalks $\frac{1}{4}$ to 1 in. long. Flowers two to four together in small axillary cymes $\frac{1}{2}$ in. long, each flower $\frac{1}{6}$ in. across, green. The fruit is at first a green, pea-shaped, three-valved capsule; but when mature the valves open and turn back, revealing their golden yellow inner surface, and the shining scarlet-coated seeds within.

This beautiful climber is widely spread over N.E. Asia, and seeds were first sent to Kew by Prof. Sargent in 1870, and by the late Dr Bretschneider from Peking in 1883. But the species is by no means so well known as it ought to be, for it is the most striking of all hardy climbers during November, December, and January. At that season each branch is furnished from end to end with hundreds of the brilliantly coloured fruits, which remain for at least two months in full beauty, each branch a wreath of gold and scarlet. Fortunately, the fruits appear to have no attractions for birds. The species is perfectly hardy, and planted in good loam soon makes a fine growth. It may be grown over a pyramid of rough oak branches, or better still, on some decrepit deciduous tree. Once attached to any support round which its stems can twine, it soon makes good its hold.

C. FLAGELLARIS, Ruprecht.

A deciduous climber, with slender, twining stems ultimately 25 ft. high, not downy, but armed with short, decurved, hooked spines, in pairs at each joint. Leaves rounded or oval, $\frac{3}{4}$ to $2\frac{1}{4}$ ins. long, from two-thirds to nearly as wide, the base broadly wedge-shaped, the apex abruptly pointed, the margin set with bristle-like teeth, both sides bright green, and smooth except for minute roughnesses on the veins beneath; stalk up to $1\frac{1}{4}$ ins. long. Flowers small and green; short-stalked, one to three together, axillary on short twigs of the previous year. Capsules orange-yellow; seed-coat red; seeds ripe in October.

Native of Manchuria and Corea; known to botany since 1857, but only introduced to Kew in 1906. It has axillary flowers and fruit like *C. articulatus*, but its stems are more slender and crowded, and in a young state at least much more spiny. It is quite distinct from that and other species in the comparatively very long leaf-stalk. It bore fruit at Kew in 1914, but is not so handsome as *articulatus*.

C. HYPOLEUCUS, Warburg.

(*C. hypoglaucus, Hemsley.*)

A large, deciduous climber, whose young shoots are covered with a purplish waxy bloom, not downy. Leaves oblong or obovate, smooth, 4 to 6 ins. long, 2 to $2\frac{1}{2}$ ins. wide; the apex contracted abruptly into a short point, dark green above, blue-white beneath, the margin toothed. Flowers produced in a long terminal raceme, and in the axils of the uppermost leaves; each flower $\frac{1}{4}$ in. across, yellowish. Fruit in racemes as much as 8 ins. long, about the size of

a large pea, green until the valves split open, then showing the yellow interior and the red covering of the seeds.

Native of the provinces of Hupeh and Szechuen in China ; discovered by Henry, but introduced by Wilson for Messrs Veitch about 1900. It is apparently quite hardy both at Kew and Coombe Wood, and is a handsome and distinct climber, well marked by the glaucous under-surface of the leaves and the terminal inflorescence.

C. LATIFOLIUS, *Hemsley*.

A deciduous, unisexual shrub of striking appearance and remarkable vigour ; ultimately 10 ft. high and 20 to 30 ft. through, with strong, spreading branches prominently marked with pale lenticels, becoming corky the second year. Leaves much larger than in any other hardy species ; from 4 to 8 ins. long, by $2\frac{1}{2}$ to 6 ins. wide ; broadly oval or almost orbicular, with a short, abrupt, blunt apex, shallow rounded teeth at the margin, and a short stalk from $\frac{1}{2}$ to 1 in. long. Flowers small, greenish, produced in a terminal panicle 4 to 6 ins. long and 2 ins. wide. Fruit a roundish, obscurely three-sided capsule $\frac{1}{2}$ in. across ; when the valves of the capsule burst open, they show the orange-coloured inner surface and the bright red, fleshy covering of the seeds.

Native of the Hupeh province of China ; introduced by Messrs Veitch in 1900. A plant has flowered with great freedom for some years past at Kew ; but as it is a male, and no female plant is at present old enough to blossom, fruits are as yet unknown in this country. But as large numbers of plants are now scattered over the country, it will no doubt soon be seen in fruit. The dioecious character of the species is a disadvantage in gardens, as it is necessary to have two plants to obtain fruits, which with such large, spreading ones as this is not always convenient.

C. SCANDENS, *Linnaeus*. STAFF-TREE.

A deciduous, unisexual climber with twining branches, running freely over trees, shrubs, hedges, etc., in a wild state. Leaves ovate or obovate, elliptical, 2 to 4 ins. long, finely and irregularly toothed ; the apex sharply pointed, and either short and abrupt or long and tapering. Flowers in terminal racemes or panicles, small, yellowish white, of little beauty. Fruit in heavy, cylindrical masses 2 or 3 ins. long, each fruit at first the size of a large pea with three valves, which eventually split open and show their orange-coloured inner surface, and at the same time expose the brilliant scarlet pulpy covering of the seeds. It is then an object of singular beauty.

Introduced by Peter Collinson in 1736, this climber has never become widely cultivated. Apparently it does not fruit with the freedom that renders it one of the most beautiful autumnal plants of the eastern United States, where it is a native. Most, if not all, plants are unisexual, so that one of each sex should be planted together to form one tangle. Visitors to Niagara Falls will recall the grace and beauty of this climber on Goat Island, where it is very abundant, and, along with *Vitis bicolor*, gives an effect of almost tropical luxuriance.

CELTIS. NETTLE-TREES. URTICACEÆ.

A group of deciduous, unarmed trees, sometimes shrubs, allied to the elms, consisting of fifty to sixty species, a small proportion only of which are hardy. They are found in S.E. Europe, the Orient, N. America, and China. Leaves alternate, mostly three-veined, and unequal-sided at the

base. The nettle-trees have no beauty of flower, these being small and greenish; the flowers are unisexual, but both sexes occur on the same tree, the male or pollen-bearing ones a few together in a cluster near the base of the new growths; the seed-bearing or female flowers solitary, or two or three together in the axils of the young leaves. Fruit a drupe, solitary on a slender stalk, one-seeded. The fruit affords the best distinction between the nettle-trees and the elms, the latter having dry, winged fruits.

As garden trees the species of *Celtis* make elegant and shapely specimens, yet of no particular merit or beauty, except that the leaves of several of them turn bright yellow in autumn. In warmer countries the timber is valuable, especially that of *C. australis*. The fruit of this species is sweet, and is said to have been the lotus of the ancients—that delicious fruit which constituted the food of the Lotophagi, and made those who ate it forget their own country (*Treasury of Botany*, i., p. 245). Other species have fruits edible in their native countries.

The nettle-trees like a good loamy soil and a well-drained position. They are best propagated by seeds, but when these are not obtainable grafting on stocks of *C. occidentalis* must be resorted to. Seeds of this species, if they do not ripen here, are always obtainable from American seedsmen.

There is little to distinguish the different cultivated species in a general way, except the leaves. Of those here dealt with, *C. glabrata* and *C. Davidiana* are distinct in having no down on the leaves; *C. mississippiensis* is the only one with uniformly or nearly uniformly entire leaves; and *C. australis* has lanceolate, very downy leaves.

C. AUSTRALIS, Linnæus.

A tree up to 50 or 70 ft. high, with a grey, smooth, beech-like trunk, sometimes 10 ft. in girth; young shoots hairy. Leaves lanceolate or ovate-lanceolate, wedge-shaped at the base, rounded on vigorous shoots, the apex long, tapering, often tail-like, coarsely toothed; 2 to 5 ins. long, $\frac{3}{8}$ to $1\frac{1}{2}$ ins. wide; upper side covered with short, stiff hairs which partially fall away, leaving bases which roughen the surface; covered beneath with soft down; stalk downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit globose, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, reddish then brown, on a very slender stalk about 1 in. long.

Native of S. Europe and the Orient; cultivated in England since the sixteenth century by Gerard and others, but never common. I have raised it several times from seed obtained from various places in S. Europe; but although it makes coarse growths 4 or 5 ft. long during summer, these are cut back almost to the base by moderately severe frost. As this is repeated every winter, the base becomes stunted and diseased, and the trees rarely survive more than a few years. The large trees mentioned by Loudon in 1838 as being at Kew and elsewhere were probably some other species. What it lacks here, no doubt, is the ripening influences on the wood of its native sunshine. In the south of Europe it is believed to attain the age of one thousand years, and its timber is tough and valuable. In the suburbs of Italian and Dalmatian cities I have seen it as a pleasing small street tree, with neat, rounded heads and smooth, handsome trunks. The leaves of young seedling trees are often blotched quite conspicuously with yellow.

C. CAUCASICA, *Willdenow.* CAUCASIAN NETTLE-TREE.

A medium-sized tree with a greyish trunk and limbs, and a bushy head of branches; young shoots downy. Leaves obliquely ovate or ovate-lanceolate, slenderly (often rather abruptly) pointed, coarsely toothed; $2\frac{1}{2}$ to 4 ins. long, broadly wedge-shaped at the base; upper surface covered when young with short, bristle-like hairs which mostly fall away, leaving it slightly rough; lower surface covered at first with softer down, most of which also falls away except on the midrib and veins; stalk downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit $\frac{1}{2}$ in. diameter, yellow, borne on a slender stalk about 1 in. long.

Native of Afghanistan, N. India, Caucasus, etc.; raised at Kew from seed sent from Afghanistan by the late Dr Aitchison when he was attached to the Delimitation Commission (1884-5). It is very closely allied to *C. australis*, but is evidently a much hardier tree, and far better adapted for cultivation in the south of England. It differs from that species in its comparatively shorter, broader leaves with less drawn-out points, less downy, and usually more coarsely toothed.

C. DAVIDIANA, *Carrière.*

A small tree 20 ft. or perhaps more high, forming a rounded, bushy head; young shoots slightly downy at first, becoming smooth by autumn. Leaves ovate or ovate-lanceolate, 2 to $3\frac{1}{2}$ ins. long, 1 to $1\frac{3}{4}$ ins. wide; rounded, unequal sided, and three-nerved at the base; taper-pointed, with a few remote teeth towards the apex only, sometimes almost entire; dark glossy green and smooth above, paler and glossy beneath, with small tufts of down in the lower vein-axils; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, slightly downy. Fruits egg-shaped, black, on slender stalks $\frac{3}{4}$ in. long.

Native of N. China in mountainous regions; also found by Henry in the mountains of Hupeh. It was introduced to Kew in 1882, by means of seed sent by the late Dr Bretschneider, and collected on the hills north of Pekin. It is extremely rare in cultivation, but is a striking and handsome species, very distinct in its lustrous, almost quite smooth leaves. (See also *C. glabrata*.) It has not borne fruit in this country yet, but a tree raised from seed sent by the Abbé David to the Jardin des Plantes at Paris in 1868, bore fruit there in 1894.

There has recently (in 1910) been introduced a nettle-tree under the name of *C. SINENSIS*, *Persoon*, similar in the hard texture and very glossy upper surface of its leaves to *C. Davidiana*, but its young shoots are clothed with minute hairs and the obliquely ovate leaves are conspicuously toothed towards the apex. The two are closely allied. Native of Japan and China.

C. GLABRATA, *Steven.*

A small tree or shrub with a rounded head of branches; young shoots furnished at first with minute scattered down, becoming quite smooth later. Leaves obliquely ovate; 1 to $2\frac{1}{2}$ ins. long, $\frac{5}{8}$ to $1\frac{3}{8}$ ins. wide; markedly unequal-sided at the base, being usually rounded on one side the stalk and tapered on the other; the apex pointed; margins set with large, incurved teeth except near the base; upper surface dark green, not downy, but covered with minute warts which render it rough; lower surface paler and smooth, except for scattered minute bristles on the veins, only visible under the lens. Fruits globose, reddish brown, $\frac{1}{6}$ in. diameter, on stalks $\frac{1}{2}$ to 1 in. long.

Native of the Caucasus and Asia Minor; introduced to Kew from Van Volxem's nursery in 1870. The species had no doubt been introduced to cultivation by the late Jean Van Volxem, who had collected plants in the Caucasus about ten years previously. It is distinct from the other species

except *C. Davidiana*, in its glabrous leaves, and from that species is distinguished by the conspicuous incurved teeth extending almost all round the margins.

C. MISSISSIPPIENSIS, *Bosc.* MISSISSIPPI SUGARBERRY.

A tree 60 to 80 ft. high in its native country, with a trunk 6 to 9 ft. in girth; young shoots smooth. Leaves 3 ins. long, $1\frac{1}{4}$ ins. wide; lanceolate or oval-lanceolate; rounded or wedge-shaped, unequal and three-nerved at the base; long and taper-pointed; margins entire or nearly so; dark green, and soon quite smooth above, paler beneath, with scattered hairs on the veins and tufts of down in the vein-axils; stalks at first downy then smooth, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit egg-shaped, $\frac{1}{4}$ in. long, orange-red.

Native of the southern United States; very rare in cultivation. There is a small healthy tree at Kew, raised from seed sent by Prof. Sargent in 1877. It is distinct from all other cultivated species by its leaves being without teeth.

C. OCCIDENTALIS, *Linnaeus.* SUGARBERRY.

A tree up to 130 ft. high in a wild state (Sargent), with a trunk 6 to 12 ft. in girth; in cultivation in Britain it is rarely more than 50 to 60 ft. high; bark grey, rough, with corky excrescences; young branchlets smooth or nearly so. Leaves ovate, with an unequal, rounded, or somewhat heart-shaped base; usually long and taper-pointed; 2 to 4 ins. long, 1 to 2 ins. wide; sharply toothed except towards the base, without or nearly without down and only slightly rough above; downy on the midrib and veins beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit $\frac{1}{2}$ in. across, globose, yellowish or reddish, finally dark purple when ripe, borne on a slender stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. This tree is variable in a state of nature in regard to stature, foliage, form and colour of fruit, etc.; but these variations although great are not clearly correlated. Two forms, however, appear to be distinguishable from the type, and are by some botanists regarded as species, viz. :—

Var. *CRASSIFOLIA* (*C. crassifolia*, *Lamarck*).—This is chiefly distinguished by its invariably downy young shoots, and its often heart-shaped, much larger leaves (2 to 6 ins. long, 1 to 3 ins. wide), very rough on the upper surface. In cultivation this is a vigorous tree, making arching or pendulous shoots several feet long in a season, clothed with big leaves sometimes as much as 7 ins. by $4\frac{1}{2}$ ins. Fruit the same as in *occidentalis*, except that it is commonly longer stalked.

Var. *PUMILA* (*C. pumila*, *Pursh*).—Dwarf, often a mere shrub.

The sugarberry is the commonest species of *Celtis* in English gardens, and thrives the best. It was introduced in 1656. Var. *crassifolia*, distinguished by Emerson as the "hackberry," was introduced, according to Loudon, in 1812, but probably earlier. These are native of Eastern N. America. Var. *pumila*, introduced to Kew from the Arnold Arboretum in 1905, extends more to the west, Colorado, Utah, etc.

CEPHALANTHUS OCCIDENTALIS, *Linnaeus.* BUTTON-BUSH.

RUBIACEÆ.

A deciduous shrub from 3 to 6 ft., occasionally 10 ft. high, with smooth, shining, olive-green young stems. Leaves opposite, in pairs or in threes, oval or ovate, 2 to 5 ins. long, about half or scarcely half as wide; tapering at both ends, smooth and glossy dark green above,

paler and slightly downy on the midrib and veins beneath; stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers small, crowded in quite globular heads 1 to $1\frac{1}{4}$ ins. across, or, including the projecting styles, $\frac{3}{8}$ in. more; these heads are borne at the end of the shoot solitary or in fours, often supplemented by others in the uppermost leaf-axils. Corolla creamy white, with a slender tube and four-rounded lobes; style very long.

Native of the eastern United States and Canada; introduced in 1735. It reaches from New Brunswick to Florida, and the same species is said to occur in Cuba. It is usually found in moist situations, and in cultivation is averse to dryness at the root; it thrives well in a peaty soil. Flowering in August, it is desirable on that account, and although not showy, is interesting as the only hardy shrubby plant, except the Coprosma and the little creeping Mitchella, of the great natural order to which it belongs. It possesses bitter, tonic properties similar to those of its ally, the Cinchona (Quinine) plant. It is best propagated from imported seeds, the plants so raised thriving better than those raised from cuttings or layers.

CEPHALOTAXUS. TAXACEÆ.

A group of small evergreen trees and shrubs, all natives of Eastern Asia and allied to the yews, which in the shape and general disposition of the leaves they resemble; the leaves, however, are much larger. They have erect stems, from which the branches are borne in tiers, whilst the branchlets are both alternate and opposite. Flowers unisexual, the sexes nearly always on separate plants. Male flowers composed of four to six stamens, enclosed in a bract, produced in April and May in the axils of the leaves of the previous year's growth, and arranged in clusters of small globose heads. Fruit olive-like in shape, consisting of a fleshy coat surrounding an almond-shaped, resinous seed. The members of this genus bear a considerable resemblance to the Torreya, but differ in the leaves being soft rather than prickly pointed, and in the flowers being crowded instead of solitary in each leaf-axil.

In gardens the species of Cephalotaxus are useful evergreens, especially for semi-shaded places, where they thrive better than in full sunshine. All those mentioned below are hardy and can be increased by cuttings, although seed should be preferred if obtainable. Female trees will sometimes develop fruit and infertile seed in the absence of pollen.

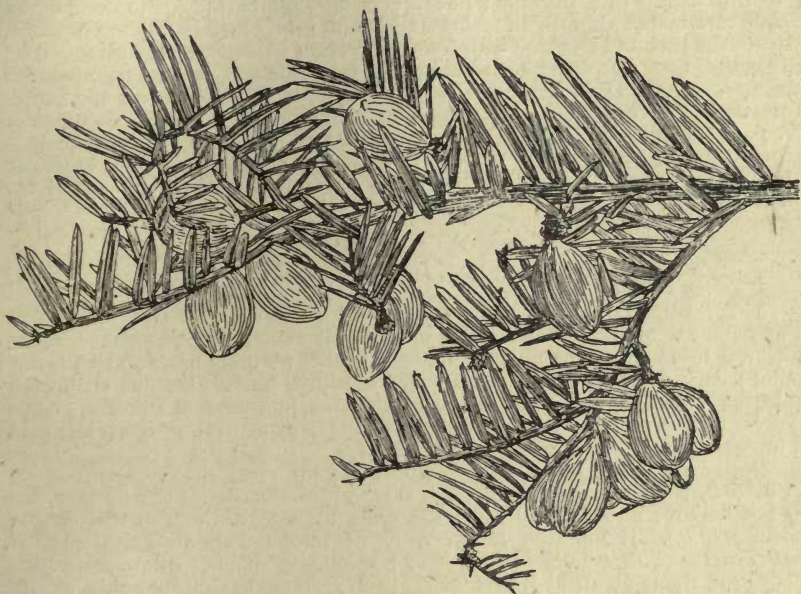
C. DRUPACEA, *Siebold.*

(Bot. Mag., t. 8285.)

A shrub of spreading habit up to 10 or 12 ft. high, sometimes a small tree in a wild state 30 ft. high. Leaves $\frac{3}{4}$ to $1\frac{3}{4}$ ins. long, about $\frac{1}{8}$ in. wide, linear, abruptly and very finely pointed, dark green above, grey with about fifteen lines of stomata each side the midrib beneath. The leaves are arranged in two ranks as in the other species, but differ in being much more erect instead of spreading, so that along the upper side of the twig they form a narrow V-shaped trough. Male flowers yellowish, in short-stalked, globose heads $\frac{1}{8}$ in. across, produced on the lower side of the branch from the leaf-

axils. Fruit 1 to $1\frac{1}{4}$ ins. long, $\frac{3}{4}$ in. wide, egg-shaped, green; on a stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long.

Native of China and Japan; introduced to Europe by Siebold about 1829. This species is easily distinguished from the others by the shorter, upstanding leaves. It is a rather handsome evergreen of a yew-like character, but bolder in foliage and not so densely furnished.



CEPHALOTAXUS DRUPACEA.

C. FORTUNEI, *Hooker*.

(Bot. Mag., t. 4499.)

A small tree with one or more erect stems giving off at intervals whorls of branches, and rarely seen more than 10 to 20 ft. high in cultivation; branchlets forked. Leaves spreading in two opposite ranks, often almost horizontally, 2 to $3\frac{1}{2}$ ins. long, $\frac{1}{8}$ in. or a little more wide; linear, tapering to a fine point, rich glossy green above, with two pale bands beneath, each composed of about twenty stomatic lines, and a green raised midrib. Male flowers in globose heads $\frac{1}{4}$ in. across. Fruit $1\frac{1}{8}$ ins. long, $\frac{3}{4}$ in. wide, oval, brown.

Native of N. China; introduced by Robert Fortune in 1849. There is some difficulty in properly differentiating this from *C. pedunculata*, but it would seem to have longer, comparatively more slender leaves, farther apart on the branchlet, and with finer, longer points. The lines of stomata beneath are more numerous; the male flower-heads solitary or few on a stalk. Specimens gathered from the earliest raised plants sixty years ago, have more slender and less divided branchlets than *C. pedunculata*. I am inclined to think many of the so-called *C. Fortunei* of the present day are really the other species. The true thing is a handsome and striking evergreen.

C. OLIVERI, Masters.

A Chinese species, first found on Mount Omi, in Szechuen, by the Rev. E. Faber, and in 1900 by Wilson, who sent home seeds. I only know of it at present as a living plant in Messrs Veitch's nursery at Coombe Wood. There it is a low bush of sturdy habit, with flat, stiffly spreading branches. Leaves $\frac{3}{4}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{6}$ in. wide; linear, curving slightly towards the end of the shoot, terminated abruptly in a short, stiff point; the base slightly the broadest part of the leaf, and truncate with rounded corners; the leaves are arranged on the twigs in two flat, quite horizontal ranks, very stiff, and so close together that the margins touch; dark green above, paler green at the margins and centre beneath, with two glaucous strips, each composed of about fifteen lines of stomata. Fruit (only seen in native specimens) egg-shaped, conspicuously tapered at the ends, $1\frac{1}{4}$ ins. long, $\frac{3}{4}$ in. wide, borne on a stalk $\frac{1}{2}$ in. long. A striking evergreen, especially in the close, stiff, comb-like arrangement of the leaves.

C. PEDUNCULATA, Siebold.

(*Podocarpus koraianus, Hort.*)

A spreading shrub or a small tree, with mostly alternate branchlets. Leaves in two opposite ranks not all in the same plane, some being semi-erect; linear, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. long, about $\frac{1}{8}$ in. wide, rather abruptly narrowed to a fine point; dark green above, marked beneath with a broad glaucous strip each side the midrib, composed of fifteen to eighteen fine lines of stomata. Male flowers in a branched cluster $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long. Fruit oval, or obovoid, about 1 in. long.

Native of Japan; introduced to Europe at the same time as *C. drupacea*, in 1829, by Siebold. Some authorities regard it as a variety of *C. drupacea*, but as noted above under *C. Fortunei*, the difficulty is to distinguish it from that species (*q.v.*). It appears, however, to be intermediate in some respects between them, especially in length of leaf and in number of stomatic lines beneath. Some plants at Kew, apparently in vigorous health, are only 4 to 5 ft. high, although planted where they are now forty years ago, spreading much more in width than in height; they were perhaps raised from cuttings.

Var. *FASTIGIATA*.—A very interesting and distinct form, analogous in its mode of growth to the Irish yew. The branches and branchlets are quite erect, sparsely divided, all the leaves being arranged spirally like those of the leading shoot of the type, and mostly decurved. The shrub is slow-growing, and of sturdy, columnar shape when young; useful for positions where a formal habit is desired. I have seen, however, large specimens in Italy and Dalmatia that assume a more open, spreading form (like old Irish yews), with a tendency to revert to the typical, distichous-leaved form at the base.

Var. *SPHÆRALIS*.—A form with quite globular fruits, described by the late Dr Masters from a tree growing in the garden of the Rev. J. Goring at Steyning, Sussex. (See *Gardeners' Chronicle*, Jan. 26, 1884, p. 113, fig. 23.)

CERCIDIPHYLLUM JAPONICUM, Siebold. TROCHODENDRACEÆ.

A deciduous tree of the largest size, often 100 ft. high in its native state, with pendulous branches and a spirally twisted, furrowed trunk. The trunk is sometimes solitary, and 3 to 4 ft. through, but more often the tree is made up of a group of several smaller stems. Leaves mostly

opposite, but sometimes alternate towards the base of the shoot, broadly ovate or heart-shaped, 2 to 4 ins. long, slightly scalloped on the margin, and glabrous except when young. The branch in its second year develops at each joint a short or almost obsolete twig, carrying a single leaf and flowers. The male and female flowers are borne on separate trees, but neither possesses any beauty; the males consist of a minute calyx and an indefinite number of stamens $\frac{1}{2}$ in. long; the females of four larger, but still very small, green, fringed sepals, and four to six carpels. The fruits are small pods, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, borne usually two to four together on a short stalk.

This tree for a long time was thought to be confined to Japan, where it is the largest of deciduous trees, reaching its finest development in the island of Yezo; but Wilson found it in China in 1910. One tree, still living, but with its top fallen away, he found to be 55 ft. in girth of trunk. The timber is light, straight-grained and yellowish, and is highly valued. The finest trees I have seen in Europe are in the Imperial Garden at Sans Souci, near Berlin, where it was, in 1908, a singularly elegant tree 30 ft. high, with slender, spreading, arching branches. It succeeds equally well in the Royal Garden at Hanover. Still finer trees, but of denser habit, are in the Arnold Arboretum, Mass., and in Mr Thayer's grounds at Lancaster in the same State. It evidently needs a continental climate. At Kew, where it was introduced in 1881, it still remains a mere shrub. Like so many N. Asiatic trees transplanted to this country, it commences to grow early in spring, and its young shoots are almost invariably ruined by frost; sometimes even the second growths meet the same fate. The leaves die off rich red or yellow. The tree is certainly worth trying in upland districts, or where late spring frosts do not prevail. The generic name refers to the resemblance of the leaves to those of the Judas-tree (*Cercis*).

CERCIS. LEGUMINOSÆ.

The members of this genus, seven in number, constitute a very distinct and homogeneous group of hardy leguminous trees and shrubs, whose resemblances to each other are as marked as are their differences from the rest of the natural order to which they belong. The leaves furnish the most distinctive feature of the genus, being alternate, simple, entire, prominently five- or seven-nerved, broad and rounded, with a heart-shaped base, and from 2 to 6 ins. long. The flowers in most of the species come in fasciculate clusters on wood one to many years old; but one Chinese species (*C. racemosa*) has them in racemes. The petals are nearly equal, but arranged somewhat after the fashion of a pea-shaped flower.

Few shrubs or small trees are more beautiful than the hardy species of *Cercis* at their best. They enjoy and merit generous conditions at the root, and succeed best in a deep, sandy loam, and should have as sunny a position as possible. Plants should be given a permanent position whilst still young, as the long, thick roots are liable to decay after the inevitable injury involved in transplanting old trees by ordinary means.

Whatever transplanting is necessary should be done in May, and not until the expanding buds give some indication that active growth has recommenced. The most insidious enemy of these trees in my experience is the coral-spot fungus, for which drastic surgery is the only remedy; the affected branches should be cut back to undoubtedly healthy wood, and the wounds thoroughly tarred over. The older and well-known species are propagated by seed, and this, of course, is preferable for all; but the newer species may be grafted on roots of *C. Siliquastrum* or *C. canadensis*.

C. CANADENSIS, *Linnaeus*. REDBUD.

A deciduous tree occasionally over 40 ft. high in a wild state, more often a tall, spreading shrub in cultivation. Leaves broadly heart-shaped, pointed, 3 to 5 ins. across, often wider than long; downy only in the axils of the veins. Flowers pale rose, $\frac{1}{2}$ in. long, each on a stalk as long as itself, produced in clusters (fascicles) of four to eight blossoms; calyx $\frac{1}{8}$ in. long, red. Pod about 3 ins. long, $\frac{1}{2}$ in. wide, pink when fully grown, but rarely seen in this country. Flowers in May and June.

Native of the eastern and Central United States, in some districts so plentiful as to make a conspicuous feature in the landscape when in flower. Although one of the most beautiful of N. American trees, it is not so striking in this country, and does not bear comparison with *C. Siliquastrum* for beauty in our gardens. It is quite easily distinguished from that species by its leaves, which are thinner, brighter green, and pointed; the flowers are not so large.

Var. ALBA.—Flowers white.

Var. FLORE PLENO.—Flowers with some of the stamens transformed into petals.

Var. PUBESCENS.—A variety found wild in the United States, whose leaves are more or less downy all over the under-surface.

C. CHINENSIS, *Bunge*. CHINESE REDBUD.

A tree sometimes 50 ft. high in a wild state, with a trunk 3 to 4 ft. in diameter, but in cultivation merely a shrub. Leaves heart-shaped, pointed, 3 to 5 ins. long, nearly or quite as much wide, glossy green, and smooth except for a few hairs beneath in the vein-axils. Flowers in close clusters of four to ten, pink, $\frac{3}{8}$ in. long. Pod $3\frac{1}{2}$ to 5 ins. long, taper-pointed. Blossoms in May.

Native of China, and probably the largest of the *Cercis*. It is more tender than either *C. Siliquastrum* or *canadensis*, and is quite a failure in the open ground at Kew. It has flowered on a wall, but is evidently a plant better suited for the south-west counties. There is a considerable resemblance between this tree and *C. canadensis*. Both have pointed, bright green leaves, quite distinct from *C. Siliquastrum*. *C. chinensis* is distinguishable out of flower from *C. canadensis* by its larger, thinner stipules, and by the leaves being glossy green beneath when quite young, those of *C. canadensis* being duller and more or less glaucous. The adult leaves appear also to be larger; there are some in the Kew Herbarium, gathered near Pekin, $6\frac{1}{2}$ ins. across.

C. OCCIDENTALIS, *A. Gray*. WESTERN REDBUD.

A deciduous shrub, or occasionally a small tree, 15 ft. high. Leaves roundish, heart-shaped, 2 to 3 ins. across, smooth. Flowers $\frac{1}{2}$ in. long, rose-

coloured, produced on short stalks in clusters on the wood of the previous or earlier years. Pod 2 to 2½ ins. long, $\frac{2}{3}$ in. wide, smooth.

Native of California, and quite distinct from the eastern *C. canadensis* in its leaves, which are rounded or notched at the apex, and are very similar in outline to those of the European Judas-tree, but of a vivid green. It will probably prove rather tender in this country, judging by plants introduced to Kew in 1908. Nearly allied to it is *C. RENIFORMIS*, *S. Watson* (*C. texensis*, *Sargent*), from Texas and New Mexico, a slender tree sometimes 20 ft., rarely 40 ft. high, with leaves downy beneath and pods larger than in *C. occidentalis*.

C. RACEMOSA, *Oliver*.

A deciduous tree, 20 ft. high, with downy young branchlets. Leaves heart-shaped, 2½ to 5 ins. long, 2 to 4 ins. wide, smooth and dark green above, paler and downy all over beneath, especially on the veins. Racemes up to 4 ins. long, downy, carrying as many as thirty or forty flowers, which are under ½ in. in length, rose-coloured. Pod 3 to 4 ins. long, $\frac{3}{4}$ in. wide, flat, smooth.

Native of China, in the provinces of Hupeh and Szechuen. The beauty and distinctness of this species had been known to us ever since it was discovered by Henry about 1886, but it was not introduced until 1907, when Wilson collected seed for Harvard University. It is remarkably distinct from all other species in the comparatively long inflorescence; and the downy character of the young wood, leaf, and flower-stalk is also well marked. Mr Wilson informs me that this is one of the very best and most beautiful flowering trees he has introduced. Like the European Judas-tree it flowers on the naked wood, one to many years of age. As it comes from 6000 ft. altitude in N.W. Hupeh, it ought to be quite hardy.

C. SILIQUASTRUM, *Linnaeus*. JUDAS-TREE.

(Bot. Mag., t. 1138.)

A deciduous tree, usually of low, bushy habit, and below 25 ft. in height, but occasionally forming a distinct trunk and reaching from 30 to 40 ft. high; branchlets smooth. Leaves roundish, with a heart-shaped base, sometimes pointed, but usually broad and rounded at the apex; from 2½ to 4 ins. across, somewhat less in length; they are quite smooth, and of a well-marked glaucous green. Flowers produced in clusters from the joints of the old wood (even on the trunk of old trees), each flower on a slender stalk about $\frac{3}{4}$ in. long; they are bright purplish rose, and $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Pod 3 to 5 ins. long, $\frac{5}{8}$ in. wide, flat and thin, eight- to twelve-seeded, remaining on the plants throughout the winter.

Native of S. Europe and the Orient; known and cultivated in England for more than three hundred years. In Italy it is the most delightful tree flowering in April and May; with us, flowering a few weeks later, it is also one of the most beautiful and picturesque trees that can be found in gardens. It flowers in the leafless state, and the profusion of blossom gives at a distance the effect of a rosy-purple mist. A sun-loving tree, it is better suited for the south of England than the north. It should only be propagated from seeds which, although they do not come to perfection regularly in this country, can be easily and cheaply purchased. The popular name of "Judas-tree" is derived from the legend that this was the tree upon which Judas went out and hanged himself after the great Betrayal. The largest tree at Kew is 40 ft. high, with a trunk 4 ft. 9 ins. in girth. One of the largest known in this country grew, and perhaps still grows, at Bath; its trunk in 1878 was stated to be nearly

6 ft. in girth. The flowers of the Judas-tree have a sweetish, acid taste, and are used as an ingredient in salads. They open in May.

Var. ALBA.—Flowers pure white.

Var. VARIEGATA.—Leaves mottled green and white.

The tree varies in the depth of shade of its flowers; a richly tinted one has been called "carnea."



JUDAS TREE. *CERCIS SILIQUASTRUM*.

oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide; dark green and becoming smooth above, downy beneath, the margins entire and decurved; the midrib is prominent, but the side veins are not conspicuous as in *C. parvifolius*. The fruit is terminated by the silky, plume-like style, 2 to 3 ins. long, characteristic of the genus.

Native of Western N. America, from Oregon south to New Mexico. It is

CERCOCARPUS.

ROSACEÆ.

Five or six species of this curious genus are known, all found in Western N. America. They are evergreen or sub-evergreen shrubs and small trees, with alternate leaves and small axillary flowers on short stalks, either solitary or in few-flowered clusters. They have no petals, but a five-lobed calyx, and numerous (fifteen to thirty) stamens. The most distinctive feature of the genus is the small, hard, slender fruit, terminated by the long, persistent style, which is plumed with long, white, silky hairs.

C. LEDIFOLIUS, *Nuttall*. MOUNTAIN MAHOGANY.

A small, evergreen tree, sometimes 40 ft. high, or a shrub, similar to *C. parvifolius* in flower and fruit, but very distinct in foliage. Young shoots hairy; leaf somewhat resinous, lanceolate or narrow

in cultivation at Kew, but has not flowered. It is known to withstand 32° of frost, so it should prove hardy—as it does, indeed, give every evidence of being.

C. PARVIFOLIUS, *Nuttall*. MOUNTAIN MAHOGANY.

An evergreen shrub of sparse habit up to 10 or 15 ft. high, with thick, persistent bark; branchlets downy when young, becoming smooth later. Leaves obovate, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, with a wedge-shaped base, and four to six pairs of prominent, parallel veins, the apex coarsely toothed, the base entire; upper surface dull and clothed with silky hairs, becoming smooth later; downy beneath, especially on the midrib and veins. Flowers produced during May, usually singly, sometimes in twos or threes, on a slender, downy stalk $\frac{1}{3}$ to $\frac{1}{2}$ in. long, from buds on the previous year's wood; each flower is about $\frac{1}{4}$ in. across, consisting chiefly of a cluster of stamens; calyx grey with down. Fruit $\frac{1}{3}$ in. long, $\frac{1}{12}$ in. wide, about the size of an oat grain, surmounted by a slender, twisted tail (the style), 2 to 4 ins. long, clothed with fine, white, silky hairs.

Native of Western N. America from Oregon to Lower California. This curious shrub has no beauty of flower, but is very remarkable for its long-tailed fruits. In California, where a great crop of them is borne, they give to the branches quite an ostrich feather-like appearance. It is perfectly hardy at Kew, and bears flowers and fruits there.

C. BETULÆFOLIUS, *Hooker* (*C. parvifolius* var. *glaber*, *Watson*), is very similar to, but taller and more robust than, the preceding, differing chiefly in its grey, thin, flaky bark (not thick and fissured as in *C. parvifolius*), and in having, on the average, one more pair of veins in each leaf. Native of California.

C. TRASKIÆ, *Eastwood*.

A small, evergreen tree up to 25 ft. high, the reddish brown young shoots thickly covered with hoary down, which persists more or less for two or three years. Leaves of tough, rather hard texture; oval, broadly ovate or roundish, usually blunt or rounded at the tip, and rounded or heart-shaped at the base, somewhat coarsely toothed except near the base; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; dark green, and with flattened hairs above, grey and thickly felted beneath; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers and fruit not seen in this country, but apparently similar to those of *C. parvifolius*. Introduced to Edinburgh Botanic Garden a few years ago from Santa Catalina Island, California. Of unproved hardiness.

CHIMONANTHUS FRAGRANS, *Lindley*. WINTER SWEET.
CALYCANTHACEÆ.

(*Calycanthus præcox*, *Linnaeus*, *Bot. Mag.*, t. 66; *Meratia fragrans*, *Loiseleur*.)

A deciduous shrub, naturally about 8 ft. high, and of compact, bushy habit, but growing considerably higher on walls. Leaves rough to the touch above, but free from down except when quite young, and on the primary nerves; lanceolate with an acuminate apex, 2 to 5 ins. long, dark lustrous green. Flowers exceedingly fragrant, produced at various times between November and March according to the weather, but in ordinary seasons at their best in December against a wall; they are solitary on very short stalks at the joints of the previous summer's shoots,

$\frac{3}{4}$ to 1 in. across, the sepals and outer petals of an almost transparent yellowish green, the inner petals smaller and purplish. Seeds produced in a stalked, gourd-shaped structure $1\frac{1}{2}$ ins. long, to the apex of which the stamens remain attached.

Var. *GRANDIFLORUS*.—Flowers a purer yellow and more showy than in the type, and as much as $1\frac{3}{4}$ ins. across, but not so strongly fragrant. The leaves, too, are larger; I have seen them occasionally as much as 9 ins. long and 4 ins. wide. The shrub is of stronger growth; there is one 15 ft. high at Warley Place.

Var. *LUTEUS*.—A variety known in gardens eighty or more years ago, but still exceedingly rare. It differs in having the inner petals yellow instead of purplish.

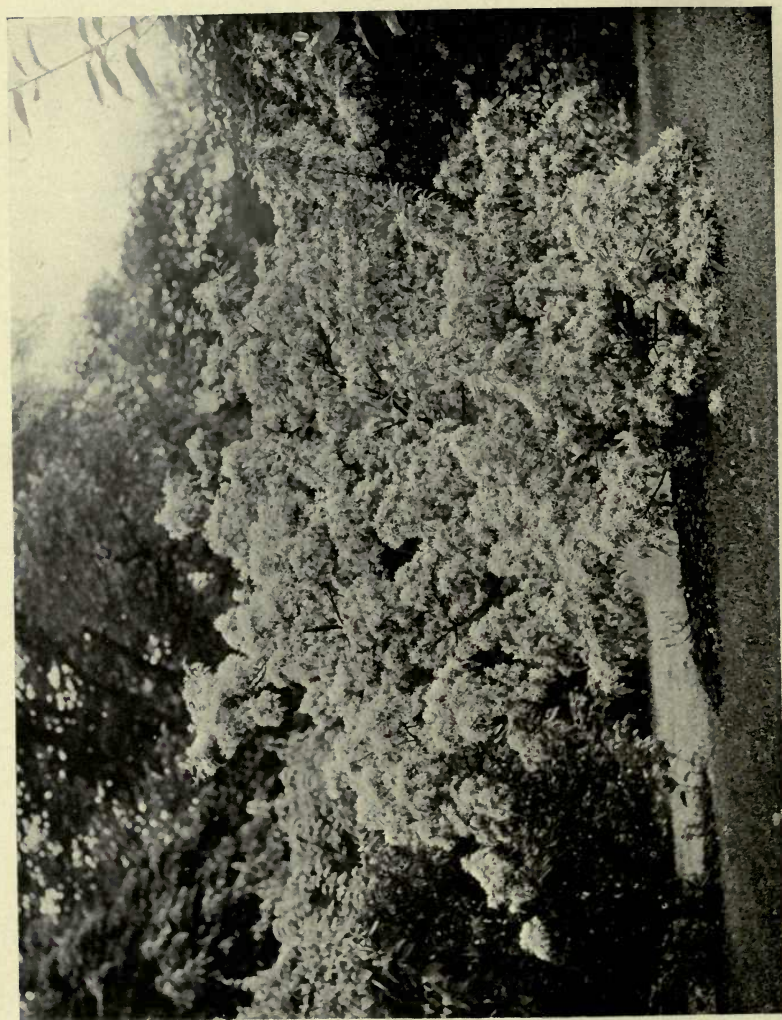
This delightful old shrub and its varieties have two strong claims to the notice of planters:—It flowers in midwinter when very few other things are in bloom, and its blossoms diffuse around them one of the most pleasing of perfumes. A charming way to use cut sprays for indoor decoration is to associate them with sprays of mahonia (*Berberis Aquifolium*). It is hardy, and frequently flowers in the open at Kew with great freedom. But usually (and always in cold localities) it is grown on a wall. It requires no pruning in the open, but on a wall an annual pruning is necessary. It should not be deferred much beyond February, so that the fullest possible length of time is allowed for the new growths to be made on which depend the next winter's crop of flowers. The pruning should consist of a shortening back of the stronger twigs, and the entire removal of the weaker and overcrowding ones. At the same time any renailing that may be needed should be done, also the laying-in of new shoots in vacant places. Propagation is effected by layers and seeds; cuttings are extremely difficult to root.

There are two species of *Chimonanthus* known, both natives of China. *C. fragrans* was introduced from Japan in 1766. The other is *C. NITENS*, *Oliver*, an evergreen species with smooth, shining, oval-lanceolate leaves, 3 or 4 ins. long. Flowers white, solitary, axillary, $\frac{3}{4}$ in. across. Found by Henry near Ichang, it has not yet been introduced, and is probably rare in a wild state. It is interesting as being a second species of a genus long thought to be monotypic.

CHIOGENES SERPYLLIFOLIA, *Salisbury*. CREEPING SNOWBERRY. VACCINIACEÆ.

A creeping, evergreen shrub, the slender stems furnished with forward-pointing bristles. Leaves alternate, very abundant, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, oval to nearly round, tapered at both ends, scarcely stalked; margins slightly decurved; smooth and dark green above, pale beneath, and furnished with a few tiny, rust-coloured bristles. Flowers produced singly in the leaf-axils on short, decurved stalks; corolla $\frac{1}{3}$ in. or less long, bell-shaped, deeply four-lobed, white. Berry white, bristly, $\frac{1}{3}$ in. across, roundish and rather bristly.

Native of N. America, from Newfoundland westward to British



CHIONANTHUS RETUSA at Highlands Park, Rochester, N.Y.

[Face p. 339.]

Columbia, and southward to N. Carolina; introduced in 1815. This plant is very rare in gardens, and the plant nearly always found under the name is one of the cranberries. These are nearly allied plants, but the *Chiogenes* is abundantly distinct in leaf, flower, and especially the white berry. Out of flower the short, broad leaf and bristly young wood amply distinguish it. It has little garden value as an ornament, but is interesting. A moist, semi-boggy spot such as the cranberries love, should, if possible, be selected for it. The whole plant, including the berry, has an aromatic taste and odour, resembling that of *Gaultheria procumbens*.

CHIONANTHUS. OLEACEÆ.

This is one of those interesting genera of plants represented, but very sparsely, in both the New and the Old Worlds. In this case one species is found in the eastern United States, the other in China. They belong to the olive family, and have opposite, deciduous leaves. The flowers are in panicles, their most remarkable feature being the four or five long, narrow, pure white petals, united quite at the base. Stamens two. The fruit is an egg-shaped or oblong drupe, containing usually one seed.

In gardens, although undeservedly neglected, the two species of *Chionanthus* are amongst the most attractive and distinguished of all hardy shrubs. They like a moist, loamy soil of good depth and quality, and a sunny position. *C. virginica* is best propagated by seeds obtained from America, but both it and *C. retusa* can be raised from layers. *C. virginica* is also grafted on the common and manna ashes, but plants so raised are neither so healthy nor so long-lived as those on their own roots. If *C. retusa* cannot be obtained on its own roots, it might be grafted on seedlings of *C. virginica*. Both of them are suitable as isolated specimens on lawns; they produce abundant fibres at the root, and transplant easily.

C. RETUSA, *Lindley*. CHINESE FRINGE-TREE.

A deciduous shrub in cultivation, but a small tree sometimes 30 to 40 ft. high in China, of spreading, rounded habit; young shoots downy. Leaves variable in shape, usually oval, sometimes obovate, sometimes almost round; from 1 to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide; rounded, notched, or blunt at the point, tapered at the base; shiny green above and downy on the midrib; downy more or less all over beneath, but especially on the midrib and veins; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, downy. Flowers snow-white, produced during June and July in erect, cymose panicles terminating young shoots of the year, 2 to 3 ins. high, and 2 to 4 ins. wide. Each subdivision of the inflorescence carries normally three flowers, the four strap-shaped petals of which are $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. wide.

Native of China, where it is widely spread; introduced by Fortune in 1845, but apparently not established in gardens until reintroduced by Maries from the region of the river Kia-Kiang in 1879. It is easily distinguished from its American ally by flowering on the young shoots of the year and by the erect, shorter, broader panicles. It is a shrub of the first rank, one traveller in China comparing it when in flower to a "dome of soft, fleecy snow." It is not native of Japan, as often stated. (Fig. p. 340.)

C. VIRGINICA, *Linnaeus*. FRINGE-TREE.

A deciduous shrub or small tree, 10 to 20 (or even 30 ft.) high; branchlets stout, stiff, downy when young. Leaves oblong, narrowly oval or obovate, always tapering at the base, usually at the apex; 2 to 8 ins. long, rather less than half as wide, not toothed; bright green above and downy on the midrib, paler below, and downy especially on the veins; stalks downy, $\frac{1}{2}$ to 1 in. long. Flowers pure white, slightly fragrant; produced during June in very lax panicles 4 to 8 ins. long; these panicles are crowded



CHIONANTHUS RETUSA.

at the upper joints of the preceding year's growths, and form a dense, mop-like mass beneath the new growths. Each branch of the panicle bears three flowers, and springs from the axil of a leaf-like bract which is occasionally 1 to $1\frac{1}{2}$ ins. long at the base of the panicle, becoming smaller towards the end; the bracts persist to the fruiting stage. Petals four or five, each $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{16}$ to $\frac{1}{12}$ in. wide; calyx minute, with pointed lobes. Fruit roundish or egg-shaped, dark blue, $\frac{2}{3}$ in. long, borne on pendulous stalks.

Native of the eastern United States, from Pennsylvania southward; introduced in 1736. This is one of the most beautiful and striking of N. American shrubs, and is perfectly hardy in this country. I have never seen it flower

so well here, however, as in Central Europe and in the United States, where the shrub in June is almost hidden in the profusion of pendent masses of blossom. There is nothing like it among flowering shrubs except its Asiatic ally.

Var. PUBESCENS.—More downy generally, but especially on the panicles.



CHOISYA TERNATA.

CHOISYA TERNATA, *Humboldt*. MEXICAN ORANGE FLOWER.
RUTACEÆ.

An evergreen shrub, of rounded, bushy habit, 6 to 10 ft. high; young shoots downy. Leaves opposite, 3 to 6 ins. long, consisting nearly always

of three leaflets, but occasionally two or four. Leaflets stalkless, obovate, $1\frac{1}{2}$ to 3 ins. long, about one-third as wide; rounded or blunt at the end, tapering to a common point of union at the end of a downy leaf-stalk 1 to 2 ins. long; when crushed they have a strong, pungent, rather unpleasant odour, and held against the light will be seen to be pitted with numerous oil-glands. Flowers produced in a cluster of axillary corymbs at the end of the shoot, each corymb three- to six-flowered, with a slender, downy stalk 2 to 3 ins. long. Flowers white, 1 to $1\frac{1}{4}$ ins. across, with five roundish oval petals; fragrant like hawthorn.

This fine evergreen is of interest as being one of the very few shrubs native of Mexico that are hardy near London. It survived practically uninjured the great frosts of Feb. 1895 at Kew, also the trying winter of 1908-9. But for some constitutional reason it is often injured during spells of lesser cold, especially after the New Year. Its normal flowering-time may be considered April and May, but it often produces flowers more or less up to September. On a few occasions after a very mild November, I have seen it in full blossom in December. It should have an open but sheltered spot, and the soil may be a rather light loam. It is better to encourage a short, well-ripened growth rather than a thick, sappy one. Cuttings made of half-ripened wood root quickly placed in gentle heat; those of a little harder wood will take root in a cold frame.

CISTUS. ROCK ROSE. CISTACEÆ.

A genus of about twenty species, nearly allied to *Helianthemum*, but differing in having the seed-vessels five- or ten-celled, whilst in *Helianthemum* they are three-celled. Leaves opposite, evergreen. Flowers of a rose-like appearance, having five broadly wedge-shaped petals and very numerous stamens; sepals three to five. Seeds numerous. In a wild state the cistus are found in the Mediterranean region, and are especially abundant in Spain and Portugal. The flowers usually last only a few hours in the morning, never more than a day, but a constant succession of them is maintained during sunny weather, making a fine display in June and July. None of the cistus are yellow-flowered, but they very frequently have a patch of that colour at the base of each petal. Although the number of true species is comparatively limited, they have hybridised freely, both in a wild and cultivated state. Some of the best are hybrids, such as *cyprius*, *purpureus*, *Loreti*, and *corbariensis*.

Unfortunately the rock roses with few exceptions are not genuinely hardy. They survive our mild winters, but many succumb in severe or even moderately hard ones. The great frosts of February 1895 killed all the cistus at Kew except *C. laurifolius*, *C. corbariensis*, and *C. Loreti*. They like a light, well-drained soil, and more than anything a position exposed to full sun, but otherwise sheltered, and something above the surrounding level. They never suffer from drought, and any dry, sunny bank will suit them. A covering of bracken or leafy branches in severe weather is a help, and will often save plants that would otherwise perish.

Propagation may be effected by seed or by cuttings, the latter being

necessary for some of the hybrids which do not perfect seed. They are best taken in late summer, and struck in mild heat. Until planted out permanently, rock roses should be grown in pots, as they suffer badly from transplanting. Many of the species exude a fragrant gum, known as labdanum or ladanum, from the young stems and leaves. The most prolific source of this gum, which is used in perfumery and, at least at one time, in medicine, is *C. villosus* var. *creticus*—a rather tender shrub. It is also got largely from *C. ladaniferus*.

The following rough key of the species in cultivation will assist in their identification:—

A. FLOWERS WHITE (PURE OR CRIMSON BLOTCHED); SEPALS THREE.

1. *Ladaniferus*. Flowers solitary; leaves nearly stalkless; sepals scaly.
2. *Cyprius*. Flowers in clusters; leaves shortly stalked; sepals scaly and hairy.
3. *Laurifolius*. Flowers in clusters; leaves stalked; sepals hairy.

B. FLOWERS WHITE; SEPALS FIVE, HEART-SHAPED, WITH WELL-MARKED BASAL LOBES.

4. *Hirsutus*. Leaves three-nerved, stalkless.
5. *Populifolius*. Leaves up to $3\frac{1}{2}$ ins. long; long-stalked.
6. *Salvifolius*. Leaves up to $1\frac{3}{4}$ ins. long; stalked, pinnately nerved.
7. *Corbariensis*. Hybrid between 5 and 6.
8. *Florentinus*. Hybrid between 6 and 9.

C. FLOWERS WHITE; SEPALS FIVE, OVATE. LEAVES THREE-NERVED, STALKLESS.

9. *Monspeliensis*. Leaves not more than $\frac{1}{2}$ in. wide.
10. *Loreti*. Petals crimson blotched at base; leaves up to $\frac{3}{4}$ in. wide.

D. FLOWERS PURPLISH RED, UNBLOTCHED.

11. *Albidus*. Leaves three-nerved, with flat margins; flowers long-stalked.
12. *Crispus*. Leaves three-nerved, with wavy margins; flowers short-stalked.
13. *Villosus*. Leaves pinnately veined.

E. FLOWERS PURPLISH RED; PETALS CRIMSON BLOTCHED.

14. *Purpureus*.

C. ALBIDUS, *Linnaeus*.

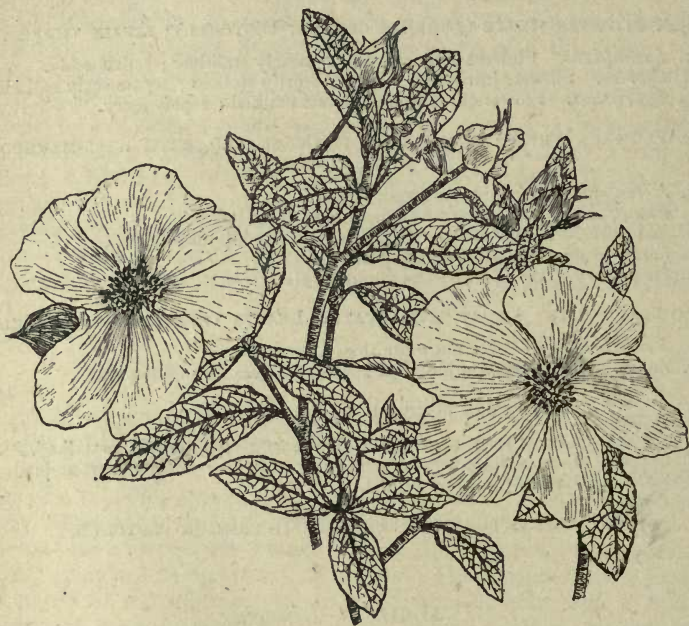
(Sweet's *Cistineæ*, t. 31.)

A compact, bushy shrub, ultimately 5 or 6 ft. high, if it survive long enough; young shoots, leaves, flower-stalks, and sepals covered with a dense, whitish, starry down. Leaves stalkless, oval, oblong or ovate, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{3}$ to $\frac{2}{3}$ in. wide, rounded or blunt at the apex, three-nerved at the base, and strongly net-veined beneath. Flowers pale rosy lilac, with a patch of yellow at the base of each petal, about $2\frac{1}{2}$ ins. across, borne on a stalk $\frac{3}{4}$ to 1 in. long, and crowded three to eight together in a terminal cluster. Sepals five, broadly ovate, $\frac{3}{4}$ to $\frac{1}{2}$ in. long.

Native of S.W. Europe and N. Africa; cultivated in 1640. It is one of the hardier sorts, and will survive all but our hardest winters. The name "albidus," it should be noted, refers to the foliage, and not to the flowers. It has hybridised with and is closely allied to *C. crispus*, from which it differs in its flat, not undulated leaves, and its comparatively long-stalked flowers—those of *crispus* being almost stalkless.

C. CORBARIENSIS, *Pourret.* CORBIÈRES ROCK ROSE.(Sweet's *Cistineæ*, t. 8.)

A densely bushy, evergreen shrub, 3 or 4 ft. high, often more in width; young branches smooth, or with a very minute down. Leaves ovate, pointed, heart-shaped or rounded at the base, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{3}$ to 1 in. wide; minutely toothed and wavy at the margin, each tooth crested with a tuft of minute hairs; net-veined, dull dark green above, paler beneath, both surfaces with starry down; stalks $\frac{1}{4}$ to $\frac{1}{2}$ in. long, downy. Flowers $1\frac{1}{2}$ ins. across, white with a yellow stain at the base of the petals, produced in June at the end of short



CISTUS VILLOSUS (see p. 349).

axillary shoots; there are from one to three flowers on each stalk, which is slender, stellately hairy, and about 3 ins. long. Outer sepals heart-shaped, $\frac{1}{3}$ in. long, hairy.

A natural hybrid between the Narbonne variety of *C. populifolius* and *C. salvifolius*, taking its name from Corbières, in the south of France. This is one of the hardiest and best of cistuses, and like many hybrids possesses a vigour and constitution superior to that of its parents. In the *débâcle* of rather tender plants which followed the great frosts of February 1895, this *Cistus* was one of the three which survived at Kew, the other two being *Loreti* and *laurifolius*. Large groups of plants raised from the survivors now give most pleasing displays from June onwards every year. The general aspect of the plant is that of a small-leaved *C. populifolius*, of which it has been known as "var. minor."

C. CRISPUS, Linnæus.

(Sweet's Cistineæ, t. 22.)

A compact, bushy shrub, 2 ft. high, much-branched; young shoots clothed with long white hairs. Leaves stalkless, lance-shaped to narrowly oblong ovate or oval, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, pointed, three-nerved at the base, margins (especially of the lower leaves) much undulated; both surfaces rough through the deeply impressed veins, and densely coated with starry down. Flowers purplish red, about $1\frac{1}{2}$ ins. diameter, crowded in a terminal head, supplemented by smaller ones on short axillary branches; each flower is on a very hairy stalk, so short that it is almost hidden in the bracts; sepals five, ovate or lance-shaped, long-pointed, hairy.

Native of S.W. Europe and N. Africa; said to have been introduced to England in 1656. It is one of the comparatively hardy species, and will survive moderately cold winters. Its short-stalked, richer red flowers, narrow, long-pointed sepals, and wavy-margined leaves distinguish it from the nearest ally, *C. albidus*. Hybridised with that species it has given

C. DELILEI, Burnat; and with *villosus* it has produced

C. CANESCENS, Sweet (Cistineæ, t. 45), both of which are intermediate between their respective parents.

C. CYPRIUS, Lamarck.(Sweet's Cistineæ, t. 39; Bot. Mag., t. 112, wrongly as *C. ladaniferus*.)

An evergreen shrub of vigorous, bushy habit, up to 6 or 8 ft. high; young branches clammy and shining with fragrant gum. Leaves narrow, lance-shaped, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{3}$ to rather over 1 in. wide, wedge-shaped and three-nerved at the base, tapered to the apex, wavy at the margin, dark dull green above, grey with down beneath; stalk $\frac{1}{8}$ to $\frac{1}{2}$ in. long, the bases clasping the stem, shining and sticky with gum beneath, like the midrib. Both surfaces of the leaf are clammy. Flowers several (three to six) in a long-stalked cluster, terminating short side branches; each blossom about 3 ins. across, white, with a conspicuous blood-red blotch near the base of each petal. Sepals three, yellowish, scaly, and, like the upper part of the flower-stalk, rather hairy.

The native country of this beautiful rock rose is generally given as Cyprus, where possibly it may occur wild; but it is almost certainly a hybrid of *ladaniferus* and *laurifolius* of unrecorded origin. Between these two species it is in many respects intermediate. It has the large, crimson-blotched flowers, the smooth stems, and the scaly sepals of *C. ladaniferus*, but the several flowers on a stalk and the broader-stalked leaves show the influence of *C. laurifolius*. In hardiness it is about intermediate, and is only injured by the very severest of winters. I consider it the most beautiful of all the cistuses we can grow out-of-doors. The leaves become metallic grey in autumn. For hot, dry banks it is unsurpassed. The several flowers in a cluster are individually as beautiful as those of the solitary ones of *C. ladaniferus*, and the shrub has much of the hardiness of *C. laurifolius*. Old plants assume a graceful, spreading habit. It thrives remarkably well in Mr Notcutt's nursery at Woodbridge, in Suffolk.

C. FLORENTINUS, Lamarck.

(Sweet's Cistineæ, t. 59.)

An evergreen shrub, 2 to 4 ft. high, much branched, not viscid, branchlets stellately downy when young. Leaves narrowly oval-lanceolate, wavy, pointed

at the apex; 1 to $1\frac{3}{4}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; upper surface dull green, roughish, net-veined beneath, the chief veins pinnately arranged; at first stellately downy above, covered beneath with a thin greyish wool. Flowers two to four on a stalk, white except for a blotch of yellow at the base of each petal; $1\frac{1}{2}$ to 2 ins. across. Sepals five, hairy, ovate, with a heart-shaped base and a slender, pointed apex.

A hybrid between *monspeliensis* and *salvifolius*, found wild in various parts of S. Europe and in Algiers. It is a useful plant although not among the hardiest. Intermediate between its parents, it has the same type of foliage as *C. monspeliensis*, but broader, whilst its flowers are larger and more like those of *C. salvifolius*. The stickiness of the young stems, seen in *monspeliensis*, is missing.

C. HIRSUTUS, *Lamarck*.

(Sweet's *Cistineæ*, t. 19.)

A small, much-branched shrub, the shoots densely covered with down amidst which are numerous white outstanding hairs. Leaves stalkless, ovate-oblong, blunt at the apex, three-nerved and rounded at the base; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; very hairy, the hairs on the upper surface and at the margins long, whitish, simple; those beneath short, starry. Flowers $1\frac{1}{2}$ ins. diameter, white, with a yellow stain near the base of each petal; produced in a terminal cymose cluster. Sepals five, outer ones heart-shaped, $\frac{3}{4}$ in. long, with a broad base $\frac{1}{2}$ in. wide, and a tapered point; inner ones ovate, smaller, all shaggy with white hairs.

Native of Spain, Portugal, and France; introduced about the middle of the seventeenth century. An almost hardy species, only injured in exceptionally severe winters. With *C. salvifolius* and *C. populifolius* it forms the group "*Ledonia*," characterised by large, heart-shaped outer sepals. It is distinguished from the other two by its stalkless leaves.

C. LADANIFERUS, *Linnaeus*.

(Sweet's *Cistineæ*, tt. 1 and 84.)

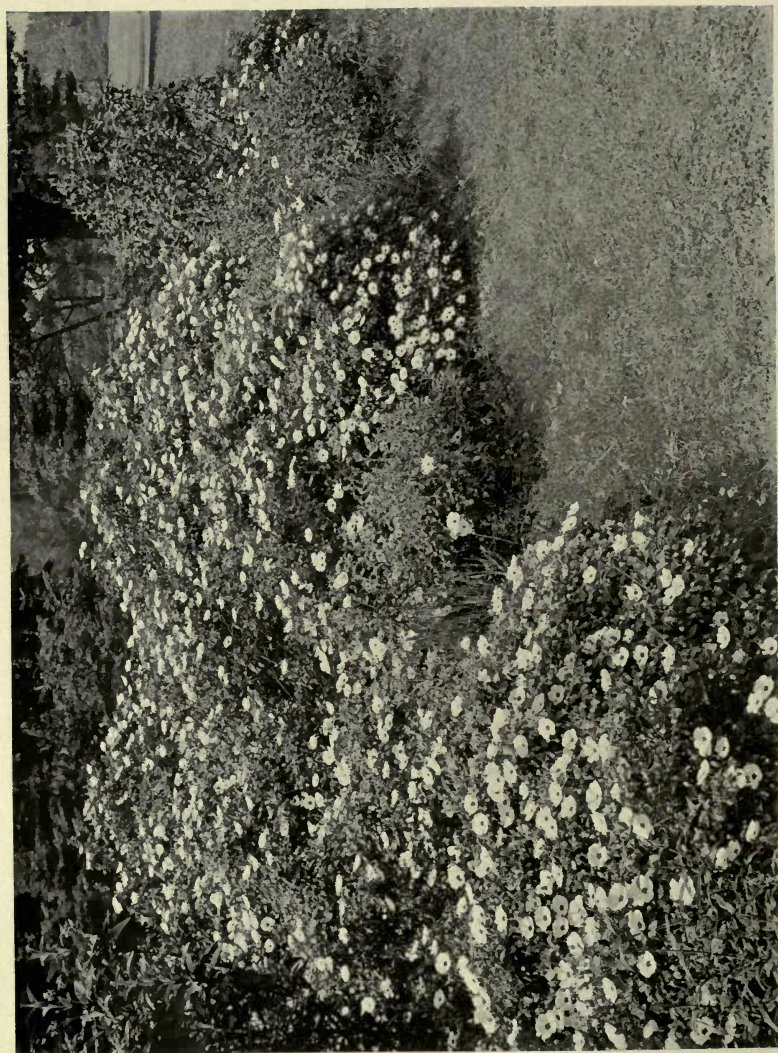
An evergreen shrub, 3 to 5 ft. high, of erect, thin habit; branches very clammy with a shining resin. Leaves three-nerved, glutinous, linear-lanceolate, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; tapering gradually to both ends, scarcely stalked, the bases of each pair clasping the stem; dark green and smooth above, covered beneath with a close grey felt. Flowers solitary at the end of slender side twigs, protected in the bud state by large bracts, white, with a fine blood-red blotch at the base of each petal, 3 to 4 ins. across, the petals crimped at the margin. Sepals three, large, concave, covered with yellowish scales. Seed-vessel ten-valved.

Native of S. Europe and N. Africa; introduced in 1629. Near London this rock rose withstands frosts up to 20° , but is certainly not so hardy as *C. cyprius*, nor so vigorous and bushy a plant. It is a beautiful species, especially the common crimson-blotched form, and has larger flowers than any other species we can cultivate out-of-doors. It differs from *C. laurifolius* in its narrow leaves, in the absence of hairs on the stem and flower-stalks, in the scaly sepals, and in the solitary flowers. (See also *C. cyprius*.) There is a pure white, unspotted form of the species known as var. *albiflorus* (or *immaculatus*).

C. LAURIFOLIUS, *Linnaeus*.

(Sweet's *Cistineæ*, t. 52.)

An evergreen shrub, 6 to 8 ft. high, with stiff, erect, open branches, hairy and glutinous when young; bark peeling. Leaves ovate to ovate-lanceolate,



CISTUS LORETI.

[Face p. 347.

$1\frac{1}{2}$ to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; rounded at the base, long and taper-pointed; three-nerved, the margins wavy; dark dull green and smooth above; pale with a close down beneath, glutinous on both surfaces; stalk hairy, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the bases of each pair meeting and clasping the stem. Flowers $2\frac{1}{2}$ to 3 ins. across, white, produced from midsummer onwards in hairy, erect, cymose panicles, 6 to 9 ins. high, at the end of short side branches. Sepals three, ovate, pointed, very concave, hairy. Seed-vessel five-valved.

Native of S.W. Europe and the Mediterranean region; introduced in 1731. This is the hardiest and one of the best of rock roses. Whilst not so showy as *C. cypricus*, and of stiffer habit, it is capable of withstanding intenser cold. At Kew it has survived uninjured 32° of frost. Grown in the mass it makes a bold evergreen group, flowering profusely from June to August. On hot days the leaves and young stems give off a pleasant, aromatic, incense-like perfume. As a flowering evergreen for banks and places too dry for most evergreens it is particularly useful, but is, nevertheless, neglected in gardens. It should be increased by seed, which it produces in plenty.

C. LORETI, *Rouy and Foucaud*.

(Bot. Mag., t. 8490; *C. lusitanicus*, *Hort.*)

An evergreen bush, 3 to 4 ft. high, and as much or more through; young stems gummy and sparsely hairy at first. Leaves stalkless, clammy, narrowly oblong-lanceolate; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; three-nerved, and clasping the stem at the base; pointed at the apex, margins slightly decurved; upper-surface dull dark green, lower-surface grey, downy, and prominently net-veined. Flowers in terminal clusters of three to five; white, with a crimson blotch at the base of each petal, 2 to $2\frac{1}{2}$ ins. across; sepals four or five, ovate, silky at the margins and inside, minutely scaly and downy outside.

A hybrid between *ladaniferus* and *monspeliensis* given the above name by Rouy and Foucaud in their *Flore de France*, ii., p. 279, in 1895, but known in cultivation long previously as *C. lusitanicus*. It was grown at Kew in 1886 under that name, and was one of the few rock roses that escaped the frosts of February, 1895. It appears to have been found wild in the south of France and Algiers. It is certainly among the *élite* of cistuses—hardy, of good habit, free-flowering, and especially valuable in keeping its flowers open during the afternoon.

Close to *C. Loreti* is *C. RECOGNITUS*, *Rouy and Foucaud*, a hybrid between *laurifolius* and *monspeliensis*. It has somewhat broader leaves than *Loreti*, with short stalks; otherwise very similar.

C. MONSPELIENSIS, *Linnaeus*. MONTPELIER ROCK ROSE.

(Sweet's *Cistineæ*, t. 27.)

An evergreen shrub, 2 to 4 ft. high, with erect, much-divided branches, hairy and slightly sticky when young. Leaves stalkless, narrowly lance-shaped or linear, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide; tapered at both ends, three-nerved, margins incurved; dark green, hairy and much wrinkled above; grey beneath with a close, starry down, as well as hairy on the midrib and nerves. Flowers white, about 1 in. wide, arranged in a compact head borne at the end of a slender, erect, shaggy stalk. All the branches are terminated by an inflorescence, the smaller side ones of three to six flowers, the terminal one of about twice as many. Sepals five, ovate, very hairy.

Native of S. Europe and N. Africa; cultivated here in the middle of the seventeenth century. From other hardy or nearly hardy species this is readily

distinguished by its narrow leaves. It is not one of the hardiest sorts, and suffers in moderately severe winters. Where it survives it makes a neat bush, remarkably profuse in blossom.

C. POPULIFOLIUS, Linnaeus.

(Sweet's *Cistineæ*, t. 23.)

An evergreen shrub, 3 to 7 ft. high, of vigorous growth; young shoots minutely downy and viscid. Leaves long-stalked, broadly ovate, with a deeply heart-shaped base, pointed; 1 to $3\frac{1}{2}$ ins. long, 1 to $2\frac{1}{2}$ ins. wide, prominently net-veined, ultimately smooth; stalk $\frac{1}{2}$ to 1 in. long, fringed with hairs. Flowers white, 2 ins. across, with a yellow stain at the base of each petal, produced during June from the leaf-axils at the apex of the previous year's growth and beneath the new growth, in two- to five-flowered clusters; flower-stalk hairy, 2 to 3 ins. long. Sepals five, the outer ones heart-shaped, $\frac{3}{4}$ in. long, $\frac{1}{2}$ in. wide at the base; inner ones smaller.

Native of S.W. Europe; cultivated since 1656. It is quite distinct from all other cultivated species of rock rose in having leaves larger and longer-stalked than any. Whilst it will not withstand our hardest winters, it may still be included among the hardier species, and is well worth growing. At Narbonne, in the south of France, a form of this *Cistus* is found—var. *NARBONNENSIS, Willkomm*—with short-stalked flower clusters, and smaller sepals hairy only on the margin. This I believe to be the hardiest form, and the best for cultivation with us.

C. PURPUREUS, Lamarck.

(Sweet's *Cistineæ*, t. 17; Bot. Reg., t. 408.)

A bush of rounded habit, 3 to 4 ft. high, and as much through; young branches downy and resinous. Leaves oblong-lance-shaped to obovate; 1 to 2 ins. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide; blunt at the apex, tapering at the base but scarcely stalked, the bases clasping the stem; upper surface dull greyish green, the veins sunken; the lower one pale with starry down. Flowers $2\frac{1}{2}$ to 3 ins. across, reddish purple with a conspicuous dark red blotch at the base of each petal; the flowers are borne in terminal clusters of about three. Sepals ovate, with short slender points and covered with starry down.

This fine rock rose, by far the best of its colour in cultivation, is considered to be a hybrid between *C. villosus*, whence it gets its colour, and the spotted form of *C. ladaniferus*, from which it derives its greater size, and striking blotches on the petals. It is only hardy through comparatively mild winters.

C. SALVIFOLIUS, Linnaeus. SAGE-LEAVED ROCK ROSE.

(Sweet's *Cistineæ*, t. 54.)

An evergreen shrub about 2 ft. high, of compact habit; the young stems, both surfaces of the leaves, and sepals covered with a soft, dense coating of starry down. Leaves shortly stalked, oval to ovate-oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to 1 in. wide. Flowers, white with a yellow stain at the base of each petal, $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. across, often solitary on their stalks. Sepals five, the outer ones heart-shaped, with fine points and $\frac{1}{2}$ in. long; inner ones smaller, ovate.

Widely spread over S. Europe and along all the shores of the Mediterranean; cultivated since the middle of the sixteenth century, but not very hardy. Moderately severe winters kill or severely injure it. It is allied to *hirsutus*

(*q.v.*), differing in the stalked leaves, the one- to three-flowered inflorescence, and in the dense, starry down on the upper surface of the leaves and calyx. *C. salvifolius* has none of the large white hairs so conspicuous in *hirsutus*.

C. VILLOSUS, Linnæus.

(Sweet's *Cistineæ*, t. 35.)

A much-branched, compact bush, 3 or 4 ft. high; young stems shaggy with whitish hairs. Leaves ovate-oblong, oval to obovate, blunt or rounded at the apex, tapered at the base to a short, flat, broad stalk; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; covered on both surfaces with a dense coating of starry down. Flowers variable in colour, but of some shade between purple and rose, yellowish at the base of the petals; 2 to $2\frac{1}{2}$ ins. across, with a space between the petals; the flowers are borne in a cymose cluster of three to five flowers at the end of the shoots. Flower-stalks varying from closely downy to densely hairy. Sepals broadly ovate with fine points, hairy.

Native of the Mediterranean region, varying considerably in different localities, on account of which and the number of hybrids between it and other species that have appeared in cultivation, there is considerable confusion in gardens as to its identity. As it is killed off in moderately severe winters, a new stock (often untrue to name) has to be obtained from S. Europe. Its two nearest cultivated allies are *albidus* and *crispus*, both with red-purple flowers; from these it differs in its pinnately veined leaves, whilst they are marked by three longitudinal veins. (See Fig. p. 344.)

CLADOTHAMNUS PYROLÆFLORUS, *Bongard.* ERICACEÆ.

(Bot. Mag., t. 8353.)

A deciduous shrub, 2 to 4 ft. (sometimes more) high, with erect stems and smooth young shoots. Leaves alternate, oblanceolate or narrowly oval, 1 to $1\frac{3}{4}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; tapered gradually to a stalkless base, abruptly narrowed to a point at the apex, entire, perfectly smooth on both surfaces. Flowers produced in June, mostly solitary from the axils of the uppermost leaves and the end of the shoot, $\frac{3}{4}$ to 1 in. across. Sepals five, narrow oblong, persistent, green; petals five, spreading, broader and rather longer than the sepals, rosy in the centre, yellowish at the margins; stamens ten, spreading, the stalks flattened towards the base; style $\frac{3}{8}$ in. long, decurved, persistent; flower-stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long.

Native of Alaska, British Columbia, etc.; discovered in Sitka Island in 1828, but only introduced a few years ago by Mr T. Smith, of Newry. It is a neat shrub, suitable for a peaty situation in the rock garden. It is allied to *Ledum*, and is interesting among the Ericaceæ through the segments of the corolla being divided almost to the base.

CLADRASTIS. LEGUMINOSÆ.

Two species of deciduous trees; one found in the United States, the other in China. The leaves are alternate, pinnate; the pea-shaped flowers in loose panicles; pods flattened. The shrub or small tree sometimes called *C. amurensis* is now usually placed in a separate genus—*Maackia*.

The true *Cladrastis* is readily distinguished from *Maackia* on account of the swollen base of the leaf-stalks enclosing and hiding the buds; in *Maackia* they are exposed; the flowers of *Maackia*, too, are arranged closely in cylindrical racemes. The name *Cladrastis* is derived from the Greek, and refers to the brittleness of the branches; this is characteristic of both the American and Chinese species, but not of *Maackia*.

These two trees are best when raised from seeds, but failing them, plants may be raised from root-cuttings. They both like a sound, loamy soil and a sunny position.

C. SINENSIS, *Hemsley*. CHINESE YELLOW WOOD.

A deciduous tree, 50 ft. and upwards high in a wild state, whose swollen leaf-bases enclose the buds as in *C. tinctoria*; young shoots rusty-downy at the base. Leaves composed of usually eleven or thirteen, sometimes seventeen leaflets, which are alternate, 3 to 5 ins. long, 1 to 1½ ins. wide; narrow oblong, pointed, tapered or rounded at the base; smooth above, rusty-downy on the midrib, and glaucous beneath; stalks downy. Flowers fragrant, bluish white, ½ in. long, produced in large, pyramidal, terminal, erect panicles, sometimes 12 ins. long and 9 ins. wide. Calyx covered with rusty coloured down. Pod flattened, smooth, 2 to 3 ins. long, ½ in. wide.

Native of China, in the provinces of Szechuen and Hupeh, in the former of which it was discovered in 1890 by Mr E. A. Pratt. It was subsequently found in Hupeh by Wilson, and introduced by him for Messrs Veitch in 1901. Plants in the Coombe Wood nursery and at Kew are now 7 ft. high, and appear quite hardy, but have not yet flowered. This tree furnishes a remarkable instance of geographical distribution. As is the case with *Chionanthus*, *Liriodendron*, *Gymnocladus*, and *Sassafras*, a genus represented by a solitary species in the New World and long known in gardens, is reinforced by a species, also solitary, from the Old World. The leaves in cultivated trees have, as yet, smaller but more numerous leaflets than those of wild specimens.

C. TINCTORIA, *Rafinesque*. YELLOW WOOD.

(Bot. Mag., t. 7767; *C. lutea*, *Koch*; *Virgilia lutea*, *Michaux.*)

A tree occasionally 50 to 60 ft. high, when drawn up by other trees, but usually 40 ft. or less in the open, with a wide-spreading, rounded head of branches; trunk and limbs pale, grey, and smooth; branchlets not downy. Leaves 8 to 12 ins. long, pinnate, composed of usually seven or nine (sometimes five) leaflets, the base of their common stalk swollen and enclosing the bud; leaflets alternate, nearly or quite smooth when mature, broadly oval, ovate or obovate, the terminal one the largest, and up to 4½ ins. long and 2¾ ins. wide; basal pair of leaflets down to 1½ ins. long. Panicles terminal, 8 to 14 ins. long, 4 to 6 ins. wide at the base, pendulous. Flowers white, 1 to 1½ ins. long, produced on stalks scarcely half as long, slightly fragrant; standard petal ½ to ¾ in. across, reflexed, with a pale yellow blotch at the base. Calyx bell-shaped, ⅝ in. long, with five blunt teeth, and covered (like the flower-stalk) with minute down. Pod 3 to 4 ins. long, ½ in. wide, flat, with four to six seeds.

Native of the south-east United States, most plentiful in Tennessee, although nowhere very common; introduced in 1812. This interesting tree does not flower regularly in this country, but is very distinct and handsome in its foliage, which turns bright yellow before falling, and in summer is of a beautifully vivid green and luxuriant aspect. The timber is hard,

heavy, and close grained, and when freshly cut is yellow. There is a good tree at Kew 35 ft. high, with a head of branches 45 ft. across. A finer one grows in the nursery of Mr Anthony Waterer at Knap Hill, 45 ft. high, and at Syon there is one 60 ft. high, but not so healthy. Propagated best by imported seeds. Blossoms in June.



CLADRASTIS TINCTORIA.

CLEMATIS. RANUNCULACEÆ.

There are at present over two hundred species of Clematis known. They are spread more or less over all the great terrestrial regions, but the hardy ones are confined to Europe, Northern Asia (especially China),

and N. America. A New Zealand species, *C. indivisa*, one of the most beautiful of them all, is sometimes cultivated on walls in mild districts, but it is, strictly speaking, a greenhouse plant.

In habit, clematises vary from dwarf, herbaceous plants to woody climbers up to 60 or more feet high. The leaves are always in pairs at each joint, and are occasionally simple, but usually divided, consisting of the three, five, seven, nine, or perhaps fifteen leaflets. The climbing species support themselves by means of the leaf-stalks, which curl round any slender support available. In the absence of any such support they fasten on to each other, making an inextricable tangle. Whilst the clematises when in flower provide some of the most beautiful effects possible in gardens—excepting roses, they are our most extensive group of flowering climbers—the autumn and early winter effect is often deplorable. The leaves of many species do not fall off in autumn, but remain through much of the early winter black and unsightly. Nor are the early stages of decay enlivened by any bright colour.

Clematis belongs to the buttercup family, but is an anomalous member thereof, owing to the flowers having no petals. The showy, petal-like organs, usually four but up to eight in number, which give the flowers their chief decorative value, are sepals. There is one section of the genus, the *ATRAGENE* group, sometimes kept up as a separate genus—which have, between the sepals and stamens, one or more rows of petal-like organs which may be regarded as either petals or enlarged abortive stamens. There is considerable variation in the form of Clematis blossoms. In the most popular forms, represented so abundantly in gardens by varieties and hybrids of *C. patens*, *florida*, and *lanuginosa*, also by species like *montana* and *orientalis*, the sepals spread out nearly or quite to their full extent. In another group, of which *C. Viorna* is the type, the sepals form a pitcher-shaped flower; that is, they are connivent at the margins, so that the flower is rounded and swollen at the base, but narrows to a contracted mouth. In the *Vitalba* group, the flowers are small, very numerous, and produced in panicles.

The seed-vessel, popularly known as the “seed,” and to botanists as the “achene,” is terminated by the persistent style, which in many species is from 1 to 2 ins. long, and clothed with long silky hairs, so that a plant in full fruit is often a striking object. The juice of several species is acrid, and has an inflammatory effect on the skin.

CULTIVATION.—The natural habitat of the climbing sorts is mostly among small trees and shrubs, over which they run. The flowering portions of the plant are therefore exposed to full sunshine, whilst the main stem and lower parts of the plant are often in shade; this is a point that should not be overlooked in the cultivation of the more delicate species on posts and pillars. In such positions it is advisable to place the plant with its base on the northern side of its support. Otherwise, the plants delight in full sunshine.

They all like an open, loamy, moist soil, and the stronger-growing ones should have an occasional top-dressing of rotted manure. The Clematis is essentially a plant of calcareous regions, and whilst many species thrive quite well in garden soil from which lime is absent, it is in such cases

always advisable to add this. I have seen from experience how much better some species thrive with lime or chalk present.

The methods of pruning clematises depend on the position and space they are intended to occupy, and on their time and mode of flowering. The early-flowering sorts like *patens*, *florida*, *Armandi*, *montana*, and *alpina* must not be pruned in winter; whatever pruning is necessary should be done as soon as the flowers are past, and it should be done chiefly with relation to the space the plant is desired to occupy. The late-flowering sorts, those, that is, which flower on the growths of the current year, may be pruned back as much as desired about February, late enough at any rate for it to be ascertainable how much of the stems is dead or alive. Several of the species discussed in the following notes are only semi-shrubby, and much of the summer growth dies back naturally during the winter. It is desirable to remove as much of this as possible. The *Viorna* and *Viticella* groups are of this type. Others, such as the *Jackmani* group, *Flammula*, and part of the *lanuginosa* varieties do not die back, but form in a short time a heavy tangle at the top of their supports whilst they become quite naked at the base. With these it is a good plan to prune a proportion at least of the stems well back, so that in breaking into new growth they provide a furnishing for their supports near the ground.

The provision of support for clematises in gardens must remain a matter largely of discretion and opportunity. At Kew, where a collection of some forty to fifty species is grown in close proximity, most of the climbing sorts are trained over untrimmed branches of oak or other wood stuck in the ground. Three or more of these are put in a bed, and the tops are fastened together so as to form a tent-like structure. The stronger species soon cover this, and in a few years a dense tangle of stems is formed which become almost self-supporting. For the species like *Viorna* and *fusca*, which die back almost to the ground in winter, and send up shoots several feet long during the summer, ordinary pea-sticks are suitable. Pergolas, trellises, and arbours are of course admirable places for most species, and the stronger species may be used for covering the butts of trees and mounds.

An imitation of the natural conditions under which many of the clematises live should more frequently be attempted in gardens. They should be planted near shrubs, over which they can climb. Such shrubs should not be of great value, or very rank growers. Mr Robinson has adopted this system in his garden at Gravetye, with happy results.

The leaves of *Clematis* vary much in size and form on the same plant, so that some of the descriptions in the following pages must in both respects be taken as approximate. It is also difficult in this genus to draw a line between the shrubby climbers and the herbaceous sorts.

Whilst many of the species described in the following pages are of great beauty, it has to be admitted that the interest taken in clematises at the present time is chiefly centred in the large-flowered garden races which have been raised by hybridisation and selection—from *C. lanuginosa* mainly, but also from *C. patens*, *florida*, and *Viticella*. These varieties are more particularly alluded to under their respective type species.

C. ACUTANGULA, Hooker fil.

A deciduous, climbing shrub, 12 to 15 ft. high, perhaps more, with slender stems sharply angled, and very viscid when young; reddish purple. Leaves doubly pinnate, 6 to 9 ins. long; the primary divisions are three-foliolate, or, in the case of the lower ones, often five-foliolate; leaflets ovate-lanceolate, 1 to 2 ins. long, coarsely toothed or two- or three-lobed, smooth and shining on both surfaces, and of a purplish tint; leaf-stalks ribbed, the bases of each pair flattened, expanded, and surrounding the stem. Racemes $1\frac{1}{2}$ to 3 ins. long, furnished with usually five flower-buds, the terminal one of which opens first, and is often the only one to open. Flower bell-shaped, 1 in. wide, $\frac{3}{8}$ in. long; sepals four, lilac-coloured, narrowly ovate, but much curled back at the points, which are downy. Stamens and styles clothed with silky down.

Native of the Himalaya and China; introduced from the latter by Wilson for Messrs Veitch about 1903. The only plant I have seen, and the one from which this description was made, is in the Coombe Wood nursery, where it is a luxuriant grower and quite hardy, flowering in autumn.

C. ÆTHUSIFOLIA, Turczaninow.

A deciduous climber, growing 5 or 6 ft. high; stems slender, slightly ribbed, downy when quite young. Leaves 3 to 8 ins. long, pinnately divided into three, five, or seven segments, which are themselves either deeply lobed or trifoliolate; the ultimate subdivisions varying from linear to obovate or oblong, $\frac{1}{4}$ to $1\frac{1}{4}$ ins. long, coarsely and unequally toothed, downy. Flowers nodding, produced in August and September on erect, slender stalks 1 to 2 ins. long, which come either singly from the joints of the stem, or three or five together at the end of short axillary branches, the whole terminal part of the shoot being transformed into a leafy panicle. Each flower is pale yellow, narrowly bell-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ in. long; the sepals narrow oblong. Seed-vessels with white feathery styles $\frac{5}{8}$ in. long.

Native of N. China and Manchuria; introduced to Kew by way of St Petersburg about 1875. Although one of the smaller climbing clematises, it is a free grower, and forms a dense tangle of its slender stems. The finely divided foliage is very elegant. It blossoms in great profusion, the whole plant being covered with the little pendent bells, which, although not highly coloured, are pretty and graceful.

Var. LATISECTA, *Maximowicz*, is a form with leaf-divisions of the broader shape given above. (Bot. Mag., t. 6542.)

C. ALPINA, Miller.

(*Atragene alpina*, *Linnaeus*, Bot. Mag., t. 530.)

A deciduous climber, 6 to 8 ft. high, with smooth, slightly ribbed stems, often much enlarged at the joints, through an agglomeration of buds there. Leaves 3 to 6 ins. long, doubly ternate, being composed of nine leaflets arranged in three triplets; leaflets ovate-lanceolate, scarcely stalked, coarsely toothed, 1 to 2 ins. long, one-third as wide, downy at the base. Flowers solitary, on stalks 3 to 4 ins. long, nodding, produced along with the young leaves in April and May. Sepals four, blue of various shades, 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide, oblong; petals small, spoon-shaped, half as long as the sepals. Seed-vessels terminated by a silky style $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. long, the whole forming a globular grey tuft, 2 ins. or more across.

Native of N. Europe and N. Asia, also of the mountains of Central and S. Europe; introduced in 1792. It belongs to that section of the genus once kept separate as "*Atragene*," because of the petal-like organs that come

between sepals and stamens. They are not conspicuous, and the sepals make the chief decorative feature of the flower. Except for *C. calycina* and *C. cirrhosa*, this is the earliest of this genus to blossom in the open air, the flowers coming direct from the axillary buds on previous year's growth.

Var. *SIBIRICA* (*Atragene sibirica*, *Linnaeus*, *Bot. Mag.*, t. 1951).—Sepals yellowish white. Introduced previous to the type, in 1753.

C. APIIFOLIA, *De Candolle*.

A vigorous, woody climber, deciduous, 12 to 15 ft. high, with slightly downy, slender stems. Leaves mostly trifoliolate, but sometimes pinnate with the basal divisions trifoliolate; leaflets thin, broadly ovate to ovate-lanceolate, 1 to 3 ins. long, heart-shaped to tapering at the base, deeply toothed, often three-lobed, nearly smooth, except for hairs on the nerves beneath. Flowers dull white, $\frac{5}{8}$ in. across, in axillary panicles 2 to 6 ins. long, produced in September and October; sepals very downy outside, spreading; stamens smooth. Seed-vessels with silky styles.

Native of China and Japan, cultivated at Kew for nearly forty years. It is not one of the most attractive species, although a vigorous grower and flowering copiously. Allied to *C. Vitalba*, it lacks the beauty of that species in fruit, at any rate in cultivation. The Clematis grown in gardens as "*C. brevicaudata*" or "*C. Pieroti*" is not true, but this species.

C. ARMANDI, *Franchet*.

An evergreen, climbing shrub, growing 20 to 30 ft. high, stems minutely downy when quite young. Leaves composed of three leaflets, which are narrowly ovate-lanceolate, rounded or slightly heart-shaped at the base, pointed, not toothed, prominently three-veined, of a rich glossy green, and quite smooth on both surfaces; they vary from 3 to 6 ins. in length, and from 1 to $2\frac{1}{2}$ ins. in width; the main stalk is $1\frac{1}{2}$ to 4 ins. long, the secondary ones $\frac{1}{2}$ to 1 in. long and twisted. Flowers 2 to $2\frac{1}{2}$ ins. across, produced in April in dense axillary clusters, mostly three on a stalk; sepals four to six, narrow oblong; about 1 in. long by $\frac{1}{2}$ in. wide, pure or creamy white, changing to rose. The bases of the flower-stalks are surrounded by numerous bracts.

Native of Central and W. China; introduced by Wilson for Messrs Veitch in 1900, and first flowered by them in their nursery at Coombe Wood. It is a most beautiful and distinct Clematis, and a very striking addition to our scanty evergreen climbers. As regards its hardiness in this country generally, it may need the protection of a wall; but in the milder parts should be quite hardy. An inferior form with sepals only half as wide is in cultivation.

C. AROMATICA, *Köch*.

A presumed hybrid between *C. integrifolia* and *C. Flammula*, and only woody at ground-level, dying back every winter. It grows 4 to 6 ft. high, the stems slender, the leaves pinnate and mostly composed of five leaflets, which are oval or broadly ovate, unequal at the base, not toothed, and 1 to $2\frac{1}{2}$ ins. long. Flowers 1 to $1\frac{1}{2}$ ins. across, dark bluish violet, very fragrant, and produced on a slightly downy stalk about 2 ins. long; sepals four, oblong, spreading fully, downy at the margins. Seed-vessels silky-hairy. It flowers from July to September, and is a valuable plant for grouping in the herbaceous border. Its origin is not precisely known, but the first place in which it is recorded as being in cultivation was the Royal Gardens of Sans Souci, about the middle of the nineteenth century. It is not a climber.

C. CALYCINA, Aiton. FERN-LEAVED CLEMATIS.(Bot. Mag., t. 959; *C. balearica, Richard.*)

An evergreen, climbing shrub, 10 to 15 ft. high in this country; young stems dark brown, furnished with silky hairs, angular. Leaves finely divided, and somewhat fern-like, the larger ones deeply and doubly lobed, the smaller ones simply three- or five-lobed; they are $1\frac{1}{2}$ to 3 ins. long, the ultimate subdivisions linear and pointed. In summer the foliage is dark green, in winter it becomes bronzy purple. Flowers $1\frac{1}{2}$ to 2 ins. across, produced from September to March, solitary on stalks 1 in. or less long. Sepals four, very downy outside, oval-oblong, yellowish white, stained inside with narrow, irregular, reddish purple spots. Beneath the sepals, and separated from them by a short hairy part of the stalk, is a cup-shaped organ known as the involucre. This organ distinguishes this species and its near ally, *C. cirrhosa*, from all other hardy species.

Native of Minorca, Corsica, etc.; introduced to Kew by way of Paris, in 1783. It is not so hardy as *C. cirrhosa*, but has lived out-of-doors at Kew merely trained up tree branches, flowering through the winter whenever the weather was mild. I have not seen it in England in better condition than at Shrublands. On account of its blossoming in midwinter, and the beauty of its finely cut foliage at that season, it is well worth a sunny, sheltered spot, although the flowers are not showy.

C. CAMPANIFLORA, Brotero.

A deciduous climber, growing 10 to 20 ft. high, very vigorous; stems slender, slightly downy when young. Leaves composed normally of fifteen or twenty-one leaflets (that is, five or seven sets of three each), but irregular. Leaflets not toothed, but sometimes lobed, variable in shape, narrow-lanceolate, ovate and oval; up to 3 ins. long, ultimately smooth. Flowers solitary or several together at the end of a downy stalk 2 or 3 ins. long, nodding, produced in July and August. Sepals four, woolly, oblong, pointed with the points recurved, $\frac{3}{4}$ in. long, half expanded; white tinged with violet. Seed-vessels roundish ovate, terminated by a slightly downy style less than $\frac{1}{2}$ in. long.

Native of Portugal; introduced in 1810. A hardy species, very thriving in cultivation. The flowers are scarcely bell-shaped, as implied by the name, but rather bowl-shaped. The species is an ally of *C. viticella*.

C. CHRYSOCOMA, Franchet.

(Bot. Mag., t. 8395.)

A deciduous, semi-woody shrub, 6 to 8 ft., perhaps more, high; young stems, leaves, leaf-stalks, and flower-stalks covered with a dense, brownish yellow, shaggy down. Leaves trifoliate; leaflets varying in shape from broadly ovate or rhomboidal to narrowly obovate; $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, often as much wide, usually three-lobed, but sometimes merely coarsely and irregularly toothed. The two side leaflets are much smaller than (usually about half the size of) the terminal one. Common stalk 1 to 2 ins. long, that of the terminal leaflet $\frac{1}{2}$ to $\frac{1}{4}$ in. long; the side leaflets are stalkless. Flowers white, tinged with pink, $1\frac{1}{2}$ ins. diameter, produced singly on stalks $1\frac{1}{2}$ to 3 ins. long, which spring from the joints of the previous year's wood. Sepals four, broadly oblong, with a short, abrupt point; stamens not downy, forming a cluster 1 in. across. Seed-vessels terminated by a style $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, plumed with brownish golden hairs.

Native of Yunnan, China; discovered by L'Abbé Delavay in 1884; introduced

duced to Kew in 1910, by Mr Maurice de Vilmorin. It is a very charming and pretty plant, distinct in its short, erect habit, and its covering of shaggy down. It is found on mountain slopes and summits at 7000 to 9000 ft., but is rather tender at Kew. Mr Mottet tells me, however, that it is hardy in Mr P. de Vilmorin's garden at Verrières-le-Buisson, near Paris. It succeeds very well in Cornwall.

C. CIRRHOSA, *Linnaeus*.

(Bot. Mag., t. 1070 ; C. balearica, *Persoon*.)

An evergreen climber, said to cover trees in its native country, but only a few feet high in the average climate of Britain ; young stems silky-hairy. Leaves glossy beneath, broadly ovate with a heart-shaped base, or three-lobed, coarsely toothed, smooth ; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide ; stalk $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long. Flower solitary, on a stalk 1 to 2 ins. long ; sepals oval, dull white or cream-coloured, downy outside ; the whole flower $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. across produced in winter. Seed-vessels terminated by plumose styles $1\frac{1}{2}$ to 2 ins. long, forming large, beautifully silky tassels.

Native of Spain, Algeria, and Palestine ; first discovered in Andalusia by the botanist Clusius in the latter half of the sixteenth century, and soon afterwards introduced to Britain. It shares with C. calycina the well-marked distinction of a cup-like involucre on the flower-stalk beneath the sepals. It appears to be hardier than C. calycina, but at Kew does not flower so well, nor has it the beautifully cut, bronzy foliage that is so attractive in its ally. Both species have been called "balearica," and considerably confused in gardens.

C. COCCINEA, *Engelmann*.

(Bot. Mag., t. 6594 ; C. texensis, *Buckley*.)

A climbing, semi-herbaceous plant in this country, mostly dying back in winter, but several yards high in its native country. Leaves pinnate, glaucous, composed of four to eight leaflets, each of which has a stalk as long, or longer than its blade, the common stalk often ending in a sort of tendril. Leaflets ovate to roundish, or sometimes two- or three-lobed, mostly heart-shaped at the base, 1 to 3 ins. long, with well-marked, netted veins ; quite smooth, and not toothed. Flower solitary, on a ribbed stalk 5 to 6 ins. long, pitcher-shaped, nodding ; 1 in. long, $\frac{3}{4}$ in. wide at the base, much narrowed towards the mouth, of various shades of red from scarlet to purplish. Sepals thick, narrowly ovate, with the points slightly reflexed, downy at the margins. Seed-vessels ending in a feathery style, $1\frac{1}{2}$ ins. long.

Native of Texas ; discovered in 1850 and introduced in 1868. This species is rather tender, and needs some protection in winter. At Kew it lives outside, at the foot of a south wall. The flowers are variable in shade, but the rich red form in cultivation is unique in colour among cultivated species. It has been hybridised with the large-flowered varieties of the patens and other groups, and has given some very distinct and handsome varieties, such as "Ville de Lyon" and "Countess of Onslow." Blossoms in autumn.

Var. MAJOR has flowers up to $1\frac{1}{2}$ ins. long.

C. CONNATA, *De Candolle*.

A deciduous climber of vigorous habit, growing probably 20 ft. or more high ; stems only slightly ribbed, not downy. Leaves mostly consisting of three or five leaflets, which are bright green on both sides, sometimes three-lobed, but in the main ovate, with a heart-shaped base, and a long, fine point,

coarsely toothed, 2 to 5 ins. long, 1 to 3 ins. wide, either smooth or downy. The bases of the common stalks of each pair of leaves are flat, thin, and broad, and surround the stem. Flowers, bell-shaped, slightly fragrant, produced in September and October in axillary panicles 4 or 5 ins. long. Sepals soft yellow, oblong, $\frac{3}{4}$ to 1 in. long, pointed with the points turned back, finely downy inside. Seed-vessel surmounted by silky plumose styles, 1 to $1\frac{1}{4}$ ins. long.

Native of the Himalaya up to 10,000 ft. It bears some resemblance to *C. Rehderiana*, but its leaves are not silky, and are especially distinguished by the broad, flattened stalks at the base; the sepals, too, are not so distinctly ribbed. The flower is rather larger and not so fragrant. It is quite hardy at Kew in the open ground. The species varies considerably in the amount of down on the leaves and young stems, and in the size of the flattened expansions of the leaf-stalks.

C. CRISPA, *Linnaeus*.

(Bot. Mag., t. 1892.)

A deciduous, half-woody climber, varying from 3 to 8 ft. high. Leaves pinnate, consisting of three, five, or seven leaflets; these leaflets are themselves often trifoliate or variously lobed, but not toothed, varying from lance-shaped to broadly ovate with a heart-shaped base, and from 1 to 3 ins. long by $\frac{1}{3}$ to $1\frac{1}{3}$ ins. wide, thin and smooth. The larger leaves are altogether 6 to 8 ins. long. Flowers solitary on stalks 1 to 3 ins. long, fragrant; sepals $1\frac{1}{4}$ to 2 ins. long, convergent below, spreading and separate towards the points, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide, thin and wavy at the margins, partially downy at the back, bluish purple, nearly white at the margins. Seed-vessel either silky or becoming nearly smooth.

Native of the south-eastern United States; introduced in 1726. This is regarded as one of the *Viorna* group, but is amply distinguished by the upper half of the sepals expanding widely and being much broadened and wavy at the margin. It flowers from June to August.

C. DAVIDIANA, *Decaisne*.

(*C. heracleæfolia* var. *Davidiana*, *Franchet*.)

A semi-shrubby, deciduous plant, up to 4 ft. high; stems ribbed. Leaves rather leathery, composed of three leaflets, the terminal one the largest; roundish ovate, shallowly and unequally toothed, from 3 to 6 ins. long, and nearly as much wide, side ones similar except in being short stalked and much smaller. Flowers $1\frac{1}{4}$ ins. across, produced in dense axillary clusters; the base is tubular, but the four sepals are spreading (not curled back as in *C. tubulosa*), indigo-blue outside. Male and female flowers occur on separate plants.

Native of China; introduced to Paris in 1864 by the Abbé David, after whom it is named. It is, perhaps, the most desirable of the *tubulosa* group. From *C. tubulosa* itself it differs in its taller habit; the plants are unisexual (dioecious), and the sepals are larger, longer, and do not curl back. At the same time the late Mr Franchet made *Davidiana* a variety simply of the other.

C. DURANDII, *Kuntze*.

(Garden, Feb. 8, 1896, t. 1052.)

A robust climber, growing 9 ft. high, with stout stems. Leaves undivided, ovate, pointed, tapering or slightly heart-shaped at the base; 3 to 6 ins. long, about half as wide, with three or five longitudinal veins, firm-textured,

shining green, almost or quite smooth; stalk 1 to 2 ins. long. Flowers 3 to 4½ ins. across, the sepals usually four (occasionally more), obovate, 1½ ins. wide, wavy at the margins, dark blue-violet; stamens yellow. Seed-vessels with long silky tails.

A beautiful hybrid between *integrifolia* and one of the large-flowered garden varieties, raised by Durand frères of Lyons about 1870.

Var. *PALLIDA*.—Flowers paler, violet-rose.

Both these are exceptionally desirable and flower from June to September.

C. FLAMMULA, *Linnaeus*.

A climbing, deciduous plant, growing 10 ft. or more high, forming at the top a heavy, bushy tangle, whilst it is comparatively naked and unfurnished below; young stems smooth. Leaves very variable in size and shape, but mostly composed of three or five leaflets, which are not toothed, but often two- or three-lobed and frequently trifoliate; they are bright green on both sides and quite smooth, varying in shape from narrowly lanceolate to almost round. Flowers pure white, delightfully fragrant, ¾ to 1 in. across, produced from August to October in loose cymes up to 1 ft. in length. Seed-vessels oval, ¼ in. long, surmounted by a white-plumed style 1½ ins. long.

Native of S. Europe; cultivated in Britain since the sixteenth century. In the fragrance of its blossoms this *Clematis* provides one of the greatest pleasures of the autumn garden. It is variously compared with the scent of almonds, vanilla, and hawthorn, and is perceptible some yards away from the plant.

C. *RUBRO-MARGINATA* (C. *Flammula* var. *rubro-marginata*).—A hybrid between C. *Flammula* and C. *Viticella*. The flowers are 1 to 1½ ins. across, the sepals being white at the base, the remainder reddish violet. Their fragrance is equal to that of C. *Flammula*, and they expand during the same period. One of the most charming of late summer-flowering climbers.

C. FLORIDA, *Thunberg*.

(Gardeners' Chronicle, July 23, 1902, fig. 20.)

A deciduous, or semi-evergreen, shrubby climber, growing 8 to 12 ft. high, with hard, wiry stems. Leaves 3 to 5 ins. long, normally composed of three divisions, which are each again divided into three leaflets. Leaflets ovate to lanceolate, 1 to 2 ins. long, mostly untoothed in the cultivated forms, but often coarsely toothed in the wild; glossy dark green above, more or less hairy beneath. Flowers 2½ to 3 ins. across, solitary on downy stalks 3 to 4 ins. long, that are furnished about the middle with a pair of stalkless, variously lobed, leaf-like bracts. Sepals from four to six, oval, pointed, fully spread, white or creamy white, with a greenish band down the back. Stamens spreading, dark (almost black) purple. Seed-vessels purplish, with silky tails. Flowers in June and July.

Native of China, and possibly Japan. It was first noticed in Japan by Thunberg, and was introduced in 1776, but the plants Thunberg saw were doubtless cultivated ones. The wild type was collected by Henry, near Ichang, but is probably not now in cultivation. The *florida* group of garden clematises is much prized by cultivators, although many varieties are doubtless hybrids with *patens* and *lanuginosa* "blood" in them. C. *florida* and *patens* are no doubt closely allied, and are united by intermediate forms, so that some authorities have united them. But for garden purposes, C. *patens* is well distinguished in having no bracts on the flower-stalk, and in the leaves consisting of three or five simple leaflets. The varieties of C. *florida* are not quite so hardy as those of *lanuginosa*, but some have lived and flowered regularly

out-of-doors at Kew for ten years at least. They blossom well in advance of the great lanuginosa group, and are prized on that account.

Var. BICOLOR, *Lindley* (*C. Sieboldii*, *Don*).—In this variety the flowers are “doubled” through the transformation of the stamens into petal-like organs. Whilst the sepals are white, the centre of the flower is purple. A cultivated Japanese variety, introduced in 1837.

Var. FLORE PLENO, *Jacquin*, has the stamens transformed the same way as bicolor, but they are white.

Neither *C. florida* nor any of the group to which it gives its name need any pruning beyond the removal of old flowering wood.

The differences between the type species of the three great groups of garden Clematis may be tabulated as follows :—

A. FLOWER-STALKS WITH TWO BRACTS.

1. *C. florida*. Leaves doubly ternate.

B. FLOWER-STALKS WITHOUT BRACTS.

2. *C. lanuginosa*. Leaves often simple, very woolly beneath; sepals overlapping.
3. *C. patens*. Leaves never simple, but three or five foliolate, slightly downy; sepals set apart.

C. FUSCA, *Turczaninow*.

A semi-herbaceous climber, 8 or 9 ft. high, stems angled, downy when young. Leaves pinnate, 4 to 8 ins. long, and composed mostly of five or seven leaflets, which are ovate with a rounded or heart-shaped base, and often long, tapering points, not toothed; smooth or slightly downy beneath. Flowers solitary on stout stalks, which are $\frac{1}{2}$ to 1 in. long, and thickly covered with reddish brown hairs. The flower has the pitcher shape of the *Viorna* group, the sepals being $\frac{3}{4}$ to 1 in. long, the points recurved; outside they are reddish brown, woolly. Seed-vessels with tails about $1\frac{1}{4}$ ins. long, plumed with yellowish brown, silky hairs.

Native of N.E. Asia, from Asiatic Russia through Manchuria to the Kurile Islands. It is an interesting but not very ornamental plant, distinct in its group, because of the very short hairy flower-stalks, and the hairiness generally of the flower. It grows very well, and produces abundant seed.

C. HENDERSONII, *Chandler*.

A hybrid between *C. Viticella* and *integrifolia*, raised by Henderson of St John's Wood about 1830, and one of the most beautiful of garden clematises. It is, however, scarcely woody enough to justify its inclusion in this work, dying back to the ground level each winter. The stems are slender, 6 to 8 ft. high, the leaves pinnate, and the solitary, slightly perfumed flowers 2 to $2\frac{1}{2}$ ins. across, deep bluish purple, and borne on stalks 3 to 4 ins. long. Sepals four, spreading, $\frac{3}{4}$ in. wide. This Clematis flowers most profusely from July to September, and if grown in a group, with the stems supported by stakes, makes a very gay display. The parentage of the plant as given above is deduced from its appearance, the habit and foliage resembling *C. Viticella*, whilst the flower and feathery-tailed seed-vessel are those of *C. integrifolia*—a well-known herbaceous species.

C. BERGERONII, *Lavallée*, is of the same origin as *C. Hendersonii*.

C. INTERMEDIA, *Bonamy*, is a third hybrid between the same parent species, very handsome also, but taking more after *C. integrifolia* than *C. Hendersonii* does. The flowers are bluish purple, $2\frac{1}{2}$ ins. across, and appear from July to September. The plant is sturdier and shorter than *C. Hendersonii*.

C. JACKMANI, T. Moore.

In 1860, some young plants were raised in the nursery of Messrs Jackman at Woking, from seed which was said to have been obtained by crossing *C. Hendersonii* and *C. lanuginosa*. They flowered in 1862, were named after their raisers, and were the first of the fine race of garden varieties of *Clematis* everywhere known to-day as the Jackmani group. They are probably more grown now than any others. *C. Jackmani* has flowers 4 to 5 ins. across, composed normally of four sepals of a rich velvety violet-purple. In the later-raised varieties of this group some of the flowers have six sepals, and are 6 ins. or even more across. They commence to flower in July, and are still gay in October if the weather remain open and sunny. They may be pruned to within a foot of the older stems each spring, being vigorous growers, and flowering on the shoots of the current year.

C. JOUINIANA, C. K. Schneider.

(*C. grata*, of many gardens, but not of *Wallich*.)

A very vigorous, deciduous climber, about 10 ft. high, stems strongly ribbed and slightly downy. Leaves composed of three or five leaflets, which are more or less intermediate between those of *C. Vitalba* and *Davidiana*. Flowers in corymbs 4 to 6 ins. long, springing from the leaf-axils towards the end of the shoot, the whole forming a large panicle 1 to 2 ft. long. Sepals four, strap-shaped, pointed, $\frac{3}{4}$ in. long; at first yellowish white, finally suffused with lilac; half to fully expanded, but little recurved. (Fig. p. 362.)

A hybrid between *C. Vitalba* and *C. Davidiana*, which is widely spread in gardens under the erroneous name of "*C. grata*." It is a quick-growing plant with perennial stems, and it flowers with great freedom from August to October. Very suitable for covering old tree-stumps or mounds. It is named after Mr E. Jouin, the well-known manager of the Simon-Louis nurseries at Metz.

The true *C. GRATA, Wallich*, is a climber allied to *C. Vitalba*, native of the Himalaya and China. Leaves pinnate, made up of five leaflets, which are broadly ovate, long-pointed, deeply toothed, often three-lobed, downy beneath. Flowers yellowish white, $\frac{3}{4}$ in. across. It is not in general cultivation, but plants of Chinese origin are in the Coombe Wood nursery.

C. LANUGINOSA, Lindley.

A deciduous climber, said to be only 6 ft. high in nature, but half as high again as represented by cultivated varieties. Leaves either simple or composed of three leaflets, which are heart-shaped at the base, pointed at the apex, up to 5 ins. long by 3 ins. wide, of thick texture, covered beneath with a thick, soft, grey wool, smooth above; stalks 3 to 6 ins. long, downy. Flowers 4 to 6 ins. across, produced at the end of the shoots on woolly stalks which have no bracts. Sepals normally six, but often seven or eight; oval or obovate, overlapping and fully expanded; very downy behind, varying in cultivated varieties from white to pale lilac. Seed-vessels with long silky tails.

This *Clematis* was originally introduced to cultivation by Robt. Fortune, who found it near Ningpo, China, in 1850. It is the type of a very important and showy group of cultivated varieties, and, although allied in a botanical sense to *C. patens* and *C. florida*, is amply distinct in the dwarfer habit, larger flowers, and the very woolly, often simple leaves and woolly flower-stalks. Many of the varieties have flowers 8 ins. across, some close on 12 ins. By cross-breeding, the distinctions between the various groups of course tend to disappear, and many so-called *lanuginosa* forms have deep purple

flowers. The group flowers from June to October, and requires only a slight pruning in February. (See note under *C. florida*.)

C. LASIANDRA, *Maximowicz*.

A vigorous, deciduous climber; stems slender, angled, sparsely hairy. Leaves ternate or doubly ternate, 3 to 8 ins. long, composed of three or nine



CLEMATIS JOUINIANA.

leaflets; when three they are often deeply three-lobed. Leaflets 2 to 4 ins. long, ovate to lanceolate, the lateral ones of each trio oblique at the base; all with long, slender points, coarsely and irregularly toothed, sparsely downy and dull dark green above; paler, brighter and smooth beneath. The base of the leaf-stalks and the nodes are hairy. Flowers usually in threes,

in axillary cymes $1\frac{1}{2}$ to 2 ins. long; sepals downy, varying on different plants from white to dull slaty purple, oblong, the margins pressed together at the base, the points rolled back, forming a bell-shaped flower $\frac{1}{2}$ in. long, stuffed with yellowish white stamens thickly clothed with silky hairs. Fruit-heads composed of numerous ovate-lanceolate carpels, each with a long, feathery tail.

Native of Japan and China; introduced from the latter country by Wilson in 1900. It flowers in October. Not one of the most promising species.

C. LIGUSTICIFOLIA, *Nuttall*.

This little-known species is a native of Western N. America, and in the American floras is grouped with *C. virginiana*. It is easily distinguished from that species (which has trifoliolate leaves) by its five leaflets, the terminal one of which is deeply three-lobed or occasionally three-foliolate. It is, perhaps, more likely to be confounded with our native *C. Vitalba* in foliage, but the plant is much less vigorous, and does not flower freely with us. Moreover, male and female flowers are confined to separate plants. They are white, fragrant, $\frac{3}{4}$ in. across, and produced in corymbose panicles, the sepals downy. Leaflets ovate, pointed, coarsely toothed, of firm texture, bright green and smooth. Seed-vessels with feathery tails. Flowers in September.

Var. CALIFORNICA, *S. Watson*, has leaves downy or even velvety beneath.



CLEMATIS MONTANA VAR. RUBENS.

C. MONTANA, *Buchanan*.

A deciduous climber of vigorous habit, growing at least 20 ft. high; stems smooth except when quite young. Leaves composed of three leaflets on a common stalk 2 to 4 ins. long; the leaflets short-stalked, ovate to lanceolate, pointed, variously and unequally toothed; 1 to 4 ins. long, half as wide. Flowers solitary, pure white, 2 to $2\frac{1}{2}$ ins. across, each borne on a smooth stalk 2 to 5 ins. long. Sepals four, spreading, oval. Seed-vessel elliptical, surmounted by a plumose style $1\frac{1}{2}$ ins. long.

Native of the Himalaya; introduced by Lady Amherst in 1831. It is quite hardy near London, and is undoubtedly one of the loveliest of all climbers. The flowers appear in May, and being produced singly on long stalks, can only be confused with the white variety of *C. alpina*, and that is not only very different in habit and vigour, but has the petal-like parts of the

flower characteristic only of the *Atragene* group. *C. montana* is a valuable plant for covering arbours, pergolas, and especially verandas, where its long shoots can be allowed to hang down and form a sort of curtain.

Var. *RUBENS*, *Kuntze*.—A Chinese variety introduced for Messrs Veitch by Wilson in 1900. It is very distinct, the foliage being similar in size and form to the type, but more downy and purplish, although not so markedly purple as the leaf-stalks and young stems. The flowers appear in June, rather later than those of the type, and are of a beautiful rosy red. The sepals are $1\frac{1}{4}$ ins. long, $\frac{7}{8}$ in. wide; flower-stalks hairy. This variety is probably the most beautiful and useful climber distributed in the twentieth century. It is hardier than the type and flowers with greater regularity. Easily increased by cuttings.

Var. *WILSONI*, *Sprague* (*Bot. Mag.*, t. 8365).—This variety has larger white flowers on downy stalks, 3 ins. in diameter, and they appear in July and August. This habit of late flowering adds to its value. Native of Central China; introduced by Wilson. It is sometimes wrongly named "*C. repens*" in gardens.

C. ORIENTALIS, *Linnaeus*.

(*C. graveolens*, *Lindley*; *Bot. Mag.*, 4495.)

A deciduous climber, growing 10 to 20 ft. high; young stems ribbed and not downy. Leaves 6 to 8 ins. long, pinnately divided, the primary divisions usually trifoliate; leaflets with slender stalks 1 to 2 ins. long, dull glaucous green, ovate or lanceolate, $\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, usually angularly toothed or deeply lobed, but sometimes entire, quite smooth. Flowers yellow, slightly fragrant, $1\frac{1}{2}$ to 2 ins. across, produced during August and September singly on slender stalks 2 to 4 ins. long (lengthening in fruit); sepals ovate, pointed, downy on the inside. Seed-vessel with slender, feathered styles $1\frac{1}{2}$ ins. long, the whole forming a handsome globular tuft over 3 ins. across. In a wild state this *Clematis* extends from the Caucasus and Persia to the Himalaya, N. China, and Manchuria; it accordingly varies considerably in minor points. The plant usually known as *graveolens* is a less glaucous form, the leaves slightly downy, the leaflets mostly larger. *C. orientalis* was introduced in 1731.

Nearly allied to *C. orientalis* is *C. GLAUCA*, *Willdenow*, of which there is in cultivation the var. *AKEBIOIDES*, *Rehder* (*C. orientalis* var. *akebioides*, *Maximowicz*). This has flowers $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. diameter, deep orange yellow. A handsome Chinese form introduced for Messrs Veitch by Wilson, which flowers late into October, and is more vigorous than the type. Both differ from *C. orientalis* in having the sepals downy on the margins only.

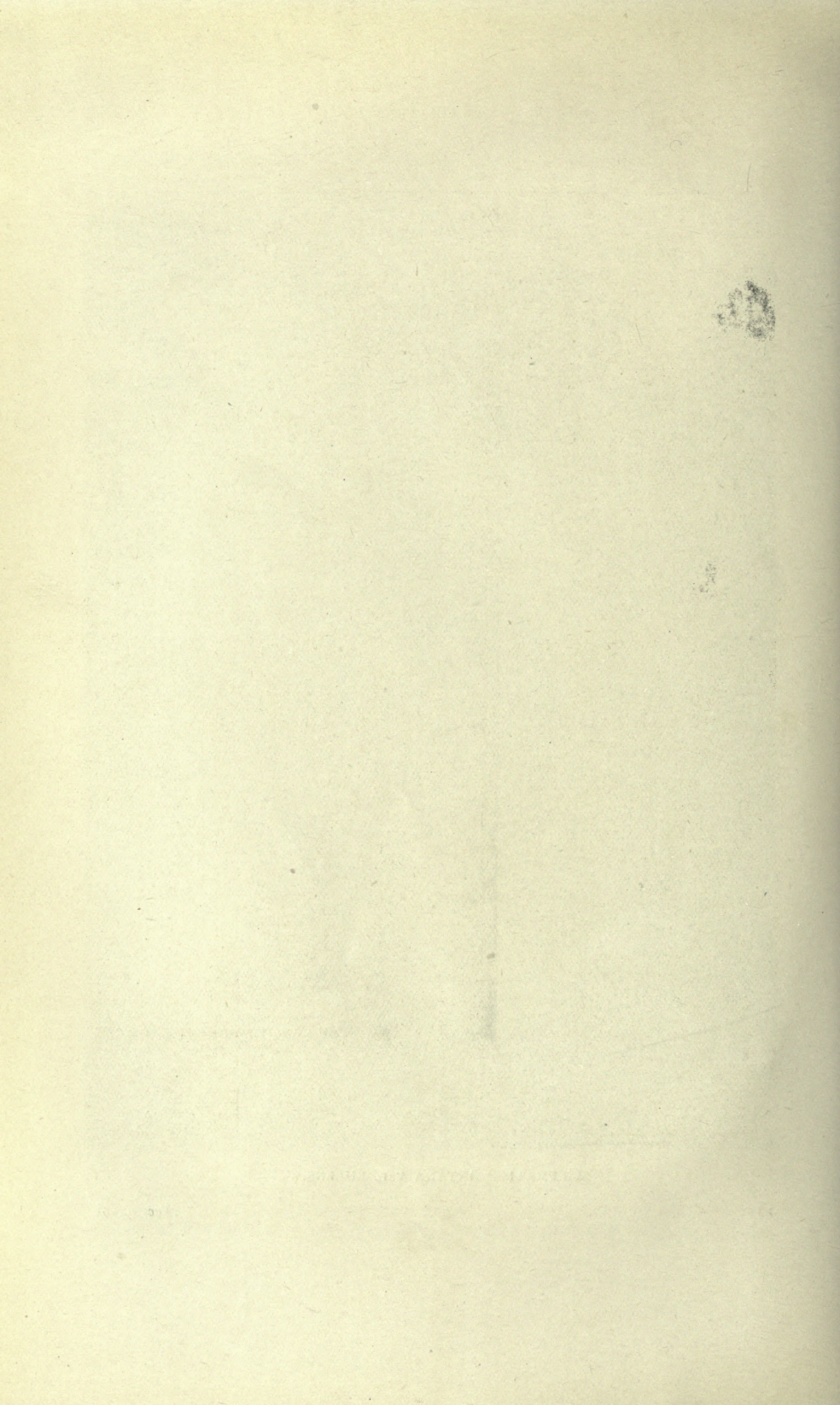
C. PANICULATA, *Thunberg*.

A very vigorous climber, growing 30 ft. or more high, and forming a thick tangle; young stems slightly downy. Leaves composed of three or (usually) five leaflets, which are dark green on both sides, heart-shaped or ovate, 1 to 3 ins. long, not lobed or toothed, nearly or quite smooth, and comparatively long-stalked. The blades of the largest leaflets resemble in form and colour the leaves of the common lilac. Flowers scented like hawthorn, 1 in. or more across, produced during September and October in forked panicles, 3 to 4 ins. long, from the axils of the current year's growth. Sepals four, white, oblong. Seed-vessels with grey feathered styles 1 to $1\frac{1}{2}$ ins. long, rarely seen in Britain.

Native of Japan; discovered and named by Thunberg, who lived in that country in the last quarter of the eighteenth century. It has never been largely planted in the British Isles, for, although hardy and vigorous enough, it rarely flowers with freedom, and usually too late in the season to develop well. In the eastern United States, on the other hand, it is one of the most beautiful and wonderful of climbing plants, producing its pure white flowers in marvellous



CLEMATIS MONTANA var. RUBENS.



profusion. In Britain it lacks, no doubt, sufficient summer sun to bring out its best qualities, and would be best against a south wall. It is an ally of *C. Flammula*, but much more vigorous.

C. PATENS, Morren.

(*C. cœrulea*, *Lindley*; *Bot. Reg.*, t. 1955.)

A deciduous climber, growing 8 to 12 ft. high. Leaves composed of three or five leaflets with downy stalks; leaflets lanceolate; 2 to 4 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide, pointed, smooth above, downy beneath. Flowers solitary on downy stalks without bracts; 4 to 6 ins. across; sepals six to eight, long-pointed, wide-spreading, and more separated from each other than in *C. florida* (*q.v.*). In the typical *C. patens* the flowers are said to be white, but this is probably not in cultivation now, and the cultivated forms of the *patens* group vary from white tinged with violet to deep violet-blue. Seed-vessels with silky tails.

Commonly cultivated in, and probably a native of Japan, whence it was introduced to Europe in 1836 by Siebold, who had found it in a garden near Yokohama. It is the parent of a group of garden clematises inferior in importance to those only of *C. lanuginosa* and *C. Jackmani*. Some authorities regard it as a variety of *C. florida*; the distinctions are pointed out under that species. The *patens* varieties flower in May and June, and need no pruning beyond the removal of dead wood.

C. PITCHERI, Torrey and Gray.

A deciduous climber, 9 to 12 ft. high; young stems downy. Leaves pinnate composed of three to seven leaflets, which are ovate, with a rounded or slightly heart-shaped base, sometimes two- or three-lobed, or even trifoliate; 1 to 3 ins. long, half as wide; strongly net-veined, and more or less downy beneath. The terminal leaflet is often reduced to a tendril. Flower solitary on a downy stalk, 2 to 4 ins. long. Sepals purplish blue outside, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, the tapering points slightly reflexed, showing the greenish yellow inner surface, margins downy; the margins of the sepals converge, giving the flower the urn or pitcher shape characteristic of the *Viorna* group to which this belongs. Seed-vessels almost circular, but narrowed at the top to a slightly downy (not feathery) style $\frac{3}{4}$ in. long.

Native of the Central United States; introduced to Kew in 1878. It has been confused in French periodicals with *C. coccinea*, which differs not only in the colour of the flowers, but is, like another ally, *C. Viorna*, distinguished by the plumed styles. *C. Pitcheri* is the best of the *Viorna* group in gardens; the stems do not die back so much in winter as the others. It flowers from the end of May to September, never making any great display at one time.

C. REHDERIANA, Craib.

(*C. nutans*, *Hort. not Royle*; *C. n. var. thyrsoides*, *Rehder*; *C. Buchaniana*, *Hort.*, not *De Candolle*.)

A deciduous climber up to 25 ft. high, with angled, downy stems. Leaves pinnate, 6 to 9 ins. long, consisting of usually seven or nine leaflets. Leaflets broadly ovate, pointed, heart-shaped at the base, often three-lobed, coarsely toothed; $1\frac{1}{2}$ to 3 ins. long, about two-thirds as wide; more or less downy above, clothed with silky down and conspicuously veined beneath; stalk of leaflets 1 to $1\frac{1}{2}$ ins. long, hairy. Flowers mostly nodding, fragrant like cowslips; borne on erect, downy, ribbed panicles 5 to 9 ins. high from August to October. The four sepals are of a soft primrose yellow, ribbed, and form a bell-shaped perianth $\frac{1}{2}$ to $\frac{3}{4}$ in. long; their points are recurved, and they are

velvety outside, glabrous within; stamens about as long as the sepals, thinly hairy their whole length. Seed-vessels orbicular-ovate, downy, terminated by a silky style 1 in. long.

Native of W. China; introduced to France, in 1898, by Père Aubert from near Tatién-lu, thence to Kew in 1904. Wilson introduced it from the same neighbourhood in 1908. It is one of the latest flowering clematisses and is worthy of cultivation on that account, also for the sweet fragrance of its pretty blossoms. Its naming has been much confused. When first introduced it was called *C. Buchaniana* by the French; then it was identified with *C. nutans*. Both these species are Himalayan, and probably not in cultivation.

C. VEITCHIANA, *Craib*, hitherto confused with the above under the name "*C. nutans*," has lately been distinguished by Mr Craib. Its most noticeable distinction is in the leaves being doubly pinnate; the two or three lower primary divisions are usually trifoliate. The leaflets, in consequence, are smaller and more numerous—often over twenty. Another distinction is that the bracts on the inflorescence are very small ($\frac{1}{8}$ to $\frac{1}{4}$ in. long) and awl-shaped, whereas in *C. Rehderiana* they are much larger ($\frac{5}{8}$ to $\frac{3}{4}$ in. long), ovate or oval, sometimes deeply three-lobed. The flowers are rather smaller, but of the same shape and colour. Introduced from W. China by Wilson in 1904.

C. SONGARICA, *Bunge*.

A semi-woody, scarcely climbing plant, 4 or 5 ft. high, with slender, furrowed, not downy stems. Leaves simple, lanceolate to linear; $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{4}$ to $1\frac{1}{4}$ ins. wide; margins either entire or coarsely and angularly toothed, quite smooth, and of a greyish or glaucous green, with three prominent veins; stalk $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Flowers yellowish white, produced on stalked cymes 3 to 6 ins. long, both axillary and terminal; each flower is $\frac{3}{4}$ to 1 in. across, on a slender stalk 1 to 2 ins. long. Sepals downy outside, smooth within. Seed-vessels with plumed styles.

Native of S. Siberia, Turkestan, Mongolia, and the region of the river Sungari, from which it takes its name; sent to Kew in 1880 by Ed. Regel of St Petersburg. Both entire leaves and leaves with jagged margins occur on the same plant, the former usually as basal leaves of flowering branches, springing from the axils of leaves of the latter type. The whole plant has a grey-green tinge similar to that of *C. orientalis*, but its simple leaves distinguish it.

C. STANS, *Siebold*.

(Bot. Mag., t. 6810; *C. heracleæfolia* var. *stans*, *Kuntze*.)

A deciduous, sub-shrubby, or sometimes scandent plant, with stems up to 6 ft. long, dying back nearly to the base in winter; stout, ribbed, covered with grey down. Leaves composed of three leaflets, broadly ovate, the terminal one three-lobed, all coarsely and sharply toothed, from 2 to 6 ins. long, nearly as wide, downy on the stalks and on the strongly marked veins. Flowers produced on branched stalks 4 to 10 ins. or more long, the flowers being clustered in the axils of leaf-like bracts. They are $\frac{3}{4}$ in. long and wide, tubular at the base, the sepals curled at the ends, nearly white.

Native of Japan; introduced by Von Siebold to France about 1860. It belongs to the same group as *C. tubulosa* and *C. Davidiana*, a group distinguished by tube-shaped, hyacinth-like flowers. In *C. stans* the plants may be male or female, or they may have flowers of both sexes on the one plant. This last (monœcious) form is sometimes known as *C. KOUSABOTAN*, *Decaisne*. *C. stans* is distinguished from *tubulosa* and *Davidiana* by its laxer habit, more downy stems, and smaller flowers.

Var. LAVALLEI (C. Lavallei, *Decaisne*) is a very strong-growing form with sweet-scented flowers of both sexes on the same plant (monœcious); flower-stalks up to 18 ins. long; flowers $\frac{3}{4}$ in. long.

C. TANGUTICA, *André.*

(C. orientalis var. tangutica, *Maximowicz*; Bot. Mag., t. 7710.)

A species closely allied to, or perhaps a variety of, C. orientalis; growing 8 or 10 ft. high; stems slightly downy. Leaves grey-green, like those of C. orientalis, but downy when young; leaflets raggedly toothed, and sometimes two- or three-lobed. Flowers rich yellow, solitary, on downy stalks 3 to 6 ins. long; sepals nearly 2 ins. long, narrowly ovate, long and slenderly pointed, downy outside and at the edges. Seed-vessels crowned with long feathered styles.

Native of Central Asia; introduced to Kew from St Petersburg in 1898. It is the handsomest yellow-flowered Clematis in cultivation, the finest flowers being about 4 ins. across. It differs from C. orientalis in the larger flowers, and in the downy stems, flower-stalks, etc. It is a superior plant.

C. TUBULOSA, *Turczaninow.*

(C. heracleæfolia, *De Candolle* (in part).)

A semi-shrubby, deciduous plant, growing 2 to 2½ ft. high; stems ribbed, more or less downy, brownish red. Leaves composed of three leaflets, the terminal one much the largest, roundish ovate; shallowly, unequally, and sparsely bristly toothed; the base slightly heart-shaped, or almost cut off straight; from 2 to 5 ins. long and wide; the side leaflets are similar in texture, etc., but are only half the size, and are scarcely stalked. Flowers $\frac{3}{4}$ to 1 in. long, produced from the joints of the stems of the year in dense short clusters, each flower on a downy stalk 1 in. or less in length. They are tubular at the lower half and swollen at the base, the four sepals curling outwards and backwards towards the end, deep blue outside, downy. The flowers are unisexual, but both sexes appear on one plant. Seed-vessels with feathered tails.

Native of Central and N. China; introduced in 1837; flowering from July to September. It is the type species of a group of Clematis, whose four sepals close up and form a half tubular flower of the same shape as hyacinths; to this group C. Davidiana and C. stans as well as other minor forms belong. They are notable for the large leaves and robust, although semi-herbaceous growths.

Var. HOOKERI (Bot. Mag., t. 6801) has paler flowers.

C. UNCINATA, *Champion.*

(C. leiocarpa, *Oliver*; Hooker's Icones Pl., t. 1533.)

A large climbing shrub, with smooth, slender stems. Leaves doubly ternate, the three or five primary divisions being again trifoliate. Leaflets all stalked, quite smooth, oval or oval-lanceolate, pointed at the apex, rounded at the base, not toothed; somewhat leathery, and deep shining green; 1½ to 4 ins. long, one-third as wide. Flowers 1 in. diameter, produced from the leaf-axils, and at the ends of the shoots on branching cymes 4 to 6 ins. long. Sepals four, narrow oblong, purplish brown with white, downy margins. Stamens smooth. Seed-vessel crowned with a feathery style, but itself smooth and lance-shaped.

Native of Central China; discovered by Henry about 1884; introduced to cultivation by Wilson in 1901. The species appears to be somewhat tender, especially when young, and may need the protection of a wall. It flowered with Messrs Veitch at Coombe Wood in July 1906.

C. VERTICILLARIS, *De Candolle*. BELL RUE.(Atragene americana, *Sims*; Bot. Mag., t. 887.)

A climbing shrub of the Atragene group, 6 to 8 ft. high; young stems slightly ribbed, smooth, becoming much enlarged at the joints with age. Leaves ternate, being composed of three leaflets on a common stalk 2 to 3 ins. long; leaflets ovate or heart-shaped, 1 to 2 ins. long, coarsely toothed or entire, with a little loose down about the veins and stalks when young. Flower solitary on a stalk about 3 ins. long, purple or purplish blue, 2 to 3 ins. across. Sepals four, thin, lance-shaped, pointed, prominently veined, downy, especially at the margins; petals about $\frac{3}{8}$ in. long. Seed-vessel surmounted by a feathery style about $1\frac{1}{2}$ ins. long.

Native of Eastern N. America; introduced in 1797. It is most nearly allied to the European *C. alpina*, producing its flowers in May from the joints of the previous year's wood, and having petals or petal-like organs between the sepals and stamens. It is, however, quite distinct in having but three leaflets to each leaf, and these have not the deep, handsome toothings of *C. alpina*. *C. verticillaris* is now very rare in gardens, as it is said to be also in a wild state.

C. VIORNA, *Linnaeus*. * LEATHER-FLOWER.

A half-woody climber, 6 to 10 ft. high. Leaves mostly pinnate; leaflets, usually five, of various sizes and shapes, the basal ones largest, mostly two- or three-lobed, or trifoliate, often heart-shaped at the base, $1\frac{1}{2}$ to 2 ins. long and wide; the upper ones not lobed, ovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long; all of them without teeth and often smooth. Flowers nodding, solitary on stiff stalks 2 or 3 ins. long; sepals very thick and leathery, pointed, 1 to $1\frac{1}{4}$ ins. long, dull reddish purple, greenish white or yellowish inside. The sepals touch and form a bell-shaped flower, slightly narrowed towards the mouth where the points are curved back. Seed-vessels with brownish feathery styles 1 in. long.

Native of the eastern United States, introduced in 1730. It is the type species of a group of Clematis (sometimes separated as a distinct genus under the name of *Viorna*), whose converging sepals give an urn- or bell-shape to the flower. The stems die back in winter to the woody base of the plant. Although interesting and curious, this species is not particularly attractive.

C. VIRGINIANA, *Linnaeus*.

A deciduous, climbing shrub up to 20 ft. high; young stems ribbed and almost without down. Leaves nearly always consisting of three leaflets (rarely five), which are ovate, rounded or heart-shaped at the base, coarsely and unequally toothed, borne on a common stalk $1\frac{1}{2}$ to 3 ins. long; each leaflet on its own stalk $\frac{1}{2}$ to $\frac{1}{2}$ in. long, slightly downy when young. Flowers dull white, 1 to $1\frac{1}{4}$ ins. across, produced in axillary panicles 3 to 6 ins. long in August and September; sepals four, oblong, thin. Seed-vessels with silky, feathered styles, forming silvery heads about $2\frac{1}{2}$ ins. across.

Native of Eastern N. America; introduced in 1767. It is but little grown outside botanic gardens, being inferior in vigour to our native species, and not so attractive as many others. It is allied most closely to *C. Vitalba*, but is distinguished by its three-foliate instead of five-foliate leaves. Plants, too, are frequently unisexual.

C. VITALBA, *Linnaeus*. TRAVELLER'S JOY.

A deciduous, climbing shrub, forming woody stems reaching ultimately, if support be available, 40 ft. or more high, the older portions near the ground

becoming in time as thick as a man's wrist; young stems ribbed and downy. Leaves very variable in size and length; from 3 to 10 ins. long, composed of five leaflets pinnately arranged. Leaflets ovate with a heart-shaped or rounded base, or lance-shaped, 1 to 4 ins. long, stalked, the lowest pair occasionally trifoliate, coarsely toothed or almost entire, more or less downy. Flowers dull white, borne in panicles 3 to 5 ins. long from the leaf-axils; each flower about $\frac{3}{4}$ in. in diameter, faintly almond-scented. Seed-vessels with long, plume-like styles, forming, when ripe, grey tufted balls very conspicuous in autumn and winter.

Native of Europe, and common in the south of England. Among our native climbers, it is the most vigorous and rapid in growth, making shoots several yards long in one season. It flowers from July to October, and its remarkable crop of silky fruits remain on the plants long after the leaves have fallen. It is of too aggressive a nature to be associated with valuable shrubs, which it would in time smother, but it has a charming effect in the wilder parts of the garden, where it may be allowed to wander over vigorous common shrubs or worn-out trees of little consequence. In such positions it gives a better idea than any other British plant of the *lianes* or "bush ropes" of the tropics.

The popular name of "old man's beard" refers of course to the silvery grey fruits. The French name, "*herbe aux gueux*" (beggar's plant), originated from the use by beggars in Paris of the acrid juice of the plant to produce ulcerous wounds as a means of exciting pity. The pleasant name of "Traveller's joy," was apparently invented by Gerard, who says this Clematis is "esteemed for pleasure by reason of the goodly shadow and the pleasant sent or savour of its flowers. And because of its decking and adorning *waies* and hedges where people travel, thereupon have I named it Traveller's joy."

C. VITICELLA, *Linnaeus*.

(Bot. Mag., t. 565.)

A deciduous, partially woody climber, growing 8 to 12 ft. high; stems slender, ribbed, and slightly downy when young. Leaves 4 or 5 ins. long, pinnate, with the primary divisions trifoliate; leaflets not toothed, but frequently two- or three-lobed, lance-shaped to broadly ovate, $\frac{3}{4}$ to 2 $\frac{1}{2}$ ins. long. Flowers solitary on stalks 2 to 4 ins. long, or several on a branched stalk; 1 $\frac{1}{2}$ ins. across; sepals obovate, blue, purple, or rosy purple. Seed-vessels broad and short, with very small tails devoid of the feathery covering so common in Clematis.

Native of S. Europe; cultivated here since the sixteenth century. The type and the double-flowered form were grown in 1597 by Gerard, who says, "they grow in my garden at Holborn and flourish exceedingly." Many charming varieties have been raised in gardens, the double-flowered one just mentioned (FLORE PLENO) being one of the least attractive, owing to an excessive multiplication of the sepals, which gives the flower a heavy, lumpy aspect.

Var. ALBA has nearly white flowers.

Var. NANA is a dwarf form about 3 ft. high, raised by Mr Carrière in Paris. There are also numerous minor forms and hybrids. Of these, RUBRA GRANDIFLORA, raised by Jackman of Woking, has large flowers of a deep reddish purple. Var. KERMESINA is another whose flowers have a reddish tinge.

None of the forms of C. Viticella are genuinely shrubby in this country, the summer's growth dying back during the winter nearly to the older stem. They should be cut back in February to the living part. All the forms flower with great freedom from July to September.

CLERODENDRON. VERBENACEÆ.

A large genus of shrubs and climbers, mostly tropical, only three species of which are hardy. Leaves opposite. Flowers in wide, cymose or corymbose clusters. Corolla slender-tubed, five-parted at the mouth. Calyx at first bell-shaped or inflated, persistent, becoming fleshy, with the sepals reflexed. Stamens four. Fruit fleshy, and highly coloured.

C. FARGESII, Dode.

(*C. trichotomum* var. *Fargesii*.)

A vigorous, deciduous shrub, of very leafy habit; young wood greyish, almost smooth. Leaves ovate, taper-pointed, entire, variable in size, 2 to 8 ins. long, about half as wide; purple-red when quite young, afterwards glossy green on both sides, with scattered hairs on both surfaces. Flowers produced in August from the axils of the terminal leaves in cymose clusters, the whole forming an inflorescence at the end of the shoot, 4 to 6 ins. across. Corolla white, $\frac{3}{4}$ to 1 in. across, star-shaped, the five lobes narrow oblong, radiating from a slender tube $\frac{3}{4}$ in. long. Calyx green, ovoid, conspicuously five-angled, and with five-pointed lobes, downy on the ridges. Fruit about the size of a pea, porcelain-blue, surrounded by the five fleshy, reflexed lobes of the persistent calyx become pink with age.

Native of Szechuen, China; introduced to France by Père Farges, and first raised by Mr Maurice de Vilmorin in 1898. It is closely allied to *C. trichotomum*, but differs in the paler, more slender shoots; smaller, brighter green, less downy leaves; in the green, not red, young calyx; and paler blue fruits. It is inferior in beauty, but is probably hardier and does not die back like *C. trichotomum*. The leaves have an unpleasant odour when crushed.

C. FÆTIDUM, Bunge.

(*Bot. Mag.*, t. 4880.)

In the open air this species can scarcely be regarded as a shrub. It is killed back to the ground every winter, but sends up vigorous, erect, woody shoots during the summer 3 to 6 ft. high, bearing large heart-shaped leaves 4 to 8 ins. long and nearly as wide, coarsely toothed, downy on the veins. In August and September come the terminal rounded corymbs, each 4 to 5 ins. across, densely packed with purple-red blossoms. It has lived for many years at the foot of a greenhouse wall at Kew, spreading rapidly by its suckers, and forming in summer a dense thicket of stems. Although the flowers are fragrant, the leaves when crushed emit a heavy nauseous odour. Easily increased by division in spring.

Native of China; introduced by Fortune in 1844.

C. TRICHOTOMUM, Thunberg.

(*Bot. Mag.*, t. 6561.)

A deciduous, small tree, 10 or 12 ft. high, of bushy, rather sparse habit; branches very pithy, downy when young. Leaves variable in size, and considerably larger on young plants than on adult ones; in the latter they are ovate or oval, 4 to 9 ins. long, 2 to 5 ins. wide, occasionally toothed, soft, with scattered down beneath, and flaccid; stalks downy, 1 to 4 ins. long. The lower

leaves are sometimes deeply two- or three-lobed towards the apex. Flowers fragrant, produced from July to September in long-stalked cymes from the axils of the uppermost leaves, the whole forming an erect inflorescence 6 to 9 ins. across. Corolla white, 1 to $1\frac{1}{2}$ ins. across, the base tubular, expanding at the mouth into five spreading, oblong, narrow lobes. Calyx reddish, $\frac{1}{2}$ in. long, inflated, five-angled, and five-lobed. Fruit bright blue, ultimately black, about the size of a pea, surrounded by the persistent crimson calyx whose lobes have become fleshy and spreading.

Native of Japan and China, and a very handsome late summer-flowering tree. The leaves have a heavy unpleasant odour when crushed. It is quite hardy at Kew, and likes an open, loamy soil. The pithy branches are very apt to die back in winter. It is easily increased by root-cuttings, or by the young suckers which frequently spring from the roots.

CLETHRA. ERICACEÆ.

From their allies in the heath family the Clethras are distinguished by having the five parts of the corolla so deeply divided that they appear to be separate petals. They are small trees or shrubs, all the hardy ones deciduous, but the tender ones all or mostly evergreen. Leaves alternate. Flowers white, fragrant, usually produced in racemes or panicles near the end of the shoot; stamens ten. Seed-vessel a capsule enclosed by the persistent calyx, and carrying many seeds.

Of the hardy species, three come from America, one from China and Japan. They all like a peaty soil, and are useful for flowering late in the season. Propagated by seeds, cuttings, and layers. The cuttings are best made in August, of side shoots 3 or 4 ins. long, with a heel of older wood, and placed in gentle bottom heat. In Guernsey and in the milder parts of Ireland, the beautiful evergreen species from Madeira—*C. ARBOREA*, *Aiton*—may be seen growing in the open air. It is known as the "lily-of-the-valley tree," from its long white racemes.

C. ACUMINATA, Michaux. WHITE ALDER.

A deciduous shrub under cultivation, but assuming the form of a small tree 20 ft. high in a wild state; young wood downy. Leaves clustered at the ends of the shoots, oval, with a long tapering apex, 3 to 6 ins. long, the base rounded or shortly tapered, toothed on the terminal part; lower surface downy; stalk $\frac{1}{4}$ to $1\frac{1}{4}$ ins. long. Racemes 6 ins. or more long, solitary, slender, cylindrical, terminal, hairy. Flowers white; petals $\frac{1}{2}$ in. long, not spreading; sepals downy, ovate, ribbed; stamens hairy at base; flower-stalk $\frac{1}{2}$ in. long, downy.

Native of the south-eastern United States, found on cliffs and mountain-sides; introduced in 1806. It is the least hardy of the American species, but may be grown in the south of England. From *C. alnifolia* and *C. tomentosa* it is distinguished by the leaves being nearly always broadest below the middle, and crowded at the end of the twig. The racemes, too, are mostly solitary.

C. ALNIFOLIA, Linnæus. SWEET PEPPER-BUSH.

A deciduous shrub, ultimately 8 or 9 ft. high, with erect branches; young shoots covered with a very close, fine down. Leaves obovate or wedge-

shaped; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide; abruptly tapered at the apex, toothed except near the base, almost or quite smooth except on the midrib and stalk, the latter being downy and $\frac{1}{8}$ to $\frac{3}{4}$ in. long. Flowers fragrant, $\frac{3}{8}$ in. across, thickly set on erect, cylindrical, downy racemes 2 to 6 ins. long and $\frac{3}{4}$ in. wide, produced in August at the end of the current season's shoots and in the axils of their uppermost leaves. Petals white, obovate, rounded at the apex; sepals persistent, ovate, downy; stamens and style smooth; flower-stalk $\frac{1}{8}$ in. long, downy.

Native of Eastern N. America; introduced in 1731. A very handsome shrub, useful on account of its late flowering. It loves abundant moisture at the root. Propagated by layers or by separating the sucker growths at the base.

Var. PANICULATA (*C. paniculata*, *Aiton*) has terminal panicles (not merely clustered racemes), and is superior to the type. It is the best of all the Clethras that can be grown out-of-doors, being quite hardy, a vigorous grower, and equal in flower beauty to *C. tomentosa*.

C. CANESCENS, *Reinwardt*.

(*C. barbinervis*, *Siebold*.)

A deciduous shrub, 3 to 6 ft. high in cultivation, more bushy and less erect than the American species; young shoots at first sprinkled with a minute starry down. Leaves often clustered at the end of the twig, oval or obovate, more tapering at the base than at the apex; 2 to 5 ins. long, 1 to $2\frac{1}{4}$ ins. wide; hairy at first on both sides, but especially so on the midrib and nerves beneath, toothed; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers white, $\frac{1}{2}$ in. across, produced from July to September in a rather compact, terminal panicle 4 to 6 ins. long, covered with white, starry down; calyx and seed-vessel hairy; stamens smooth.

Native of Japan and China; introduced in 1870. It is a very pretty shrub where it thrives, but it is not so hardy as *C. alnifolia*, although it will survive all but the severest winters near London. The leaves have usually two or more pairs of veins than the American species.

C. TOMENTOSA, *Lamarck*.

(*Bot. Mag.*, t. 3743; *C. alnifolia* var. *pubescens*, *Aiton*.)

A deciduous shrub up to 6 or 8 ft. high, branches erect; young shoots very downy. Leaves obovate, $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide, tapering to a very short stalk at the base, toothed on the terminal half, pointed; upper side with scattered short hairs, lower side felted with a thick, pale wool. Flowers fragrant, white, nearly $\frac{1}{2}$ in. across, produced during September in erect, woolly racemes up to 6 ins. long, either terminal or from the uppermost leaf-axils. Sepals woolly, ovate-oblong, $\frac{3}{8}$ in. long; stamens smooth; style downy; flower-stalk woolly, $\frac{1}{8}$ in. long.

Native of the south-east United States; introduced in 1731. Closely allied to *C. alnifolia*, and sometimes regarded as a variety of it, it is distinguished by flowering a month later and by its greyish aspect due to the woolly covering of its various parts. Its flowers, too, are purer white, larger and more ornamental, and the style is downy. Its distribution in a wild state does not extend so far north as that of *C. alnifolia*, and it is not quite so hardy. At Kew, however, it does not suffer from cold.

CLEYERA FORTUNEI, *Hooker fil.* TERNSTRÆMIACEÆ.

(Bot. Mag., t. 7434.)

An evergreen shrub, 5 to 6 ft. or probably more high, with smooth branchlets. Leaves 3 to 6 ins. long, 1 to $1\frac{1}{2}$ ins. wide; tapering towards



CLETHRA TOMENTOSA.

both ends, quite smooth and entire, deep green in the middle with a yellow margin of varying width. Flowers produced singly or in pairs

from the axils of the leaves, each one nearly $\frac{3}{4}$ in. across when fully open, the flower-stalk $\frac{1}{2}$ in. long; petals pale yellow.

The genus *Cleyera*, named in honour of Dr Cleyer, a Dutch botanist, is a small genus of evergreen trees and shrubs from N.E. Asia. The calyx is five-parted, and there are five petals with numerous stamens slightly attached. The genus is nearly allied to *Eurya*, but differs in having chiefly bisexual flowers, those of *Eurya* being unisexual and found on different trees.

C. Fortunei was introduced from Japan by Robert Fortune about 1860, and was long grown in gardens, chiefly in cool greenhouses, as "*Eurya latifolia variegata*." It never appears to have flowered, or the fact of its doing so was not made known until 1894. In the September of that year it was exhibited in flower at Chiswick, and flowering specimens were sent to Kew about the same time, by the late Mr T. Acton of Kilmacurragh. In this and other similarly situated gardens it may be grown without protection, but in colder localities wall-protection is necessary. It has long been cultivated by the Japanese for its handsomely variegated leaves, but is probably a native of China. It is quite easily rooted from cuttings in gentle heat. No green-leaved form of the plant appears to be known.

CNEORUM TRICOCCUM, *Linnaeus*. SIMARUBACEÆ.

A low, evergreen shrub, 1 to 2 ft. high, with erect, forking branches. Leaves alternate, greyish green, 1 to 2 ins. long, rarely more than $\frac{1}{2}$ in. wide, glabrous, terminating as a rule in a tiny, abrupt point. Flowers $\frac{1}{2}$ in. in diameter, yellow, produced several together at the end of the branchlet and in the axils of the terminal leaves; petals three or four. Fruit brownish red, composed of three segments, each about the size of a small pea flattened on two sides; it has a fleshy covering, but is bony beneath.

Native of the Mediterranean region, and rather common along the French and Italian Riviera in dry positions. Among other places one may find it on the Cap d'Antibes, and on the hills behind Mentone. It is not hardy at Kew, but lives in the gardens of the south and west coasts. I have seen it flourishing in the garden of Mr Hiatt C. Baker at Almondsbury, near Bristol. It has considerable scientific interest as one of a curious genus whose right place in the Vegetable Kingdom is uncertain. At present it is associated with the very dissimilar *Ailanthus* and *Picrasma*. It has been known in gardens since the last years of the eighteenth century, but owing no doubt to its lack of any striking beauty is rarely seen now. Easily increased by cuttings in a cold frame.

COCCULUS. MENISPERMACEÆ.

In the outdoor garden this genus is at present represented by three species, two of them climbers, the other an evergreen shrub. They are nearly allied to the "moon-seeds" (*Menispermum*), but differ in having

six petals and six stamens, whilst *Menispermum* has six to eight petals and twelve to twenty-four stamens and peltate leaves. The flowers are small, inconspicuous, and unisexual. The climbing species are of the easiest cultivation, growing in any soil of moderate quality, and easily propagated by division or pieces of root. They may be grown up rough branches of oak or supports of a similar nature. Their beauty, apart from the luxuriant foliage, is in their red or purplish blue berries. The shrubby species—

C. LAURIFOLIUS, *De Candolle*, is an evergreen shrub 10 ft. or more high, sometimes a small tree, with lance-shaped, conspicuously three-ribbed leaves 5 to 8 ins. long, about 2 ins. wide, the stalks $\frac{3}{4}$ in. long; they are of a very glossy, varnished, dark green, giving to the shrub a very characteristic aspect. Flowers small, in axillary panicles. At Kew this plant can only be grown against a wall, where it has lived for many years without injury. In the south of France and Italy it forms a picturesque spreading shrub or small tree. There is a very pleasing example in the garden of the British Embassy at Rome. Native of the Himalaya.

C. CAROLINUS, *De Candolle*.

(*Cebatha carolina*, *Koelne.*)

A climber with twining stems, naturally woody, but often herbaceous in Britain, downy. Leaves more or less heart-shaped or ovate, three- to seven-veined, rounded at the end, often obscurely lobed, 2 to $4\frac{1}{2}$ ins. long, with stalks nearly as long; clothed with pale down beneath, deep green, ultimately smooth above. Flowers sometimes hermaphrodite, but usually unisexual, with the sexes on separate inflorescences, sometimes on separate plants, white; males on short, axillary panicles, each flower about $\frac{1}{4}$ in. across, with six sepals, petals, and stamens. Females in racemes, similar to the males as regards sepals and petals, but with abortive stamens and three to six pistils. Berries about the size of small peas, red when ripe.

Native of the south-eastern United States. Although introduced in 1759, it has never become common. Flowers in July.

C. TRILOBUS, *De Candolle*.

(*Bot. Mag.*, t. 8489; *C. Thunbergii*, *De Candolle*; *Cebatha orbiculata*, *Kuntze.*)

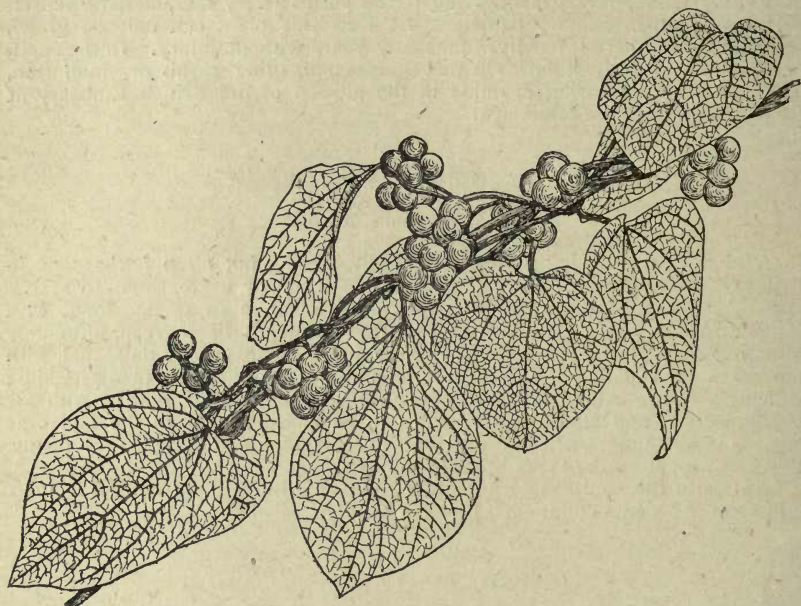
A climbing, twining shrub with downy, naturally woody stems. Leaves $1\frac{1}{2}$ to 4 ins. long, ovate or heart-shaped, sometimes three- or five-lobed, rounded or pointed at the apex, downy beneath, especially when young, becoming smooth (except on the nerves) and bright dark green above, prominently three- or five-nerved. Flowers in axillary clusters, expanding in August. Fruit spherical, $\frac{1}{4}$ in. diameter, black covered with a blue bloom, produced in clusters of six to twelve, ripe in October, and then rather handsome. Plants at Kew bore a great crop in 1911, which seems to show they like abundant sunshine.

Native of Japan, Corea, and China. The down, or small hairs, on the stems point downwards. The plant from which our figure (p. 376) was made was introduced to Kew from Japan by Prof. Sargent, but the species may have been in cultivation before.

COLLETIA, CRUCIATA, *Hooker.* RHAMNACEÆ.

(Bot. Mag., t. 5033; *C. spinosa*, *Hort.* not *Lamarck*; *C. bictoniensis*, *Lindley*.)

A dimorphic shrub up to 10 ft. high, armed with spines of one of two kinds; the one flat, triangular, rigid, frequently $1\frac{1}{2}$ ins. wide at the base, the other flattish, bodkin-shaped, sharply pointed, comparatively slender, and from $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long. As a rule a plant has spines of the triangular kind only; but in very rare instances the two kinds are found on one branch. These spines are really branchlets producing



COCCLUS TRILOBUS.

leaves and flowers in the usual way; they are arranged in pairs, each pair set at right angles to the next. Leaves very small, scanty, or even absent, each one $\frac{1}{4}$ in. or so long, ovate, and toothed. Flowers produced from below the spines usually singly or in pairs, occasionally in fours; they have no petals, and the calyx is tubular, yellowish white, swollen at the base, divided at the mouth into five reflexed lobes; the whole flower and stalk combined are little more than $\frac{1}{4}$ in. long.

This shrub, so uncommon of aspect in both its forms, has no great beauty of flower, but it is one of the most grotesquely and formidably armed, as well as one of the most interesting, of all hardy plants. It was introduced from Uruguay about 1824. The curious fact that the plant with large, flat, triangular

spines will sometimes, though rarely, produce shoots with flattish bodkin-like spines has created some confusion. In the first edition of this work I adopted the generally accepted view that *C. cruciata* and *C. spinosa* were one and the same species—the latter being simply the bodkin-spined form of *C. cruciata*. Lately, Mr N. E. Brown, who has carefully studied the question, has stated that the two are perfectly distinct. The old story of *C. cruciata* being raised from seed of *C. spinosa* at Bicton, sometime previous to 1850, must, therefore, be disbelieved, as, indeed, it largely was when first told. The shrubs (consisting of what are now regarded as three or four distinct species) to which the name *C. spinosa* was given, are natives of Chile and Peru, and, therefore, from the opposite side of the continent to *C. cruciata*. Two species with bodkin-shaped spines are in cultivation named by Mr Brown as follows :

C. ARMATA, *Miers*, a native of Chile, has terete spines $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, very rigid and sharply pointed, greyish green, and differing from those of *C. cruciata* in both its states in being covered with short down. The flowers are white, very like those of *C. cruciata*, the stamens exserted. The shrub grows at least 10 ft. high and blossoms in September. The fruit is composed of three united roundish capsules each $\frac{1}{2}$ in. wide and carrying a single seed. The second species, similar in general aspect to *C. armata*, Mr Brown calls *C. INFUSTA*. This is glabrous and has the stamens inclosed within the perianth. Cultivated at Bicton, where it blossoms in March. Flowers white. (Figured Bot. Mag., t. 3644, as *C. horrida*.)

COLUTEA. BLADDER SENNA. LEGUMINOSÆ.

A small genus of deciduous shrubs, natives of the Old World, with unequally pinnate leaves and yellow, coppery, or reddish brown, pea-shaped flowers borne in few-flowered racemes. The most distinctive character of the genus is the large inflated pod, which, when half ripe, may be made to burst with a miniature report when squeezed. There is nothing similar among hardy Leguminosæ, and among all hardy shrubs similar fruits occur only in *Staphylea* and *Koelreuteria*.

In gardens the Coluteas do not figure largely; although the commonest species, *C. arborescens*, is sometimes seen in rough shrubberies. They all flower late, and over a long season, which is in their favour; and all except *C. istria* are of the easiest cultivation, thriving in any soil and any situation except a very shaded one. Those species that produce seeds are easily propagated by them, the others can be struck from cuttings made of half-ripened wood placed in gentle heat.

C. ARBORESCENS, *Linnaeus*. COMMON BLADDER SENNA.

A strong-growing, deciduous shrub up to 12 ft. high, of bushy habit and copiously branched. Leaves 3 to 6 ins. long; leaflets nine to thirteen, elliptic or broadly obovate with the apex notched, from $\frac{1}{2}$ to 1 in. long, hairy beneath when young, becoming nearly or quite smooth with age. Racemes axillary on the current season's growth, produced successively as the branches extend; $1\frac{1}{2}$ to 4 ins. long, carrying three to seven flowers towards the end. Flowers pea-shaped, yellow, $\frac{3}{4}$ in. long, borne on a downy stalk $\frac{1}{4}$ in. long; wing-petals rather shorter than the keel; calyx cup-shaped, with triangular lobes. Pod inflated and bladder-like, about 3 ins. long, 1 to $1\frac{1}{2}$ ins. wide, pointed, many-seeded.

Native of the Mediterranean region and S.E. Europe; cultivated for at least three hundred years in England. Few introduced shrubs have made themselves so thoroughly at home as this. It has taken possession of some of the railway banks in the suburbs of London, and will, indeed, grow in almost any position not water-logged where it has sufficient light. Its accommodating nature has made it, perhaps, despised in gardens, but it is quite pretty when in full bloom, and it lasts more or less from June until the frosts come. The inflated pods, which explode with a sharp report when squeezed, make the shrub very attractive to children. A group of plants can be kept to a neat shape and convenient size by pruning back the shoots almost to the old wood every winter, the flowers being borne on the shoots of the year. The abundant seeds render its increase easy.

Var. *BULLATA* (pygmæa).—A dwarf variety of dense habit, whose leaflets are small and wavy at the margin, $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Racemes 1 to $1\frac{1}{2}$ ins. long.

C. CILICICA, *Boissier*.

(*C. longialata*, *Koehne*.)

A deciduous shrub, similar in habit to *C. arborescens*. Leaves composed of nine to thirteen leaflets, which are obovate or oval, with a few flattened hairs beneath. Flowers yellow, produced three or five together in short racemes. Wing-petals longer than the keel.

Native of Asia Minor. Very similar to *C. arborescens* (of which it is perhaps only a geographical form) and *melanocalyx*; it is chiefly distinguished from the former by the larger wing-petals, and from the latter by the unfelted calyx.

C. ISTRIA, *Miller*.

(*C. halepica*, *Lamarck*; *C. Pocockii*, *Aiton*.)

A deciduous shrub, 3 or 4 ft. high, much branched. Leaves composed of nine to fifteen leaflets, which are the smallest among cultivated Coluteas, being $\frac{1}{4}$ to $\frac{3}{8}$ in. long, obovate or broadly oval, and furnished with white flattened hairs. Flowers borne two to five together towards the end of a raceme about 2 ins. long. Each flower is $\frac{3}{4}$ in. long, coppery yellow, with a handsome standard petal $\frac{5}{8}$ in. across; wings as long as keel. Pod 2 ins. or more long.

Native of Asia Minor, and a similar or closely allied plant occurs in Abyssinia. It was first introduced in 1752, but the true plant has always been rare. It is, perhaps, not hardy enough to withstand our severest frosts. The small graceful foliage and handsome flowers make it at once distinct and handsome, and it has not the rank growth of the *arborescens* group. It is the earliest of the genus to flower, commencing in late May or early June, and continuing more or less for three months.

C. MEDIA, *Willdenow*.

A hybrid between *C. arborescens* and *C. orientalis*, given this name by the German botanist in 1809, at which time it was cultivated in the Botanic Garden of Berlin. It is a vigorous shrub of bushy habit very similar in general appearance to *C. arborescens*, the leaves consisting usually of eleven or thirteen leaflets, which are obovate, $\frac{1}{2}$ to 1 in. long, bluish green, downy beneath when young. The influence of *C. orientalis* is most in evidence in the colour of the flowers, which are of a brownish red or coppery hue, also in the longer, linear-lanceolate teeth of the calyx, as compared with the triangular lobes of *C. arborescens*. *C. media* has a large inflated pod like *C. arborescens*, 3 ins.

long. This shrub is useful in the same situations as *C. arborescens*, and may be planted on dry banks. It is found in gardens under a variety of names, such as *C. arborescens flore rubro*, *C. purpurea*, etc.

C. MELANOCALYX, *Boissier*.

A deciduous shrub very similar in general appearance to *C. arborescens*, differing chiefly in the calyx, which is longer ($\frac{1}{3}$ in. long), more tubular, with broader triangular teeth, and, like the stalk of the flower, clothed with a thick, very dark brown, velvety down. Petals yellow, the wings about as long as the keel. Leaflets seven to eleven, broadly elliptical, indented at the end.

Native of the mountains of Asia Minor; flowers from July to September.

C. ORIENTALIS, *Miller*.

(*C. cruenta*, *Aiton*.)

A deciduous bush of rounded, close habit, up to 6 ft. high, with rather erect branches, often marked with small black warts. Leaves pinnate, 3 to 4 ins. long, composed usually of seven or nine leaflets, broadly obovate or roundish, $\frac{1}{4}$ to $\frac{5}{8}$ in. long, rounded at the end, tapered at the base; very glaucous, smooth on both surfaces except when quite young. Flowers two to five, clustered towards the end of a raceme $1\frac{1}{2}$ to 3 ins. long, brownish red or copper-coloured, each $\frac{5}{8}$ in. long, the rounded standard petal $\frac{1}{2}$ in. across, with a yellow spot at the base; wings two-thirds as long as the keel. Calyx slightly hairy. Pod open at the end, $1\frac{1}{2}$ ins. long, smooth.

Native of the Orient; introduced to England in 1710. It flowers from June to September, but never makes a very striking display. It is more notable for its grey-white foliage.

COMPTONIA ASPLENIFOLIA, *Banks*. SWEET FERN.

MYRICACEÆ.

(*Myrica asplenifolia*, *Linnaeus*.)

A deciduous shrub, 2 to 4 ft. high, with slender, often erect branches, very hairy when young. Leaves alternate, linear-oblong, tapered at both ends, 2 to 4 ins. long, $\frac{1}{3}$ to $\frac{5}{8}$ in. wide, the blade deeply cleft (almost to the midrib) into broad, oblique, rounded lobes, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; dark green, downy; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Male catkins cylindrical, $\frac{3}{4}$ to 1 in. long, $\frac{1}{8}$ in. wide; closely set with downy, broadly triangular, long-pointed bracts. Female inflorescence globular, each ovary surrounded by eight awl-shaped, downy scales, which give the fruit-cluster a bur-like appearance. Nut egg-shaped, $\frac{1}{5}$ in. long, shining.

Native of Eastern N. America; introduced in 1714, and long a favourite in gardens because of its beautifully cut, fern-like leaves, and pleasant bay-like scent. It is closely allied to, and often regarded as belonging to, the *Myricas*, but differs from them in the two sexes usually occurring on the same plant, and in the ovary being surrounded by eight persistent scales, instead of two to four inconspicuous ones. It is also quite distinct from them, or indeed any other hardy shrub, in general aspect. It likes a peaty soil.

CONVOLVULUS CNEORUM, *Linnaeus*. CONVOLVULACEÆ.

(Bot. Mag., t. 459.)

An evergreen, very leafy shrub, 2 to 3 ft. high, covered with silky hairs that give the entire younger part of the plant a beautiful silvery aspect. Leaves shortly stalked, alternate, narrowly oblong or oblanceolate, 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide, always tapered at the base, but either pointed or rounded at the apex. Flowers in a terminal umbel, but opening successively during the summer; they are of the trumpet-mouthed type common to "morning glory," being $1\frac{1}{4}$ ins. long, rather more across, of flimsy texture, white tinged with pink, yellow in the tube; calyx as long as the corolla-tube, silky.

Native of S. Europe; cultivated in England, according to Aiton, in 1640. It is not quite hardy near London except against a wall, but thrives in the south and west. There are five strips of silky hairs traversing the corolla lengthwise outside. It needs a dry, sunny spot, and can be increased very readily by cuttings taken during the summer, and placed in gentle heat.

COPROSMA ACEROSA, *A. Cunningham*. RUBIACEÆ.

A low, evergreen shrub, whose prostrate wiry stems are covered with a minute down, and form a mass of interlacing twigs. Leaves opposite, either in pairs or in clusters, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, about $\frac{1}{20}$ in. wide, linear, dark green, smooth. Flowers unisexual; the males from one to four in a cluster, females solitary; both inconspicuous. Fruit globose and berry-like, $\frac{1}{8}$ to $\frac{1}{2}$ in. in diameter, of a pale, translucent blue.

Native of New Zealand, up to 4000 ft. It is a fairly hardy shrub, surviving the winters at Kew, but finding more congenial conditions in milder places. I have seen it very charming in the botanic garden at Glasnevin and in other Irish gardens, where it bears fruit freely. There are two varieties in cultivation, viz.:—var. *BRUNNEA*, *Kirk*, with brown shoots, shorter branches, and more widely separate leaves; and var. *ARENARIA*, *Kirk*, with yellow, more slender branches, and more closely set leaves. According to Mr C. F. Ball of Glasnevin, the former variety fruits much the more freely in Ireland, and is more ornamental. It is suitable for the rock garden.

Another species occasionally grown is *C. PETRIEI*, *Cheeseman*, a dwarf plant with prostrate stems forming broad patches, 2 to 3 ins. high. It has narrow oblong, or obovate leaves, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, more or less hairy. Fruits globose, $\frac{1}{8}$ to $\frac{1}{2}$ in. across, of various shades and depths of purple. Native of the south island of New Zealand up to 4000 ft. elevation. Suitable for rock garden cultivation, and apparently quite hardy.

About forty species of *Coprosma* are found in New Zealand, some of which can be grown on walls, or in the mildest parts of the kingdom, but generally they belong more to the greenhouse than the open air.

COREMA. EMPETRACEÆ.

Two small, evergreen, heath-like shrubs, one native of S.W. Europe, the other of Eastern N. America. They have short, slender leaves mostly in whorls of three, and flowers in terminal clusters, usually but not always unisexual, with the sexes on separate plants. Their only ally in gardens is the crowberry (*Empetrum*), from which the *Coremas* are distinguished by the terminal inflorescence and three-seeded berries. Propagation and cultivation the same as for heaths.

C. ALBUM, *Don*. PORTUGUESE CROWBERRY.

An evergreen shrub, $1\frac{1}{2}$ to 2 ft. high, erect in habit and heath-like; young shoots very downy. Leaves narrow linear, $\frac{1}{4}$ to $\frac{3}{8}$ in. long, blunt, the margins reflexed so as to leave only a narrow slit behind, dark green and soon becoming smooth, mostly arranged in threes. Flowers in terminal clusters, stalkless and inconspicuous. The female plant bears globose white berries in clusters, each berry $\frac{1}{4}$ in. across.

Native of Portugal and Spain; introduced in 1774. It grows very well near London in sandy peat, and resembles its close ally *Empetrum nigrum*, but is taller and larger leaved, and the berry is white with only three seeds. A neat little evergreen, but not showy.

C. CONRADII, *Torrey*. PLYMOUTH CROWBERRY.

An evergreen, heath-like shrub, 6 to 20 ins. high, forming spreading tufts; young branches nearly smooth. Leaves narrow linear, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, blunt, margins much curled back, often arranged in threes and very closely set, dark green. Flowers in terminal heads, the males conspicuous only for the long purplish stamens with brown anthers. Berry very small, dry when ripe, containing usually three seeds.

Native of Eastern N. America, usually in dry, sandy places; introduced in 1841. It is a rare shrub even in a wild state, and is found in only a comparatively few isolated places. Its most famous site is a few acres near Plymouth, Mass., where it is said to be very pretty in April, with its purple flowers. It has never become properly established in English gardens, although several times imported. It is not so robust a plant as *C. album*, from which it is easily distinguished by its small leaves and the almost smooth branchlets.

CORIARIA. CORIARIACEÆ.

A small genus of shrubby and herbaceous plants whose affinities are doubtful. By Bentham and Hooker the natural order is placed near *Anacardiaceæ* (*Rhus*, etc.), but other authorities regard it as more closely allied to *Simarubaceæ* (*Ailanthus*, etc.). The *Coriarias* have simple, opposite, entire leaves; small flowers in racemes terminating the current season's growth, or produced from the joints of the previous season's wood. In some species male and female flowers are borne on separate and distinct racemes. Sepals and petals five; stamens ten; carpels five,

one-seeded. The most interesting character of these plants is the persistence of the petals, which, as the fruit ripens, thicken and become juicy and more or less highly coloured; finally enclosing the fruit. It is to them that the plants owe most of their attractiveness. The leaves and fruits are mostly poisonous.

The Coriarias are scarcely hardy enough to be seen at their best near London, being killed to the ground in severe winters. They are better adapted for more southern and western counties, where they bear fruit with greater certainty. They like a fairly good, loamy soil, and can be propagated by seed (which is preferable), or by cuttings made of half-ripened shoots.

C. JAPONICA, *A. Gray.*

(Bot. Mag., t. 7509.)

A low, deciduous shrub with semi-herbaceous, pithy, four-angled branches, renewing itself by strong shoots from the base; it is rarely more than 2 ft. high in this country. Leaves of variable size, 1 to 3½ ins. long on the secondary shoots, but half as large again on the first-year, sucker-like, basal ones; they are ovate-lanceolate, tapering to a long, fine point, prominently three-nerved, quite smooth and entire, almost stalkless. Racemes produced two or three together from the joints of the year-old branches, 1½ to 2½ ins. long, the male racemes shorter, more slender and drooping than the female ones, the flowers also smaller and inconspicuous. Petals of female flowers at first green, then thickening and becoming fleshy and turning bright coral red, ultimately purplish black; they and the fruit they enclose are ½ in. across.

Native of Japan; introduced to Kew in 1893, through Professor Sargent. It is hardy at Kew, but not long-lived, and should be renewed occasionally by means of seeds or even cuttings. It is better adapted for a slightly warmer climate than that of London, and when seen at its best is extremely beautiful. It has been grown with particular success in the Vicarage garden at Bitton.

C. MYRTIFOLIA, *Linnaeus.* REDOUL.

A deciduous shrub, 4 to 6 ft. high, of bushy habit, sending up from the base rather erect, angular, more or less four-sided stems, which the following year carry graceful, slender, twiggy shoots. Leaves opposite, in pairs, occasionally in threes; quite smooth, entire, ovate, pointed, three-nerved, 1 to 2½ ins. long, very short-stalked, glaucous green. Flowers small, greenish, produced during the summer from the joints of the previous year's growths in racemes about 1 in. long. The petals, after becoming thick, fleshy, and juicy, turn black and shining; they and the fruit they enclose, ¼ in. across. They have a sweetish and in no way disagreeable taste.

Native of the Mediterranean region, especially in the south of France, where it is often the first wild plant to reoccupy plots of ground abandoned from cultivation. It is fairly hardy in the London district, but is killed in very hard winters. When in full growth, which is rather late in the season, it is distinctly handsome in the graceful disposition of its glaucous leaves and branches. It flowers freely, but does not set fruit well in this country.

Both the leaves and fruits are poisonous, the latter especially so, producing, when eaten, convulsions similar to those caused by strychnine. A few years ago three people died from their effects at Carcassone. Various animals, even goats, are sometimes poisoned by the leaves; the fruits, macerated

in sweet water, make an excellent fly-poison. The leaves are rich in tannin, and are used for curing leather and for making ink; they also yield a black dye. Introduced to England in 1629.

C. NEPALENSIS, Wallich.

Naturally a deciduous shrub, with long spreading branches, but too tender to thrive well in the open air at Kew, where it is frequently cut to the ground during winter, and thus prevented from attaining anything like its natural size. Given the protection of glass it will grow 8 ft. high. Leaves ovate or oblong, slightly heart-shaped, 3 or 4 ins. long on the strong primary growths, much smaller on the branchlets, distinctly three-nerved, smooth, entire. Flowers produced on year-old shoots in narrow, cylindrical racemes $1\frac{1}{2}$ ins. long, greenish yellow, the petals becoming in the fruiting stage much thickened, pulpy, and black-purple.

Native of the Himalaya and the Shan Hills, Upper Burma. Its Chinese ally recently introduced by Wilson (*C. SINICA*, *Maximowicz*) may prove hardier than the northern Indian one. It is said to grow as much as 12 ft. high in the mountains of Yunnan, and is already very vigorous with us.

C. TERMINALIS, Hemsley.

(Bot. Mag. t. 852f.)

This species can scarcely be termed a shrub. It forms a woody root-stock which sends up annual branching stems 2 to 4 ft. long, and spreads by underground rhizomes. Leaves ovate, 1 to 3 ins. long, usually five- or seven-nerved, occasionally nine-nerved; much the larger, broader, and rounder on the main stems. Flowers, male and female ones of which are produced on separate terminal racemes 6 to 9 ins. long, are greenish at first, the petals of the female flowers thickening and becoming fleshy in the fruiting stage, and being then black or of a beautiful translucent yellow. Each fruit with its enveloping petals is nearly $\frac{1}{2}$ in. across.

Native of Sikkim, where it was collected by Sir Joseph Hooker, 1849-53; also of China and Thibet; introduced to England in 1897. This beautiful plant, which is distinct from the other cultivated *Coriarias* in its invariably terminal inflorescence (borne on the shoots of the year) and more numerous veined leaves, is hardy at Kew, and fruits there annually. The yellow-fruited form is distinguished as var. *XANTHOCARPA*, *Rehder*, and appears to be confined to Sikkim. Wilson introduced the form with black fruits from W. Szechuen in 1908.

CORNUS. CORNEL. CORNACEÆ.

Trees or shrubs with usually deciduous, opposite leaves, the only exceptions being *C. capitata*, more or less evergreen in mild districts; and *C. alternifolia* and *C. controversa*, both of which have alternate leaves. Flowers usually white, sometimes greenish or yellowish, always small, and produced in terminal corymbs or cymes, or clustered densely in heads; the parts of each flower are in fours. Fruit a drupe containing a two-celled stone. Many of the cornels are characterised by having the hairs of the leaf flattened to the surface and attached to it by their centres.

Botanically there are two well-marked sections of this genus, viz. :—those in which the inflorescence is surrounded at the base by an involucre of usually four bracts, and those in which this involucre is absent. The latter is much the more numerous group; the former consists of the following species :—

1. *Bracts not showy. Flowers in small umbels produced on the naked wood in spring.*—*C. Mas*, *C. officinalis*, *C. sessilis*.
2. *Bracts large and showy. Fruits crowded in a dense head but not united.*—*C. florida*, *C. Nuttallii*.
3. *Bracts large and showy. Fruits of each inflorescence amalgamated into one fleshy mass.*—*C. capitata*, *C. Kousa*.

The greater part of the remaining species are American, and are mostly shrubs of very vigorous growth, but of moderate beauty in flower, sometimes with handsome-barked wood, often with considerable beauty in fruit—an attraction which, through climatic causes no doubt, they rarely display in this country. They all like a loamy soil with abundant moisture, and those of osier-like habit, like *C. alba*, can be increased by cuttings of naked wood put in the open ground like willows, about early November. Others with a stoloniferous habit can be propagated by offsets, and the rest by layers, when seed is not available. The following may be recommended as the best for general cultivation :—

For Flower.—*C. Mas*, *C. circinata*, *C. Kousa*, *C. candidissima*. (In mild localities), *C. capitata*, *C. florida*, *C. Nuttallii*.

For Colour of Leaf.—*C. alba* *Spæthii*, *C. alba sibirica* *variegata*, *C. Mas aurea* *elegantissima*.

For Beauty of Stem.—*C. alba*; *C. stolonifera* *var. flaviramea*.

For Habit.—*C. controversa*, *C. macrophylla*, *C. circinata*, *C. Hessei*.

C. ALBA, Linnæus.

(*C. tatarica, Miller.*)

A deciduous, wide-spreading shrub, producing a thicket of stems erect to prostrate; ultimately 10 ft. high. Bark of the young shoots becoming in autumn and winter rich red. Leaves opposite, ovate to oval, rounded or wedge-shaped at the base, with short slender points; variable in size, but usually from 2 to 4½ ins. long; dark green above, glaucous beneath, with minute flattened hairs on both sides; veins in about six pairs; stalks ½ to 1 in. long. Flowers small, yellowish white, in cymes 1½ to 2 ins. across. Fruit whitish or tinted with blue, about the size of a pea.

Introduced from Siberia in 1741, and a native also of China. This is a rampant shrub, apt to smother anything less vigorous than itself growing near. It is therefore best adapted for forming an isolated mass on a lawn, or on the banks of a pond, where its deep red stems are remarkably effective all through the winter. A number of varieties are in cultivation, of which the following form a representative set :—

Var. GOUCHAULTII, Carrière.—A variegated form, margined with yellow and stained with rose. It is duller than *var. Spæthii*, and with more green and rose in the centre. *Var. FRÆBELI* and *var. TRICOLOR* differ from it but little, and are no better.

Var. SIBIRICA, Loddiges.—Not so rampant a grower as the type, the branches of a paler, brighter, red; fruit bluish. There is a handsome variegated form of this—*SIB. VARIEGATA*, whose leaves have an irregular margin of creamy white; it is thus handsome in summer as well as winter.

Var. *SPÆTHII*, *Wittmack*. Spaeth's Cornel.—Undoubtedly the handsomest of all the variegated cornels, and perhaps the most effective of all deciduous, yellow-variegated shrubs in cultivation. A mass on a lawn has a most striking aspect all the summer through, for the plant has the great virtue of never having its foliage scorched by summer sun, although the major part of the leaf is bright yellow; nor does it become dull as the season advances, like many shrubs of this colour do. When visiting Mr Spaeth's nursery at Rixdorf, near Berlin, a few years ago, I was told that this remarkable shrub originated there on a stem of ordinary *Cornus alba*, on which had been grafted a scion of the variegated sort. The graft died, but just beneath the point of union a yellow variegated twig appeared, which was removed and propagated, and is the var. *Spæthii* as we know it to-day. The bark is red in winter. The shrub does not need a very rich soil, and like the rest of the forms of *C. alba*, can be propagated by cuttings of leafless wood placed in the open ground in late autumn, or by late summer leafy shoots under glass. The outer branches can be easily layered.

Var. *VARIEGATA* (*argenteo-marginata*).—Leaves margined with creamy white. The variegated form of var. *sibirica* is less vigorous, and often preferable.

C. ALTERNIFOLIA, *Linnaeus*.

A deciduous shrub, sometimes with a cluster of erect stems, sometimes a small tree 20 ft. or so high in a wild state, flat-topped and with horizontal branches; young shoots smooth. Leaves alternate, often aggregated at the end of the shoot, oval or ovate, tapered at both ends, the apex often slender-pointed; 2 to 5 ins. long, 1 to $2\frac{1}{2}$ ins. wide; bright pale green and smooth above, more or less glaucous and furnished with centrally attached flattened hairs beneath; stalk 1 to 2 ins. long; veins in five or six pairs. Flowers yellowish white, small, numerous, of little beauty, produced during June in flattish cymes 2 to $2\frac{1}{2}$ ins. across; flower-stalks downy. Fruit roundish, $\frac{1}{4}$ in. diameter, black with a blue bloom.

Native of Eastern N. America; introduced in 1760. Although this species comes from as far north as New Brunswick and Nova Scotia, and therefore capable of withstanding intense cold, it is not infrequently a failure in this country, probably owing to insufficiency of sunlight. Its alternate leaves distinguish it from all other cornels except *C. controversa*, which is a much larger tree with cymes twice as large, and leaves with usually one to three more pairs of veins.

C. AMOMUM, *Miller*.

A deciduous shrub of compact habit, up to 10 ft. high; young bark downy, becoming purple. Leaves ovate, mostly rounded at the base, with short, abrupt points; 2 to 4 ins. long, 1 to $2\frac{1}{4}$ ins. wide; dark green and soon becoming smooth above, paler and with rusty or silky down beneath, especially on the veins; stalks similarly downy, $\frac{1}{4}$ to $\frac{3}{8}$ in. long; veins in four to seven pairs. Flowers small, yellowish white, produced in July in cymes $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. across. Fruit $\frac{1}{4}$ in. across, pale blue.

Native of Eastern N. America; introduced in 1683. A shrub thriving well in our climate, but of no especial value. Its distinctive characters are its purple young wood, the silky reddish down beneath the leaf, and the pale blue fruits.

C. *PURPUSII*, *Koehne*, is a close ally, or perhaps form of the above, found in the same region; the leaves are narrower than in *C. Amomum*, glaucous and minutely warted beneath; the down beneath is greyish, not rusty; veins in about five pairs. Young shoots yellowish red to purplish. Fruit dull blue.

Introduced about 1899, but probably in cultivation long before as *C. Amomum*. It is less compact in habit than that species.

C. ASPERIFOLIA, Michaux.

A deciduous shrub, 10 to 15 ft. high; twigs reddish brown. Leaves ovate or oval, 2 to 4 ins. long, about half as wide; slender-pointed, tapering or rounded at the base, upper surface dark green and rough, with minute, flattened, stiff hairs; lower surface pale and with thicker, softer down; veins in about five pairs; stalk $\frac{1}{3}$ to $\frac{3}{4}$ in. long, grooved, downy. Flowers yellowish white, $\frac{1}{4}$ to $\frac{1}{3}$ in. across, produced in rounded corymbs $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. in diameter; petals narrowly oblong, calyx downy and with very minute teeth. Fruit round, white, $\frac{1}{4}$ in. across.

Native of the eastern and Central United States, found occasionally as a tree nearly 50 ft. high in Arkansas and Texas (Sargent). It reaches as far north as Lake Erie, and appears to be quite hardy near London. It has little, however, to recommend it as a garden shrub.

C. BAILEYI, Coulter.

An erect, deciduous shrub, up to 10 ft. high, with downy shoots turning reddish brown by winter. Leaves ovate or lanceolate, slender-pointed, rounded at the base; 2 to 5 ins. long, 1 to $2\frac{1}{2}$ ins. wide; with minute flattened hairs above, and, when young, with a dense covering of woolly down as well as flattened hairs beneath; stalks slender, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers small, in woolly-stalked cymes 1 to 2 ins. across. Fruit white, $\frac{1}{3}$ in. across.

Native of Eastern N. America; introduced in 1892. It has been much confused with *C. stolonifera*, from which it differs in the shoots and lower surface of the leaves being distinctly woolly, and in not being stoloniferous; the bark also is duller and browner. It is usually found on sandy shores, and is recommended for light soils.

C. CANDIDISSIMA, Marshall.

(*C. paniculata, L'Heritier.*)

A much-branched, deciduous shrub, 8 or 10 ft. high, of bushy habit, with greyish bark; young shoots smooth. Leaves opposite, ovate-lanceolate, wedge-shaped at the base, long and slender pointed, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, half as wide; dark green above, pale or whitish beneath; both surfaces at first furnished with flattened, minute hairs, which largely fall away by autumn; veins in three or four pairs. Flowers small, white, borne in great profusion in June and July, in short cymose panicles about 2 ins. wide, terminating every twig. Fruit white, roundish, but depressed at the top, $\frac{1}{4}$ in. diameter; the stalks bright red.

Native of the eastern and Central United States; introduced in 1758. As a latish flowering shrub this cornel has much to recommend it, for it is usually laden with blossom shortly after midsummer. Unfortunately it does not set its fruit here with the freedom that makes it so attractive in the United States. It is neater and less rampant in growth than those of the alba and stolonifera groups.

Between *C. candidissima* and *C. Purpusii* (see under *C. Amomum*) there is a hybrid called *C. ARNOLDIANA, Rehder*. It originated in the Arnold Arboretum about the end of last century. Compared with *candidissima*, it is of more spreading habit; the year-old branches are purple; inflorescence

less elongated; leaf downy beneath; fruit bluish. Introduced in 1907. (Sargent's *Trees and Shrubs*, t. 40.)

C. STRICTA, *Lamarck* (*C. femina*, *Miller*), is closely allied to *C. candidissima*, and has similar foliage. It differs in having purplish or reddish brown twigs, and pale blue fruits. Native of eastern United States from Virginia southwards; sometimes 16 ft. high.

C. CAPITATA, *Wallich*. BENTHAM'S CORNEL.

(*Benthamia fragifera*, *Lindley*, *Bot. Mag.*, t. 4641.)

A deciduous or partially evergreen tree, 30 to 40 or more ft. high, of bushy habit, and, if allowed to develop without interference by other trees, wider than it is high; young shoots covered with fine, flattened, grey down. Leaves leathery, opposite, oval-lanceolate, tapered at both ends; 2 to 5 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; dull grey-green, covered densely on both surfaces with minute flattened hairs; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers minute, inconspicuous, crowded in a hemispherical mass $\frac{1}{2}$ in. across. The beauty of the inflorescence is in the four or six sulphur-yellow bracts that subtend the true flowers; these are obovate, $1\frac{1}{2}$ to 2 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide. Fruit a fleshy, strawberry-shaped, agglomerated crimson mass, 1 to $1\frac{1}{2}$ ins. across, in which many seeds are imbedded.

Introduced from the Himalaya in 1825, and a native also of China. It is hopeless to attempt to grow this cornel unprotected near London, although it has lived many years against a wall at Kew, but rarely or never flowers there. One has to go to the Cornish gardens, or those of S.W. Ireland to see this tree in its full splendour. The finest tree I have seen is at Fota, probably about 40 ft. high, and 70 ft. in diameter; but there are probably others in Cornwall quite as fine. When covered with the pale yellow "flowers," they provide one of the richest ornaments even those favoured gardens can display. In fruit, too, they are objects of great beauty, but often damaged by birds. The flowers are at their best in June and July, and the fruits in October and November.

C. CONTROVERSA, *Hemsley*.

(*C. brachypoda* of English gardens—not of *C. A. Meyer*.)

A deciduous tree, 30 to 50 ft. high, with horizontal branches produced in tiers; young shoots smooth or soon becoming so, and soon dark coloured. Leaves alternate, ovate or oval, rounded or somewhat wedge-shaped at the base, narrowed abruptly to a slender point; smooth and dark glossy green above; glaucous beneath, and at first furnished with flattened hairs attached by their centres; veins in usually six to eight, sometimes nine pairs; blades 3 to 6 ins. long, 2 to 3 ins. wide; stalk 1 to 2 ins. long. Flowers white, about $\frac{1}{2}$ in. diameter, produced in June and July numerous in flattish cymes 3 to 7 ins. across. Fruit blue-black, globose, $\frac{1}{4}$ in. diameter.

Native of Japan, whence the cultivated plants originated, also of China and the Himalaya. This small tree, so distinct from all other cornels except the North American *C. alternifolia* in its alternate leaves, is of very elegant habit. It sends its slender branches out horizontally, and they are produced in a group at the end of each season's growth. When of sufficient age, it flowers freely, as an old specimen about 30 ft. high in the Coombe Wood nursery shows.

Var. *VARIEGATA* (*C. brachypoda variegata* of gardens) is a form with long, narrow, lanceolate leaves, rarely more than $1\frac{1}{2}$ ins. wide, often unequal-sided and more or less deformed, but strikingly variegated with an irregular, yellowish white border, and possessing the elegant pose of the type.

Although this cornel has been in cultivation at least thirty years, the name "*controversa*" was only given to it by Mr Hemsley in 1909 (see *Kew Bulletin* for that year, p. 332). Previously it had been known in England as "*C. brachypoda*," and on the Continent as "*C. macrophylla*," in both cases erroneously, as these are synonymous terms for an opposite-leaved cornel (*C. macrophylla*, *Wallich*—q.v.). It will no doubt take some time to straighten out the confusion in gardens, but the matter is simply stated thus :—

Tree with opposite leaves is *C. macrophylla*.

Tree with alternate leaves is *C. controversa*.

The name "*C. brachypoda*" disappears as a synonym.



CORNUS FLORIDA.

C. FLORIDA, *Linnaeus*. FLOWERING DOGWOOD.

(Bot. Mag., t. 526.)

A deciduous, wide-spreading, small tree, 10 to 20 ft. high in cultivation, but occasionally twice as high in some parts of its native habitat; young shoots soon becoming smooth. Leaves opposite, broadly oval or ovate; 3 to 6 ins. long, $1\frac{1}{2}$ to 3 ins. wide; rounded or tapered at the base, the apex with a short, abrupt, slender point; dark green and with scattered down above; pale, rather glaucous and downy beneath; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers insignificant, $\frac{1}{4}$ in. long, produced in a crowded head $\frac{1}{2}$ in. across, green tipped with yellow. The real beauty of the plant is in the four bracts that form in autumn and enclose the flower-head during the winter, expanding in May. These bracts are inversely heart-shaped, the apex broad, rounded and notched, white, $1\frac{1}{2}$ to 2 ins. long, the whole forming a showy, corolla-like involucre 3 to 4 ins. across, commonly called the "flower."

Native of the eastern United States, where it is generally distributed from Massachusetts southwards; introduced in the early part of the eighteenth century, and cultivated by Thos. Fairchild in his nursery at Hoxton in 1730. There is also evidence of its having been grown by Miller at Chelsea in 1739. Although really a very hardy shrub so far as its capability of supporting

extreme cold is concerned, as is shown by its perfect health and robustness in the neighbourhood of Boston, Mass., it has never become generally cultivated in Britain. Through its susceptibility to spring frosts and the indifferent ripening of its wood in autumn, it is rarely seen in good health. It thrives very well in the garden at Grayswood Hill, Haslemere, which, being elevated a few hundred feet, escapes the late frosts that visit the valleys. After a fine summer its leaves change to glorious shades of red and crimson.

Var. *PENDULA*.—Branches rather stiffly pendulous.

Var. *RUBRA* (Bot. Mag., t. 8315).—Bracts of a bright rosy red instead of the ordinary white; extremely beautiful. This variety succeeds even better than the type at Grayswood Hill.

C. GLABRATA, *Bentham*. WESTERN CORNEL.

A deciduous shrub up to 10 or 12 ft. high, of bushy, densely twiggy habit; young shoots dark, smooth. Leaves lanceolate, or narrowly oval, tapered at both ends; $1\frac{1}{4}$ to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; glossy green on both sides, and with minute, closely pressed hairs; slightly paler beneath; veins in three to five pairs; stalk slender, $\frac{1}{6}$ to $\frac{1}{2}$ in. long. Flowers dull white, in small cymes which are $1\frac{1}{4}$ ins. or less in diameter. Fruit white or bluish white.

Native of Western N. America from Oregon to California. It has little beauty of flower, but is a neat-habited shrub of cheerful aspect, distinct in its small, abundant leaves, shining green on both sides.

C HESSEI, *Koehne*.

A dwarf, very compact, slow-growing, deciduous shrub; dense in habit and apparently not likely to exceed 2 ft. in height. Leaves opposite, crowded, oval-lanceolate, wedge-shaped at the base, slender pointed; 1 to $2\frac{1}{2}$ in. long, about one-third as wide; very dark, almost black-green above, glaucous beneath, both surfaces with flattened hairs; veins in three to five pairs. Flowers pinkish white, produced the summer through in cymes $1\frac{1}{2}$ ins. across. Fruit dingy bluish white, flattened globose, scarcely $\frac{1}{4}$ in. wide.

The native country of this very distinct little shrub does not appear to be known, but it is probably from N.E. Asia. It is quite unlike any other cornel in its dense, very leafy, compact habit and curiously dark foliage.

C. KOUSA, *Buerger*.

(Garden, Feb. 25, 1893; *Benthamia japonica*, *Siebold*.)

A deciduous shrub or small tree, up to 20 ft. in height, of bushy habit; young shoots smooth. Leaves ovate with a slender point and wedge-shaped base, $1\frac{1}{2}$ to 3 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; margin undulated; both surfaces have minute, scattered hairs at first, becoming smooth except for brown tufts in the vein-axils, stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers small and inconspicuous, produced in a round, button-like mass $\frac{3}{8}$ in. across. The beauty of the shrub, as in *C. florida* and *C. Nuttallii*, is in the bracts that accompany the inflorescence. These are four in number, lanceolate, slender-pointed, spreading; 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide; creamy white. The main-stalk is slender, smooth, 2 to $2\frac{1}{2}$ ins. long. Fruit fleshy, strawberry-like in shape.

Native of Japan, Corea, and Central China. At Coombe Wood, where there is a fine specimen, it thrives admirably, and flowers freely in May and June. The bracts and flowers are borne on short, lateral spurs at the end of a small two- or four-leaved twig and stand up erect in rows along the branches; they have

a very striking and beautiful effect. Of the species that owe their beauty to their large showy bracts as distinct from the true flowers, this is the most promising for our climate. It is only likely to be confused in gardens with *C. florida*, its East American ally, but its long slender-pointed bracts readily distinguish it. Botanically it is more nearly allied to *C. capitata*, as is shown by the agglomerated fruits.

C. MACROPHYLLA, Wallich.

(Bot. Mag., t. 8261; *C. brachypoda*, C. A. Meyer.)

A deciduous tree, 30 to 50 ft. high; young shoots smooth or nearly so. Leaves opposite, ovate to roundish or oblong, the base rounded or tapering, the apex with a slender, often tail-like point; 4 to 7 ins. long, 2 to 3½ ins. wide; bright green, and soon becoming smooth above; glaucous beneath, and



CORNUS KOUSA.

at first clothed with pale, flattened, minute hairs attached at their middle; veins in six to eight pairs; stalks ½ to 1¼ ins. long. Flowers yellowish white, numerous, produced in terminal, somewhat rounded cymes 4 to 6 ins. across; each flower ½ in. diameter; petals oblong; calyx minutely toothed, grey with minute down. Fruit globose, ¼ in. diameter, blue when ripe. Blossoms during July and August.

Native of the Himalaya, whence it was introduced in 1827, China, and Japan. It is a handsome and striking small tree, chiefly noteworthy for its fine foliage; the flowers, although profusely borne, are of too dull a white to be very effective. There is a tree approaching 40 ft. in height in Coombe Wood nursery. Much confusion has existed between this species and *C. controversa*, which, although an alternate-leaved species, has long been known on the Continent as "*C. macrophylla*." (See note on *C. controversa*.)

C. MAS, Linnæus. CORNELIAN CHERRY.

(*C. mascula*, Linnæus; Bot. Mag., t. 2675.)

A deciduous shrub or small tree, sometimes 25 ft. high, of spreading, rather open habit; young branchlets covered with minute, flattened, greyish hairs.

Leaves ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide (sometimes considerably larger on strong shoots); apex slender-pointed; base tapered or rounded; dark dull green, both surfaces furnished with centrally attached, flattened hairs; veins in three to five pairs; stalk $\frac{1}{4}$ in. or less long. Flowers $\frac{1}{2}$ in. diameter, yellow, produced in February and March on the leafless stems in short-stalked umbels from the joints of the previous year's wood, each umbel about $\frac{3}{4}$ in. across, enclosed before opening in four downy, boat-shaped bracts. Fruit a bright red, oblong drupe $\frac{5}{8}$ in. long, about $\frac{1}{2}$ in. wide, indented at the apex, of good acid flavour.

Native of Europe, cultivated for many centuries in Britain. Before the introduction of the Japanese witch hazels the Cornelian cherry was the most effective of yellow-flowering shrubs in bloom as early as February. It is still one of the most valuable we have. As it is without foliage when in bloom, it is a great advantage if it can be associated with some evergreen, such as holly. The fruit is handsome, but not, in my experience, freely borne. The wood, although limited in quantity, has considerable value because of its tough, hard, durable nature. It was formerly, if not now, much used on the Continent for small articles in domestic use. The fruit also used to be made into a rob or preserve. The following varieties are in cultivation:—

Var. AUREA ELEGANTISSIMA.—Leaves prettily variegated, having a wide unequal border of yellow, some entirely yellow; others tinged with pink.

Var. LANCEOLATA, *Kirschner*.—Leaves smaller, more lance-shaped.

Var. NANA.—Of dwarf, rounded habit.

Var. VARIEGATA.—Similar to aurea elegantissima, but with creamy white variegation.

Var. XANTHOCARPA.—Fruits clear bright yellow. There are also var. FRUCTU VIOLACEO, with presumably purple fruits, and var. ALBOCARPA, with white ones; but I have not seen them, nor are they likely to be of much interest here, where the tree is shy-fruited.

C. OFFICINALIS, *Siebold*, is very closely allied to C. Mas, and is a Korean species occasionally seen in gardens. It has the same yellow flowers and red fruits, but it differs in having in addition to the flat hairs attached by their centres, conspicuous patches of dense, rusty-coloured down beneath the leaves, in and near the vein-axils. It has also two additional (five to seven) pairs of veins to each leaf. When in flower it is not distinguishable from C. Mas, except that the habit is perhaps coarser. It is occasionally 30 ft. high in Japan.

C. NUTTALLII, *Audubon*.

(Bot. Mag., t. 8311.)

A deciduous tree up to 50 ft. high, rarely 80 to 100 ft. in a wild state, but often a shrub; young shoots minutely downy, becoming smooth. Leaves oval or obovate, tapered at the base, short-pointed, 3 to 5 ins. long, $1\frac{1}{2}$ to 3 ins. wide; downy on both sides, especially beneath; veins in five or six pairs; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers very small, crowded into a dense head $\frac{3}{4}$ in. across, purple and green; surrounding them is a whorl of four to eight, commonly six, showy bracts which make what is commonly termed the "flower." These bracts are roundish oval or obovate, pointed, and from $1\frac{1}{2}$ to 3 ins. long, 1 to 2 ins. wide, at first creamy, then white flushed with pink. The flower-head is formed the previous autumn, and is not enclosed by the bracts during winter, as in C. florida, but remains exposed, expanding with the bracts in May.

Native of Western N. America, where it is one of the most beautiful of flowering trees. In autumn, too, it is said to light up the forest by the yellow and scarlet of its decaying leaves. It is undoubtedly the noblest of the cornels,

its "flowers" sometimes 6 ins. across; unfortunately it is not perfectly adapted to the colder parts of Great Britain, but succeeds in the southern counties. It is better under cultivation at Kew than *C. florida*, and flowers regularly. The best specimen I know of is at Grayswood Hill, Haslemere, which a few years ago was 15 ft. high, and flowered freely.

C. PAUCINERVIS, Hance.

A deciduous shrub, 6 ft. or more high; young shoots angular, with very minute appressed hairs at first, becoming smooth. Leaves narrowly oval; tapering about equally towards both ends; $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide with two or three pairs of prominent longitudinal veins, both surfaces covered, with minute appressed hairs. Flowers white, $\frac{1}{2}$ in. across, produced in rounded hairy corymbs $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. across. Fruits black, globose, $\frac{1}{4}$ in. wide. The most distinctive character of this species is the narrow shape and few veins of its firm-textured leaves. The chief veins originate in pairs from the lower part of the midrib, and after curving outwards bend inwards again towards the top of the leaf. The shrub is pretty, and useful in flowering in late July and August.

Native of W. and Central China; introduced by Wilson in 1907. It first flowered with the Hon. Vicary Gibbs at Aldenham, in 1911.

C. PUBESCENS, Nuttall.

A deciduous shrub, 6 to 18 ft. high in a wild state, with smooth, purple branches. Leaves opposite, narrowly oval or ovate, $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide, tapered or somewhat rounded at the base, blunt or pointed, rarely slender at the apex; dark green and slightly hairy above; pale and woolly beneath. Flowers yellowish, crowded densely in compact, rounded, downy cymes about 2 ins. across. Fruit white.

Native of British Columbia south to California; introduced in 1874. It blossoms towards the end of May and in June, and is pretty then. It is also distinct in its dark purplish branches and in its leaves, woolly beneath.

C. RUGOSA, Lamarck.

(*C. circinata, L'Heritier.*)

A deciduous shrub, 6 to 10 ft. high, sometimes single-stemmed and like a small tree; young shoots green, warted, becoming purplish. Leaves roundish, inclined to ovate, abruptly pointed; $2\frac{1}{2}$ to 5 ins. long, nearly as wide; almost smooth above, but covered beneath with a dense greyish wool; veins in six to eight pairs; stalk about $\frac{1}{2}$ in. long. Flowers white, in slightly downy cymes 2 to 3 ins. diameter. Fruit pale blue, about $\frac{1}{4}$ in. diameter.

Native of E. Canada and the United States; introduced in 1784. This species is very rarely seen in English gardens; but as I saw it, covered with flower in the Arnold Arboretum about mid-June a few years ago, it was quite ornamental and had assumed the form of a miniature tree. Among the swarm of North American cornels this can be distinguished by its almost orbicular leaves, very downy beneath.

C. SLAVINII, Rehder, is a hybrid between *C. circinata* and *C. stolonifera*, first noticed in Seneca Park, Rochester, New York, near the gorge of the Genesee River. The leaves are woolly beneath, and the young wood is purplish as in *C. circinata*, but the habit is more that of *C. stolonifera*, only more upright. Leaves intermediate in shape. (See *Rhodora*, vol. xii., p. 111.)

C. SANGUINEA, *Linnæus*. COMMON DOGWOOD.

A deciduous shrub, 6 to 12 ft. high, of erect habit; young shoots minutely downy, dull dark green. Leaves ovate, $1\frac{1}{2}$ to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; tapered and rounded at the base, slender-pointed, furnished, especially when young, with pale scattered hairs on both surfaces, which are longer beneath than above; veins in three or four, sometimes five pairs; stalks $\frac{1}{8}$ to $\frac{1}{2}$ in. long. Flowers dull white, with a heavy odour, produced during June in cymes $1\frac{1}{2}$ to 2 ins. across; sepals and flower-stalks downy; petals about $\frac{1}{4}$ in. long. Fruit globose, purplish black, shining, $\frac{1}{4}$ in. wide, with a bitter taste.

Native of Europe, including the south of England, where it is abundant in some localities. It is a shrub of undistinguished character, its chief value being in the fine autumnal red of its leaves. The specific name applies to this and not to the young bark, which has nothing more than an occasional dark red tinge on the exposed side. The wood is tough and hard, and is used for making butchers' skewers and such like.

Var. *VARIEGATA*.—A poor form, with variegated leaves.

Var. *VIRIDISSIMA*.—Said to have green fruit.

C. SESSILIS, *Torrey*.

But little is known in cultivation of this North Californian shrub, which in a wild state is 10 to 15 ft. high, and was introduced in 1903. The young bark is greenish, and clothed with silky hairs; leaves shortly stalked, crowded at the end of the twigs; $1\frac{1}{2}$ to 3 ins. long, ovate, tapered at both ends, but more gradually towards the apex; nearly smooth above, and with flattened hairs and tufts of down in the vein-axils beneath; veins in about four pairs. Flowers $\frac{1}{4}$ in. across, yellow, crowded in stalkless umbels, at first enclosed by four ovate bracts $\frac{1}{8}$ in. long; flower-stalks silky, $\frac{1}{8}$ in. long. Fruit oval, $\frac{1}{2}$ in. long. This shrub, producing its flowers, themselves stalked, in clusters without stalks, from the axils of four bracts and on leafless twigs, belongs to the same group as *C. Mas* and *C. officinalis*.

C. STOLONIFERA, *Michaux*. RED OSIER DOGWOOD.

A vigorous deciduous shrub, up to 8 ft. high, suckering freely, and spreading by underground stems; bark of young shoots dark purplish red, smooth. Leaves ovate, oval or oval-lanceolate, with long, tapered points; 2 to 5 ins. long, 1 to $2\frac{1}{2}$ ins. wide; upper surface dark green, lower one glaucous, both with flattened hairs; veins in about five pairs; stalk $\frac{1}{2}$ to 1 in. long. Flowers dull white, small, in cymes 1 to 2 ins. across. Fruit white, globose, $\frac{1}{8}$ in. across.

Native of N. America, reaching across the continent. It is allied to the Asiatic *C. alba*, but is distinguished by the longer-pointed leaves and stoloniferous habit.

Var. *FLAVIRAMEA*, *Spath*.—Bark of young shoots yellow, and effective in winter. Sent out by Spath in 1899.

COROKIA COTONEASTER, *Raoul*. CORNACEÆ.

A remarkable evergreen, but sparsely leaved shrub, up to 8 ft. in height, forming a rounded bush; branches thin, exceedingly tortuous and interlaced, somewhat rigid, and covered with white down when young, becoming almost black with age. Leaves alternate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long

(including the broad, flat stalk), roundish ovate or obovate, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide, smooth and dark green above, covered beneath with a white felt.



COROKIA COTONEASTER.

Flowers star-shaped, bright yellow, $\frac{1}{2}$ in. across, short-stalked, solitary, or as many as four in the leaf-axils; petals five, narrowly linear, pointed, silky at the back; calyx silky white, with five short, ovate lobes. Fruit red, round or oblong, $\frac{1}{4}$ to $\frac{1}{3}$ in. long.

Native of New Zealand; introduced about 1875. At Kew this curious shrub needs the protection of a wall, where it thrives very well, and where its contorted branches, thin entangled twigs, and tiny spoon-shaped leaves are a perennial source of interest to visitors. It blossoms in May, and although not showy is decidedly pretty and interesting. The fruits have ripened in Canon Ellacombe's garden at Bitton, and in shape and colour are not unlike small Cornelian cherries. In the southern and milder counties it may be grown in the open; it thrives very well unprotected with Miss Willmott at Warley Place in Essex. "Corokia" is adapted from the Maori name "Korokia."

CORONILLA. LEGUMINOSÆ.

A genus of shrubs and herbaceous plants, two of the former being hardy in Britain and others half hardy. The distinctive features of the genus are the pinnate leaves, the umbellate arrangement of the pea-shaped flowers, the long-clawed petals, and the curious seed-pods. The last are slender, round, and separated into several one-seeded compartments defined by a constriction of the pod. The two hardy species are of easy cultivation, liking a moderately rich, well-drained, loamy soil and a sunny position. They are propagated by cuttings, which may be struck either in a soft condition (when bottom heat should be given) or later, when the growths are more woody, under a bell-glass in a cold frame. Besides the species described below, *C. GLAUCA*, *Linnaeus*, is occasionally grown outside, in the south and west. In Essex also, especially at

Warley Place, there are fine bushes growing on the sunny side of walls and against hothouse walls. In such places its glaucous, pinnate leaves and umbels of rich yellow flowers make it charming, but on the whole it must be regarded as needing winter protection in most parts of the country.

C. EMEROIDES, Boissier.

A deciduous shrub, 4 or 5 ft. high, with angled branches. Leaves in two opposite rows, pinnate, composed usually of seven leaflets; leaflets obovate, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, with a few appressed hairs or quite smooth. Flowers borne in an umbel at the end of a stalk 2 to 3 ins. long, with from four to eight (oftenest five) flowers in the umbel; each flower $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Petals yellow, with a long claw; calyx $\frac{1}{8}$ in. long, cup-shaped. Pod 2 to 3 ins. long, slender, round and jointed, each segment containing one seed.

Native of Greece, Crete, and other parts of S.E. Europe, also Syria. It is nearly allied and very similar to the well-known *C. Emerus*, in habit, leaf, colour and shape of flower. But it is distinguished by having seven instead of nine as the usual number of leaflets, by its longer-stalked umbels, and by the more numerous flowers in each. It commences to flower in May or June, and continues for several months.

C. EMERUS, Linnæus. SCORPION SENNA.

(Bot. Mag., t. 445.)

A deciduous shrub, 7 to 9 ft. high, and as much through, of elegant habit. Branchlets angled, grooved, and smooth. Leaves 1 to 2½ ins. long, alternate, pinnate, distichous, composed usually of seven or nine leaflets, which are obovate, $\frac{1}{8}$ to $\frac{3}{4}$ in. long, slightly downy when young. Flowers borne on slender stalks, 1 to 2 ins. long, springing from the leaf-axils, and carrying not more than three flowers at the top. These are yellow, $\frac{3}{4}$ in. long, and distinct on account of the long claw to each petal; the standard petal has a reddish brown line down the back. Pods 2 ins. long, very slender, round, and jointed into several portions, each portion containing one seed.

Native of Central and S. Europe; cultivated in England for more than three centuries. This is a very pleasing, graceful shrub, which begins to flower in May and continues until October. The popular name refers to the slender articulated seed-pod, which is compared to a scorpion's tail. It is very abundant as an undergrowth in thin woodland, in some places along the French and Italian Riviera.

C. JUNCEA, Linnæus.

A curious shrub, 2 to 3 ft. high, with round, rush-like, somewhat hollow, zigzag, much-forked branches. Leaves $\frac{3}{4}$ to 1½ ins. long, pinnate, composed of five or seven leaflets, which are narrow, oblong, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the common stalk flattened. Flowers yellow, $\frac{1}{3}$ in. long, arranged in often globose umbels produced from the leaf-axils, each umbel carrying six to twelve flowers. Seed-pods very slender, about 1 in. long.

Native of S. Europe; introduced, according to Aiton, in 1656, but always rare on account of its tenderness. It has succeeded against a wall in the Cambridge Botanic Garden, but except in some such warm corner its tenure is precarious.

CORYLOPSIS. HAMAMELIDACEÆ.

A small genus of deciduous shrubs and small trees from N.E. Asia, with bristle-toothed leaves resembling those of the hazel (*Corylus*) hence the name. The flowers are pale, sometimes greenish, yellow, produced on the leafless shoots in short, pendent spikes; they are usually fragrant. The parts of the flower are in fives. Leaves alternate, plaited in the bud state, veins parallel, strong, proceeding from the midrib at an acute angle. Fruit a woody capsule. From its hardy allies—*Hamamelis* and *Parrotia*—the genus is very distinct. The spike on which the flowers are borne is really a short branch. At the base there are a few thin, membranous, bract-like organs, which are not accompanied by flowers, but from the axils of which a leaf is developed after the flowers farther along the spike have faded. By the time the seed-vessels are ripe these leaves are fully developed. (See Hemsley in *Gardeners' Chronicle*, Jan. 13, 1906, p. 18.) Seeds in all the known species black.

As garden shrubs the species of *Corylopsis* are not in the very first rank; at the same time the flowers have a soft beauty of their own, and they are among the earliest to open in spring. Of the better known species, *C. spicata* is the hardiest, but it is possible it may in future prove to be equalled both in that respect and in beauty by the newer Chinese species.

C. PLATYPETALA, *Rehder*, is a new species from W. Hupeh, China, introduced by Wilson in 1908. Its most distinctive character appears to be its "broad, hatchet-shaped petals." Its branchlets are smooth except for sparse gland-tipped hairs, yellow, grey the second year. Leaves ovate to roundish, up to 4 ins. long, soon quite smooth, rather glaucous beneath. Flowers pale yellow, fragrant, up to twenty in a raceme; calyx and fruit glabrous.

Var. *LÆVIS*, from W. Szechuen, has brown year-old shoots.

C. GRIFFITHII, *Hemsley*.

(*C. himalayana*, Bot. Mag., t. 6779—not of *Griffith*.)

A shrub with very downy young wood. Leaves 3 to 4½ ins. long, 2 to 3 ins. wide, broadly ovate or roundish, more or less heart-shaped at the base, long-pointed, toothed; upper surface pale green, not downy, lower one downy, especially on veins and midrib; stalk 1 to 1½ ins. long. Flowers pale primrose-yellow, very closely packed on pendulous spikes, 1½ to 2½ ins. long, ¾ in. wide; basal bracts very thin, silky inside, oblong, ½ to 1 in. long, those of the flowers much smaller and silky both sides; anthers purplish red.

Native of the Himalaya; introduced to Kew in 1879. One of the most ornamental of *Corylopsis*, this is, unfortunately, not hardy enough to succeed without wall protection. It may be recommended for the south-western counties.

C. PAUCIFLORA, *Siebold*.

(Bot. Mag., t. 7736.)

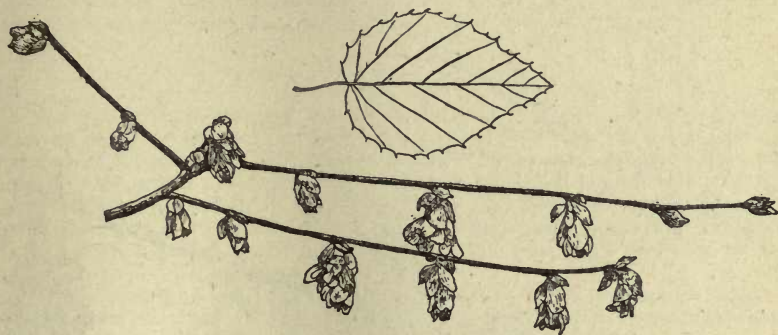
A shrub of spreading habit up to about 4 ft. high; branches slender, smooth. Leaves more or less broadly ovate, heart-shaped at the base, acutely pointed; 1½ to 3 ins. long, 1 to 2 ins. wide; with a few bristle-like teeth,

smooth and bright green above, somewhat silky beneath on the veins and margins; stalk slender, $\frac{1}{3}$ to $\frac{1}{2}$ in. long. Flowers primrose-yellow, about $\frac{3}{4}$ in. across, produced two, sometimes three together on short spikes; basal bracts of spike pale green, thin, hairy inside.

Native of Japan; introduced by Messrs Veitch. Although the spikes of this charming little shrub are shorter and fewer-flowered than in *C. spicata* and other species, the blossom itself is larger, more open, and more beautiful. The plant itself is not so hardy as *C. spicata*, and I have known it destroyed by severe cold; owing to its early growth also, spring frosts frequently pinch the young shoots. For the milder parts of the kingdom no more delightful March-flowering shrub could be chosen. It differs from all the other hardy species in its large, open flowers.

C. SINENSIS, *Hemsley*.

A shrub 10 to 15 ft. high in a wild state; young shoots downy and (like the leaf-stalks) more or less glandular. Leaves obovate-oblong, 2 to $3\frac{1}{2}$



CORYLOPSIS PAUCIFLORA.

ins. long, abruptly pointed, heart-shaped at the base, toothed, silky-felted beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ ins. long, very downy. Flowers pale primrose-yellow, fragrant, produced twelve to eighteen together during April in a drooping spike $1\frac{1}{2}$ to 2 ins. long, each flower $\frac{1}{2}$ in. long; petals orbicular, $\frac{1}{6}$ in. diameter; anthers yellow; calyx greenish yellow with short rounded lobes; stipular bracts broader than long, concave, silky inside and at the margins, smooth outside, yellow-green; floral bracts hairy both sides. Fruits globose, $\frac{1}{2}$ in. diameter, hairy.

Native of Central and W. China; introduced by Wilson for Messrs Veitch about 1901. It appears to be closely allied to *C. Griffithii*, but differs in the basal bracts of the inflorescence being broader and shorter, and in the yellow anthers. *C. spicata* has differently shaped leaves, much more glaucous, and broadest below the middle. *C. sinensis*, so far as can be judged at present, is quite hardy. At Coombe Wood it grows vigorously and is 5 ft. or more high, flowering regularly in April. It promises to be as useful in gardens as *C. spicata*.

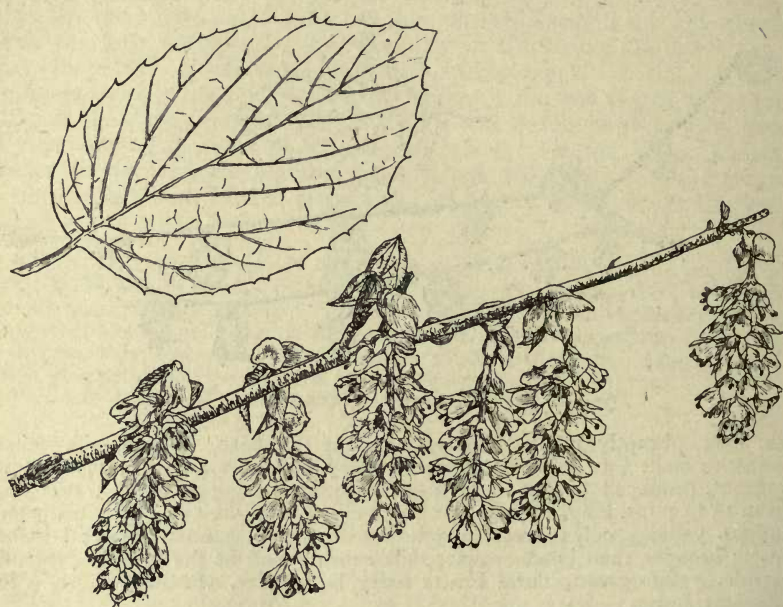
C. SPICATA, *Siebold*.

(Bot. Mag., t. 5458.)

A wide-spreading bush up to 6 ft. high, with crooked, flexible branches, clothed with silky down when young. Leaves broadly heart-shaped, pointed;

3 to 4 ins. long, 2 to 3 ins. wide ; edged with minute bristle-like teeth ; dull pale green above, glaucous and downy beneath ; stalks woolly, $\frac{1}{2}$ to 1 in. long. Flowers yellow, six to twelve appearing on a drooping spike, the main stalk of which is very woolly, produced in March and April from the naked shoots of the previous summer. The base of the spike is occupied by several large, yellowish green, ovate bracts, silky inside ; on the terminal portion of the spike the bracts are much smaller, and in the axil of each one is a stalkless flower. Petals obovate, $\frac{1}{3}$ to $\frac{1}{2}$ in. long. Seed-vessels downy, top-shaped, $\frac{1}{3}$ in. long.

Native of Japan ; introduced by Messrs Veitch about 1863. The quiet beauty of this shrub would perhaps be little noticed two months later in the year, but being one of the earliest to blossom and often at its best in March, it becomes particularly welcome, especially as the soft yellow of its flowers is accompanied by a charming cowslip-like fragrance. The shrub itself is quite hardy, but the flowers are damaged by inclement weather.



CORYLOPSIS VEITCHIANA.

C. VEITCHIANA, *Bean*.

(Bot. Mag., t. 8349.)

A shrub 5 to 6 ft. high, of rounded, bushy habit ; young shoots quite smooth, reddish. Leaves oval or ovate, with a heart-shaped base ; contracted at the apex to a short, slender point ; 2 to 4 ins. long, $1\frac{1}{2}$ to 2 ins. wide ; purplish and sparingly silky hairy beneath when young, somewhat glaucous and perfectly smooth when fully grown ; veins in six or seven pairs, the lowest pair giving off four to six nerves outwards ; stalk about $\frac{1}{3}$ in. long. Flowers fragrant, primrose-yellow, produced in a nodding spike 1 to 2 ins. long, $\frac{3}{4}$ in. wide. Basal bracts smooth outside ; floral bracts hairy outside. Anthers

red-brown, distinctly protruded. Calyx lobes short, rounded, hairy. Fruit at first densely hairy, about $\frac{1}{2}$ in. long.

Introduced in 1900 by Wilson from Western Hupeh, China, and first raised in the Coombe Wood nursery, where it has flowered each April for some years past. From *C. sinensis* it differs in its glabrous leaves and protruded red-brown anthers.

C. WILLMOTTIE, Rehder and Wilson.

A deciduous shrub, 6 to 12 ft. high; young shoots brown, not downy, but with numerous small lenticels; winter buds pale shining green, stalked. Leaves 2 to 4 ins. long, oval, obovate or roundish ovate; truncate or slightly heart-shaped at the base, short-pointed; dark bright green and smooth above; rather glaucous beneath and downy, especially on the midrib and veins; veins in seven to ten pairs. Flowers soft greenish yellow and fragrant. Calyx, ovary, and fruit smooth.

Native of W. Szechuen, China; introduced by Wilson in 1909; first shown in flower at the Horticultural Hall, 5th March 1912, as "*C. multiflora*." The true plant of that name does not appear to be in cultivation.

C. WILSONI, Hemsley.

A shrub or small tree, the branchlets at first furnished with stellate down. Leaves ovate or obovate; 3 to 5 ins. long, $1\frac{1}{4}$ to 3 ins. wide; abruptly contracted at the apex to a long narrow point, the base heart-shaped, the margin edged with bristle-like teeth; glaucous beneath, and smooth on both sides when mature; stalk $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long. Flower-spike 2 to 3 ins. long, the basal or stipular bracts roundish ovate, $\frac{3}{4}$ in. long, silky hairy on both sides; flower bracts similar except for being smaller. Petals $\frac{1}{4}$ in. long, narrowly obovate, primrose-yellow. Fruits not downy.

Discovered and introduced to the Coombe Wood nursery in 1900. It differs from all other cultivated *Corylopsis* in having the lower bracts hairy outside. In many other respects it resembles *C. Veitchiana*.

CORYLUS. HAZEL, FILBERT. CORYLACEÆ.

Corylus belongs to the group of trees and shrubs with the male flowers in slender, pendulous catkins, and the fruit (a nut) enclosed wholly or in part by one or more bracts forming an involucre (husk). Its nearest allies are *Ostrya*, *Carpinus*, and *Ostryopsis*, the four constituting the natural order.

The hazels are well-marked deciduous trees and shrubs, with alternate, toothed leaves. Male and female flowers are borne on the same plant, the male catkins usually in clusters of two to five. Female flowers scarcely discernible individually, the visible part of each being two red stigmas projecting from the flower-bud; the catkin bears several flowers in the axils of its upper scales. The seed is enclosed by a hard shell, which is itself set in a husk rather fleshy at the base, with coarsely toothed or lobed margins.

In gardens the hazels are chiefly known as bearing edible nuts, viz., cobnuts and filberts. The common species have not much to attract planters for ornament alone, although in February when they are freely hung with the graceful, slender, yellow, male catkins, they have that

charm in great degree which even the humblest flower possesses to some extent at that early season. The female flowers, too, sometimes give a quite effective red haze in sunshine. *C. Columna* is a striking tree, and the new *C. chinensis* is of similar although possibly not so robust habit. *C. rostrata* and *C. mandschurica* have remarkable fruits. The attention of those who admire purple shrubs may be directed to *C. maxima atropurpurea*.

They all thrive well in a loamy soil, and are very suitable for chalky districts. The sorts grown for their fruit are most fertile on soil of moderate quality. In this country *C. Columna* needs some attention to ensure the formation of a good clean trunk by watching, and, if necessary, training up the leading shoot, and removing lower branches and suckers. As to propagation, most of the hardy sorts can be increased by taking off the suckers; if these do not form, layering should be adopted, and for the genuine species seed is usually obtainable. They bear transplanting well.

The species of *Corylus* are very much alike in leaf, and are best distinguished by habit and by the form of the husk. The following ten species may be classed as follows:—

I. TREES.

1. *Columna*. } Husk fringed with numerous segments $\frac{1}{2}$ to 1 in. long.
2. *Chinensis*. }
3. *Tibetica*. Husk very spiny, like a sweet chestnut.

II. SHRUBS.

4. *Americana*. }
5. *Avellana*. } Husk open at the end, showing the nut.
6. *Heterophylla*. }
7. *Mandschurica*. } Husk bristly, hairy, and downy, protruded beyond the nut into a long
8. *Rostrata*. } beak and hiding it.
9. *Sieboldiana*. Like Nos. 7 and 8, but with a beak only one-third as long.
10. *Maxima*. Husk about twice as long as the nut, downy, but not bristly hairy.

C. AMERICANA, *Walter*. AMERICAN HAZEL.

A shrub up to 8 or 10 ft. high; young shoots glandular-hairy. Leaves broadly oval or ovate to roundish, coarsely, irregularly, or doubly toothed, heart-shaped or rounded at the base, pointed; 2 to 5 ins long, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. wide; upper surface with scattered hairs, downy beneath; stalk $\frac{1}{8}$ to $\frac{1}{2}$ in. long, glandular-hairy. Male catkins $1\frac{1}{2}$ to 3 ins. long. Nut roundish, egg-shaped, about $\frac{1}{2}$ in. long, slightly flattened and set in a husk (involucre), which is nearly double its length, downy, much and deeply toothed.

Native of Eastern N. America; introduced in 1798. The American hazel is very similar in habit to *C. Avellana*, but does not grow so high in this country. It is readily distinguished from it in fruit by the involucre being so much longer. Compared with *C. Avellana*, it is of no value as a nut-bearer in this country, and is scarcely needed except for botanical collections.

C. AVELLANA, *Linnaeus*. HAZEL or COBNUT.

A shrub 12 to 20 ft. high, sometimes with the habit of a small tree, but usually forming a dense thicket of erect, much-branched stems, renewing itself by sucker growths from the base; young shoots glandular-downy. Leaves roundish or obovate, heart-shaped at the base, 2 to 4 ins. long, $1\frac{1}{2}$ to 3 ins.

wide ; the lower half irregularly toothed, the terminal half often shallowly lobed as well as toothed ; downy on both surfaces, but especially beneath ; stalk glandular-hairy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Male catkins $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long. Nut $\frac{3}{4}$ in. long, set in a husk about or scarcely as long as itself, the margins of which are cut into shallow, often toothed lobes.

Native of Europe (including Britain), W. Asia, and N. Africa. This is the hazel whose nuts are among those commonly eaten for dessert. It is really a shrub for the woodland rather than the garden, and on many properties a brake of it is grown for the sake of the nuts. In autumn, the hazel frequently turns a soft pleasing yellow, but its chief attraction as an ornamental shrub is in the abundance and earliness of its male catkins. These form in the autumn, and remain as short, dark, cylindrical bodies all the winter. About mid-February the anthers burst, and they then become a soft yellow ; at that time a bush well in flower makes an attractive picture. The branches of the hazel are extremely supple, and on this account the shrub was in earlier times much used to form the pleached alleys or shaded walks in the vicinity of the old chateaux of France. The pliancy of hazel rods renders them useful for various purposes, such as hoops for crates, etc. The twigs are used by water-diviners. There are several varieties of hazel, most of them grown for the qualities of the nut. Those of interest as ornamental shrubs are as follows :—

Var. AUREA.—Leaves a poor yellow.

Var. CONTORTA.—Twigs remarkably curled and twisted. This curious variety was discovered about 1863, in a hedgerow at Frocester, in Gloucestershire. (See figure in *Gardeners' Chronicle*, September 29, 1894, p. 380.)

Var. LACINIATA.—Leaves smaller and more downy than in the type, and of oval outline. Their most distinctive character, and one which renders them very pretty, is the deep lobing all round the blade. These lobes are triangular and penetrate about one-third of the distance to the midrib, being themselves sharply toothed. The variety was called "heterophylla" by Loudon, but in view of the existence of a Japanese species of that name, it is better to use the name given here, which is now commonly adopted.

Var. PENDULA.—A weeping variety which, trained up to form a trunk or grafted high, makes a small pretty tree.

Var. PURPUREA.—This is of more recent origin than the purple variety of *C. maxima*, and is not so coarse a grower. The purple of the leaves is not so heavy and dark.

C. CHINENSIS, *Franchet*. CHINESE HAZEL.

(*C. Colurna* var. *chinensis*, *Burkill*.)

Nearly allied to the Turkish hazel (*C. Colurna*), this species may be distinguished by its darker coloured, much more persistently glandular-downy young shoots, leaf-stalks, and midrib ; by the leaf-margins being more finely and evenly toothed (not lobed as in *C. Colurna*) ; and by the base being more unequally, if not so deeply heart-shaped. It was introduced by Wilson about 1900 from Hupeh, China, to the Coombe Wood nursery, where, as at Kew, young trees grow well, and promise to make fine trees. Mr Wilson tells me he saw it up to 120 ft. high in a wild state. Cultivated trees are not likely to bear fruit for some years to come, but Henry, who several times collected this hazel in Hupeh and Szechuen, describes the husk as constricted above the nut, its lobes forked, the ultimate segments pointed and sickle-shaped. The leaves are up to 6 or 7 ins. long, with as many as thirteen pairs of primary veins.

C. COLURNA, *Linnaeus*. TURKISH HAZEL.

A tree up to 70 or 80 ft. high, with a trunk sometimes 7 ft. or more in girth, covered with pale scaling bark ; young shoots yellowish at first, glandular

downy. Leaves $2\frac{1}{2}$ to 6 ins. long, 2 to $4\frac{1}{2}$ ins. wide; broadly oval, obovate or ovate, pointed (sometimes abruptly) at the apex, heart-shaped at the base, coarsely double-toothed or almost lobed; upper side dark green, lower one downy along the midrib and veins; stalk $\frac{1}{2}$ to 1 in. long, glandular-downy at first, afterwards smooth. Male catkins 2 to 3 ins. long. Nuts $\frac{1}{2}$ to $\frac{5}{8}$ in. diameter, the husk (involucre) in which it is set $1\frac{1}{2}$ ins. across, fringed with numerous narrow pointed lobes $\frac{1}{2}$ to 1 in. long, covered with a fine down freely mixed with which are gland-tipped bristles. The nuts are closely clustered three or more together.

Native of S.E. Europe and Asia Minor; introduced to England about the middle of the seventeenth century. There are some fine specimens in old English gardens, notably at Syon House, near Brentford. The tree is well worth growing for its stately form, so remarkable for a hazel, and for its curiously enveloped nuts. It thrives very well in the hot summers and cold winters of Central Europe, and has there a usually short trunk with the bottom branches touching the ground, the whole tree forming a lofty pyramid. I have seen trees of this character near Hanover, and at Schönbrunn, 70 to 80 ft. high.

C. JACQUEMONTII, *Decaisne* (C. *lacera*, *Wallich*), is the Himalayan representative of C. *Columna*. It differs from that species chiefly in the husk of the nut having few or no glandular bristles mixed with the down, and in the leaves being more distinctly obovate and sharply lobed and toothed. It thrives well at Kew, and bore nuts there in 1912. It commences to grow in spring two or three weeks in advance of C. *Columna*.

C. HETEROPHYLLA, *Fischer*. JAPANESE HAZEL.

A shrub or small tree up to 20 ft. high; young shoots and leaf-stalks glandular-hairy. Leaves variously shaped, often obovate, broadest near the apex, where they are cut off straight with the exception of a short, abrupt point; base often narrowed, always heart-shaped; unevenly toothed, often slightly lobed; downy beneath, especially on the midrib and veins. Nuts usually solitary or in pairs; the husk $\frac{3}{4}$ to 1 in. long, downy on the margin, cut into large triangular teeth $\frac{1}{2}$ to $\frac{1}{4}$ in. deep.

Native of Japan and China, where it appears to represent C. *Avellana*, just as C. *americana* does in the New World. It is recognisable in fruit by the more regularly toothed husk. The leaves do not differ much, and some of identical shape are to be found on both species, but those of C. *Avellana* are, in general, not so much lobed.

C. MANDSHURICA, *Maximowicz*. MANCHURIAN HAZEL.

A shrub up to 12 or 15 ft. high, its largest leaves 5 or 6 ins. long and 4 ins. wide; ordinarily 3 or 4 ins. long, roundish obovate, heart-shaped at the base, pointed, the terminal part doubly toothed or even shallowly lobed; stalk $\frac{1}{2}$ to 1 in. long. Nut conical, $\frac{1}{2}$ in. long, the husk covered with pale brown bristles as well as down, and drawn out at the apex into a slender beak protruding $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. beyond the nut and quite enclosing it.

Native of Manchuria and N. China; introduced to Kew in 1882 by the late Dr Bretschneider, and about ten years later by Prof. Sargent. It is quite hardy, and has borne good crops of its remarkable and handsome fruits. These occur in pendent clusters of three or four, the bases touching and the long beaks standing out horizontally. During the summer the husk is prettily suffused with purple. It is closely allied to and may be regarded as the Asiatic representative of C. *rostrata*, differing chiefly in the more distinctly lobed terminal portion of the leaves, which are also longer stalked, rounder, and broader.

C. SIEBOLDIANA, *Blume*, a native of Japan, is allied to these two species, and has the same bristly hairy husk, but considerably shorter than either, and protruding beyond the nut $\frac{3}{4}$ in. only. It has recently come into cultivation.

C. MAXIMA, *Miller*. FILBERT.

(*C. tubulosa*, *Willdenow*.)

A shrub of the same habit as *C. Avellana*, but more robust, sometimes a tree 20 ft. or more high; young shoots glandular-hairy. Leaves broadly obovate or roundish, heart-shaped at the base, usually with a short, slender, abrupt point; toothed all round the margin, doubly so on the upper half; 2 to 5 ins. long, $1\frac{1}{2}$ to 4 ins. wide; stalk glandular, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Male catkins 2 to 3 ins. long. Nut ovate-oblong, set in a husk nearly twice its own length, and cut into numerous deep, narrow lobes.

Native of S. Europe, but not of Britain; introduced in 1759. It is the parent of the filberts of English orchards, distinguished from the hazel or cobnut by the husk protruding well beyond the nut, and quite enclosing and holding it. The nut itself is also longer and proportionately narrower. Several varieties are cultivated for their nuts, but the only one of an ornamental character worth mentioning is

Var. ATROPURPUREA, whose leaves are of a dark purple. One of the most robust and striking shrubs of this colour.

C. ROSTRATA, *Aiton*. BEAKED HAZEL.

A shrub 4 to 8 ft. high, with erect, much-branched stems and slightly hairy young shoots. Leaves ovate, oval or obovate, heart-shaped at the base, usually pointed at the apex, closely and unevenly toothed, sometimes slightly lobed; $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, 1 to 3 ins. wide; upper surface with scattered hairs at first, becoming smooth; lower surface permanently downy on the midrib and veins; stalk $\frac{1}{3}$ to $\frac{1}{2}$ in. long. Male catkin 1 to $1\frac{1}{4}$ ins. long. Nut about $\frac{1}{2}$ in. long, the husk covered with a fine down mixed with which are numerous bristly hairs, the apex extended into a slender beak 1 to $1\frac{1}{4}$ ins. beyond the nut.

Native of the eastern and Central United States; introduced in 1745 by the then Duke of Argyll. It is rare in cultivation and has no value as a nut-bearing bush, but the long, drawn-out husk covered with bristles makes it interesting.

Var. CALIFORNICA (*C. californica*, *Rose*) differs chiefly in having the leaves more downy beneath, and the beak of the involucre shorter. Native of the western side of N. America.

C. TIBETICA, *Batalin*. THIBETAN HAZEL.

(*C. ferox* var. *thibetica*, *Franchet*.)

A tree 15 to 20 ft. high (probably more); young shoots smooth, dark brown. Leaves broadly obovate or ovate; 2 to 5 ins. long, $1\frac{1}{4}$ to 3 ins. wide; heart-shaped or rounded at the base, the apex abruptly slender-pointed, unequally and sharply toothed; upper surface with flattened hairs on and between the nerves when young; lower surface slightly glaucous with silky hairs on the midrib and veins; stalk $\frac{1}{2}$ to 1 in. long, silky hairy, glandular on the upper side. Male catkins 2 to 3 ins. long. Nuts in clusters of three to six, the husks covered with slender branching spines, the whole cluster forming a prickly ball like that of a sweet chestnut.

Native of China, and apparently widely spread in the regions bordering Tibet; introduced by Wilson for Messrs Veitch in 1901, but obtained in France by Mr Maurice de Vilmorin three years previously. Its most distinctive

character among cultivated hazels is the prickly burs that enclose the nut clusters. In this respect it is closely similar to *C. FEROX*, *Wallich*, a Himalayan species with narrower, more oblong, longer pointed leaves and less spiny burs. Perhaps more tender and not in cultivation.

COTONEASTER. ROSACEÆ.

A group of shrubs or occasionally trees, both deciduous and evergreen, found most abundantly in the cool temperate regions of N. Asia, especially in China and the Himalaya. Others occur in Europe, and one is British. *C. microphylla* is naturalised on the chalk downs near Ventnor, Isle of Wight, also in the counties of Gloucester and Somerset. Seeing how fond birds are of the fruit, it is curious that more naturalised species have not been found. They are closely allied to the thorns (*Cratægus*), but are easily distinguished by the always entire, not toothed nor lobed leaves, and by having no spines. The flowers are very uniform in size and colour, being nearly always from $\frac{1}{4}$ to $\frac{1}{3}$ in. in diameter, and either pure white or rose-tinted. They are borne in clusters of varying size, from those of some species that are 2 or 3 ins. across, to others with only two or three flowers in the cluster; still others have solitary flowers. The flowering-time is mostly in May and June. Whilst some species are very pretty then, the Cotoneasters generally are not showy in blossom. Apart from habit and foliage their greatest attraction is in their fruit. In the handsomest sorts this is brilliant red; in others it is yellowish or brownish, and in a considerable number it is black. They are either globose, egg-shaped, or oval, and vary little in size, averaging about $\frac{1}{4}$ in. in diameter.

In the following descriptive notes of the cultivated Cotoneasters, I have, for convenience sake, maintained the species as they are generally accepted in gardens. But it is certain that several so-called species are only "states" or seminal forms of others. There are *microphylla* and *thymifolia*, for instance; although distinct enough as usually seen in gardens, seeds of *C. thymæfolia* have at Kew produced plants not distinguishable from *C. microphylla*. *C. bacillaris* and *C. frigida* are connected by one or more intermediates, and in the considerable *integerrima* (or *vulgaris*) group several species are of very doubtful standing.

No shrubs are more easily cultivated than these. They thrive in any soil that is not marshy or water-logged, and are very well adapted for poor soils. They can be propagated quite easily from cuttings made of half-ripened wood about July, and placed in gentle heat. Seeds, too, are plentiful, and can be used, but for reasons suggested above, it is not advisable to use them in some cases, especially where it is desirable that the parent plant, for its brightly coloured fruit or special habit and foliage, should be propagated unchanged. The old practice of grafting them on hawthorn is indefensible.

Between the purely evergreen and the strictly deciduous kinds there are others in which the persistence of the foliage during winter depends

upon circumstances. They will retain their leaves in mild winters or warm localities, but lose them where the cold is greater. Vigorous young plants and those growing in good soil will also retain their foliage longer. The taller species from their beauty in fruit, grace of habit, and vigorous constitution, are admirable constituents of the tall shrubbery, but they are still better as isolated specimens on the lawn or in groups in thin woodland. The smaller species make useful and handsome coverings for sloping, sunny banks, whilst the dwarfest of all are very well adapted for the rock garden.

A selection of the best species would include the following :—

Tall shrubs.—*Buxifolia*, *Francheti*, *frigida*, *moupinensis*, *Simonsii*, *multiflora*, *bacillaris*.

Medium and dwarf.—*Rotundifolia*, *horizontalis*, *microphylla*.

For rock garden.—*Thymæfolia*, *congesta*, *adpressa*.

As a ground carpet.—*Humifusa*.

C. ACUMINATA, *Lindley*.

A deciduous shrub, 10 to 14 ft. high, of erect habit; young shoots thickly covered with a pale brown wool. Leaves ovate-lanceolate, 1 to 2 ins. long, about half as wide, long-pointed, dark green and silky-hairy above when young, paler and more hairy beneath; stalk $\frac{1}{4}$ in. or less long. Flowers more or less pink, $\frac{3}{8}$ in. across, produced in small clusters of rarely more than five, often of two or three, on short leafy twigs. Fruit red, $\frac{1}{3}$ in. long, oblong, thickening towards the top.

Native of the Himalaya, up to 12,000 ft.; first raised in this country by the Loddiges of Hackney in 1820. The species, which is not much grown in gardens now, is allied to *C. Simonsii*, but differs in its much larger, longer-pointed leaves. According to Brandis it often occurs as underwood in oak forests.

C. ACUTIFOLIA, *Turczaninow*.

(Gardeners' Chronicle, Jan. 6, 1912, fig. 1.)

A deciduous shrub of bushy habit, 5 to 7 ft. high, branches often pendulous; young twigs downy. Leaves pointed, ovate-lanceolate to oval, 1 to $2\frac{1}{2}$ ins. long, half as wide; dull green, and with scattered hairs above, paler and hairy beneath especially when young; veins in five or six pairs; stalk $\frac{1}{12}$ to $\frac{1}{8}$ in. long. Flowers white, three or more together in corymbs; stalks and calyx woolly, lobes of calyx triangular. Fruit reddish at first, finally black, $\frac{1}{3}$ in. diameter, smooth.

Native of N. and W. China. This is not one of the handsomest of Cotoneasters, and is, perhaps, a poor form of *C. lucida* (*q.v.*). There has been much confusion between the two, owing to *C. lucida* also having been called *C. acutifolia*; but from that species the present one is distinguished by its dull green, not shining, more hairy leaves, and its woolly calyx and flower-stalks.

Var. *VILLOSULA*, *Rehder and Wilson*.—Young shoots clothed with yellowish grey loose hairs, becoming smooth and purplish brown the second year. Leaves $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $2\frac{1}{4}$ ins. wide, larger and more drawn out at the apex than in the type. Petals rose-tinted white. Fruit roundish pear-shaped, $\frac{2}{3}$ in. long, woolly, ultimately shining black. Native of W. Hupeh; introduced by Wilson in 1900. A very vigorous shrub.

C. ADPRESSA, Bois.

A very dwarf, close-growing, rigidly branched, deciduous shrub, scarcely more than 1 or $1\frac{1}{2}$ ft. high, but spreading over the ground several yards in extent; the branches pressing on the soil and taking root there; twigs downy. Leaves in two opposite rows or irregularly arranged, broadly ovate or obovate, $\frac{1}{4}$ to $\frac{5}{8}$ in. long, dullish green and smooth on both sides, except for a few scattered hairs beneath, wavy-margined and somewhat scoop-shaped. Flowers solitary, scarcely stalked, each one produced in the centre of a fascicle of leaves from the year-old wood; petals white tipped with rose, but little expanded. Fruit $\frac{1}{4}$ in. long, roundish, bright red.

Native of China; introduced to France about 1895; first raised and grown by Mr Maurice de Vilmorin at Les Barres (Loiret), where the original plant, when I saw it a few years ago, was 9 ft. across. It is remarkable for its short, rigid branches, and close, prostrate habit. It resembles *C. horizontalis*, and by some writers is regarded as a variety of that species, but in general appearance and habit is quite distinct from that or any other species. It is a very pleasing plant for the rock garden, or a narrow border of choice shrubs.

C. AFFINIS, Lindley.

The identity of this species is somewhat confused, but what is usually grown under the name is an ally of *C. bacillaris* and *C. frigida*. It has the woolly young leaves, young wood, and flower-stalks of the latter, but the purplish brown fruit of *C. bacillaris*. It is a shrub 10 to 15 ft. high, and deciduous. Leaves oval, acute or bluntish at the apex, up to $3\frac{1}{2}$ ins. long. Native of the Himalaya; introduced in 1828.

C. AMENA, Wilson.

(Gardeners' Chronicle, Jan. 6, 1912, fig. 1.)

A densely branched, stiff-habited, evergreen bush of spreading habit, 3 to 5 ft. high; young shoots slender but rigid, felted with grey wool. Leaves oval or ovate, tapered about equally to both ends, terminated by a fine point; $\frac{3}{8}$ to $\frac{3}{4}$ in. long, $\frac{1}{4}$ to $\frac{2}{5}$ in. wide; glossy green and with loose hairs above, clothed beneath with a thick, greyish wool; veins in two to four pairs; stalks $\frac{1}{12}$ to $\frac{1}{8}$ in. long. Flowers white, $\frac{1}{8}$ in. wide, borne in six- to ten-flowered corymbs; petals roundish; stamens twenty; calyx woolly, with triangular-ovate teeth. Fruit bright red, roundish obovoid (broadest above the middle), $\frac{1}{4}$ in. long, packed in umbel-like clusters at the end of short twigs that have sprung from the growths of the previous year.

Native of Yunnan, China; introduced by Wilson about 1904 to the Coombe Wood nursery. It is most closely allied to *C. Francheti* among older species, but is dwarfer and stiffer in habit, the leaves smaller, the berries a richer red, especially on the exposed side.

C. BACILLARIS, Wallich.

A deciduous shrub, 15 ft. or more high, said to be found also as a small tree, of very graceful habit. Branches arching and often pendulous towards the end, the whole forming a wide-spreading mass more in diameter than in height; twigs smooth, or slightly downy. Leaves 1 to 3 ins. long, one-third to half as wide, of variable shape, usually oval, ovate, or slightly obovate, pointed, smooth or becoming so; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers white, $\frac{1}{8}$ in. across, borne numerous in cymose clusters 1 to 2 ins. across, at the end of short axillary branches. Fruit roundish, $\frac{1}{4}$ in. or less diameter, purplish brown or nearly black.

Native of the Himalaya up to 10,000 ft. This is one of the most useful of Cotoneasters, and one of the most graceful. It has been largely planted on the margins of the islands of the lake at Kew, where the branches overhang the water and have the elegance of a willow, with the added attractions of abundant flowers and fruits. As a flowering shrub, this is one of the prettiest in the genus, but its fruits have not the bright colour that gives to many Cotoneasters their greatest charm. The wood is strong and elastic, and is valued in its native regions for making walking-sticks and spear-shafts. The species is variable in the shape and amount of down on the leaves, and no clear line can be drawn between it and *C. affinis*, which has woolly leaves.

Var. *OBTUSA*, *Dippel*.—The name has been given to distinguish a form whose leaves are rounded instead of pointed at the apex.

C. BULLATA, *Bois*.

(*C. moupinensis* var. *floribunda*, *Stapf*; Bot. Mag., t. 8284.)

A deciduous shrub, 10 to 12 ft. (perhaps more) high, of rather spare habit; the branches few, long and arching, bark blackish brown covered with dark hairs when young. Leaves ovate or oblong; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, about half as wide; pointed, dark green and slightly hairy above, paler and felted beneath with grey or yellowish down; between the veins the leaf-blade has a swollen (bullate) appearance; stalk $\frac{1}{2}$ in. long. Flowers in corymbs of from ten to thirty; each corymb 1 to 2 ins. across, borne on short leafy branches; stalks downy. Petals rosy white, soon falling; calyx hairy, with short triangular lobes. Fruit brilliant red, pear-shaped or round, $\frac{1}{2}$ in. wide.

Native of W. China and Thibet; first cultivated in Europe about 1898, by Mr Maurice de Vilmorin at Les Barres, in France. It is undoubtedly one of the finest of the species newly introduced. Of flower-beauty it has none, for it has rarely more than two or three flowers expanded on one cluster at a time, and the petals fall almost as soon as they open. But it is very handsome indeed in fruit, the clusters, many of them 2 ins. across, being set on the shoot about 1 in. apart in opposite rows.

Wilson, in 1903, found a big-leaved form—var. *MACROPHYLLA*—in W. Szechuen, its leaves up to 6 ins. long, its calyx smooth except on the margins; this is probably in cultivation.

C. BUXIFOLIA, *Wallich*.

An evergreen bush up to 10 or 12 ft. high, with long, arching, sparsely branched stems and downy young bark. Leaves $\frac{1}{2}$ to 1 in. long, oval or obovate, dark green and usually smooth above, greyish and woolly beneath, sometimes rounded at the apex, sometimes with a short, abrupt point; stalk $\frac{1}{4}$ in. or less long. Flowers white, $\frac{1}{2}$ in. across, produced in clusters of two to eight, terminating short twigs less than 1 in. long. Fruit round, red, $\frac{1}{4}$ in. diameter.

Native of the Nilghiri Hills; introduced in 1824. This species and *C. microphylla* are undoubtedly closely allied and may be merely states of the same species, but *C. buxifolia* can be distinguished by its larger leaves and by its more vigorous habit. For some purposes it is one of the most useful of Cotoneasters or even evergreens, being pretty in habit, flower, and fruit. There is a mass at Kew 10 ft. high and 50 ft. through, forming a dense, impenetrable tangle of stems, from the main body of which stand out in every direction long, whip-like branches which give a very graceful and distinct effect. For covering tall iron or any unsightly fences

there is no evergreen superior to this. It is only necessary to tie the leading shoots to the fence until it is covered, and then leave the shrub to grow its own way ; in this way it makes an admirable screen.

C. CONGESTA, Baker.

(*C. microphylla* var. *glacialis*, *Hooker fil.* ; *C. pyrenaica*, *Hort.*)

An evergreen shrub of low, compact, dense habit, $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high ; young wood downy. Leaves oval or obovate, about $\frac{1}{2}$ in. long, dull green above, whitish beneath with a few hairs at first, but becoming nearly or quite smooth. Flowers $\frac{1}{2}$ in. across, pinkish white. Fruit bright red, round, $\frac{1}{4}$ in. diameter.

Native of the Himalaya up to 14,000 ft. This little evergreen has by some authorities been made a variety of *C. microphylla*, which it may possibly be. But it is much more distinct from ordinary *C. microphylla* than is *C. thymæfolia*, especially in its habit, which, as Mr Baker's name implies, is congested. Instead of its branches being spreading or prostrate, they are short, dense, often decurved, the whole forming a compact rounded mass. The dull green, paler leaves, not densely woolly beneath as in *C. microphylla*, afford other distinctions. I have therefore retained the original name, and the one by which this plant is best known. It is a charming little evergreen for the rock garden, or for small borders of low shrubs where it runs no danger of being smothered by more aggressive plants.

C. DIELSIANA, Pritzl.

(*C. applanata*, *Duthi.*)

A deciduous shrub, 8 ft., perhaps more, high, with long, extremely slender, arching or quite pendulous branches ; branchlets downy when young. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{3}{8}$ to 1 in. wide, ovate ; hairy above when young, covered beneath with felt, at first white afterwards pale brown ; veins prominent. Flowers three to seven in a cluster, terminating side shoots 1 in. or so long ; calyx and flower-stalk hairy, calyx lobes shallowly triangular. Fruit scarlet, round or rather pear-shaped, $\frac{1}{4}$ in. long.

Native of Central China ; introduced for Messrs Veitch by Wilson in 1900. It flowers in June, and the fruit is in full colour in September and October ; it is then one of the most effective of Cotoneasters. The habit is singularly graceful, the long whip-like shoots spreading outwards and downwards in every direction. The name "applanata" refers to the distichous arrangement of the branches of young plants, which gives them the appearance of a wall-trained tree.

C. DIVARICATA, Rehder and Wilson.

A deciduous shrub up to 6 ft. high, of spreading habit ; young shoots clothed with greyish hairs, becoming the second year smooth and reddish brown. Leaves roundish oval, sometimes ovate or obovate, tapered abruptly towards both ends, the apex mucronate ; $\frac{1}{2}$ to 1 in. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide (smaller on the flowering shoots) ; dark glossy green, and soon smooth above, sparsely hairy beneath ; veins in three or four pairs ; leaf-stalk $\frac{1}{2}$ in. or less long. Flowers usually in threes at the end of short twigs, often supplemented by solitary ones in the axils of the terminal leaves, rosy white ; calyx lobes triangular, they and the tube loosely woolly. Fruit red, egg-shaped, $\frac{1}{2}$ in. long, carrying two stones.

Native of W. Hupeh and W. Szechuen, China ; first found by Henry in the latter province about 1887 ; introduced to the Coombe Wood nursery by

Wilson in 1904. It is one of the handsomest in fruit of Chinese Cotoneasters, and was given a first-class certificate by the R. H. Society in the autumn of 1912. It is allied to the Himalayan *C. Simonsii*.

C. FOVEOLATA, Rehder and Wilson.

A deciduous shrub, 10 to 20 ft. high; young shoots covered with yellowish grey, bristly hairs, becoming smooth and greyish the second year. Leaves oval to ovate, slender-pointed, usually wedge-shaped (sometimes rounded) at the base; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; dull green and soon smooth above, sparsely hairy beneath, more so on the midrib and veins; margins downy; veins in three to six pairs, the blade often puckered between them; stalk woolly, $\frac{1}{8}$ in. or less in length. Corymbs three- to seven-flowered, on a stalk about $\frac{1}{2}$ in. long, and hairy like the young wood; flowers $\frac{1}{2}$ in. wide; petals rose-tinted white; calyx tube woolly, the lobes triangular and woolly only on the margins. Fruit red, finally black, roundish, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, carrying usually three or four stones.

Native of W. Hupeh, China; introduced by Wilson in 1908. It has not flowered under cultivation, but is growing vigorously.

Closely allied to both this species and *C. bullata* is

C. MOUPINENSIS, Franchet, but it is quite distinct from the latter in its jet black fruits, which are about $\frac{1}{2}$ in. diameter, globose, containing usually four or five stones, and in its less wrinkled leaves. From *C. foveolata* it differs "in its thicker, more rugose leaves, the many-flowered inflorescence, glabrescent calyx, and in the narrower stones, which have only a shallow furrow on the dorsal side" (Rehder and Wilson). According to Wilson, it is the common Cotoneaster in thickets and woods in W. Szechuen, China. Introduced to Kew in 1907, from Mr Maurice de Vilmorin at Les Barres.

C. FRANCHETI, Bois.

An evergreen shrub, 8 to 10 ft. high, with slender, gracefully arching branches, which the first year are covered with a dense, pale brown wool. Leaves oval, tapering towards both ends, from $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, about half as wide, pointed; upper surface rather hairy when young, lustrous green later, lower surface covered with a thick, whitish, afterwards pale brown felt; stalk $\frac{1}{8}$ in. or less long. Flowers borne in corymbs of five to fifteen flowers terminating short, lateral, leafy twigs; petals erect, white, touched with rose on the outside; calyx felted like the under-surface of the leaves. Fruit oblong, $\frac{1}{4}$ to $\frac{1}{2}$ in. long; orange-scarlet.

Native of Thibet and W. China; first raised in France about 1895, by Mr Maurice de Vilmorin, from seed sent by the Abbé Soulié. It is a shrub of very elegant growth, whose fruits are freely borne, but lose in brilliancy by the greyish down, more or less dense, which covers them. It was at first confused with *C. pannosa*; the distinguishing characters may be defined as follows:—Leaves rather longer than in *pannosa*, but with stalks scarcely half as long, the upper surface somewhat lustrous; flowers not so numerous in each cluster, petals erect and rose-tinted; fruits larger, longer, and not of so deep a red. It flowers in May, and the fruit is ripe in October.

C. FRIGIDA, Wallich.

(Bot. Reg., t. 1229.)

A large, rounded, deciduous shrub, 15 to 20 ft. high, or a small tree; branchlets at first covered with pale down, becoming smooth. Leaves 3 to 5 ins. long, 1 to 2 ins. wide; narrowly oval or obovate, deep dull green and

smooth above, pale and very woolly beneath when young, becoming almost smooth by autumn. Flowers white, $\frac{1}{3}$ in. across, produced very numerous in flattish corymbs 2 ins. or more across, terminating short leafy twigs; flower-stalks very woolly. Fruits in large clusters, each fruit about the size of a pea, rich bright red.

Native of the Himalaya; introduced in 1824, and perhaps the most striking of all Cotoneasters. The splendid clusters of "berries" wreathing the branches make some of the most brilliant pictures of autumn and early winter. Near London, owing to the attacks of birds, they disappear usually before Christmas, but in country places are occasionally seen hanging until February. The species is the most robust in the genus, making if left to itself a huge bush 20 ft. high and as much through, consisting of numerous branching stems. But if kept to one stem when young and the lower branches removed, it will make a pretty round-headed tree with a well-shaped trunk. There is a fine specimen of this kind in the Victoria Park at Bath, whose trunk is 6 ft. or so high and 1 ft. or more thick. No hardy shrub more beautiful than this thrives in town gardens.

Var. *FRUCTU-LUTEO*.—Fruits yellowish or creamy white; rare and little known, but not so beautiful as the type. A specimen is growing in the gardens of Stevenstone, Torrington, North Devon.

C. HARROVIANA, *Wilson*.

An evergreen shrub of loose, spreading habit, growing 6 ft. in height, and more in diameter; young shoots at first covered with a pale down (which later falls away), afterwards becoming nearly or quite smooth, glossy, and turning a dark purplish brown, almost black, on the side exposed to the sun. Leaves oval to obovate, wedge-shaped at the base, pointed at the apex, where the midrib is extended into a short bristle (or mucro); 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide; at first sparsely downy above, afterwards smooth, and bright dark green, covered beneath with a pale yellowish brown wool, which partially falls away by the end of the year; stalk $\frac{1}{8}$ to $\frac{1}{3}$ in. long. Flowers numerous and densely arranged in axillary and terminal corymbs about $1\frac{1}{2}$ ins. across; petals round, white; calyx and flower-stalk thickly coated with grey wool, the calyx-lobes triangular and pointed. Stamens twenty, with reddish purple anthers. Fruit red.

Native of Yunnan, China; discovered by Henry; introduced in 1899 by Wilson for Messrs Veitch, in honour of whose manager at the Coombe Wood nurseries, Mr Geo. Harrow, it is named. It is most nearly allied to *C. pannosa*, but has larger, more leathery leaves, and larger flower clusters. One of the handsomest of Cotoneasters in flower.

C. HENRYANA, *Rehder and Wilson*.

(*C. rugosa* var. *Henryana*, *C. K. Schneider*.)

An evergreen shrub, 10 to 12 ft. high, of sparse habit; the branches gracefully pendulous; young shoots hairy, becoming the second year smooth, and of a dark purplish brown. Leaves 2 to $4\frac{1}{2}$ ins. long, about one-third as wide, narrowly oval or obovate, finely pointed, dark green, and somewhat rough to the touch above; covered beneath when young with a greyish wool which mostly falls away by the second season, that which remains becoming brown, and confined to the midrib and veins, the under-surface still remaining brownish white; veins in nine to twelve pairs; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, hairy. Flowers white, produced about the middle of June in corymbs 2 to $2\frac{1}{2}$ ins. across, terminating leafy twigs less than 1 in. long, that spring from the axils

of the still persisting leaves of the previous year; stamens twenty, with purple anthers; calyx and flower-stalks hairy. Fruit brownish crimson, egg-shaped, $\frac{1}{4}$ in. long.

Native of Central China; introduced by Wilson in 1901. A handsome and distinct evergreen, and probably the largest-leaved of Cotoneasters with persistent leaves. Allied to *C. salicifolia*.

C. HORIZONTALIS, *Decaisne*.

(*C. Davidiana*, *Hort.*)

A deciduous shrub of low, flat habit, rarely more than 2 or 3 ft. high in the open, the branches spreading quite horizontally, and increasing but slowly in height; branchlets covered with a thick brown wool, and produced in two opposite rows. Leaves roundish or broadly oval, from $\frac{1}{4}$ to $\frac{1}{2}$ in. long, three-fourths as wide, shortly and abruptly pointed; dark glossy green above, smooth, or with a few scattered hairs beneath. Flowers white, suffused with pink, about $\frac{1}{4}$ in. diameter, produced during May singly, or in pairs on short leafy twigs springing from the buds of the previous summer's wood; calyx woolly. Fruit globose, bright red, about $\frac{1}{4}$ in. diameter.

Native of China. This is decidedly one of the prettiest and most distinct of Cotoneasters. Its most striking characteristic is the opposite branching and low, horizontal habit. The leaves, although small, are so abundant as to be almost without intervening spaces; they remain long on the branches, and the shrub is often in full leaf in November. Then the lower ones of each shoot begin to fade off into various shades of orange and red, whilst the terminal part retains them green. By January the shrub, as a rule, has lost all its foliage, and its bare branches present a curious fish-bone-like appearance. The fruits are very bright, and often abundant, although smaller than in most of the species. In the open ground, where it has plenty of space to develop, this Cotoneaster keeps low and flat, but it will grow much higher against a wall. In such a position there is a plant at Kew 10 ft. high spreading over the wall, but keeping from actual contact with it. Increased easily by cuttings.

C. HUMIFUSA, *Duthie*.

(*C. Dammeri* var. *radicans*, *C. K. Schneider.*)

A prostrate, evergreen shrub, with slender creeping stems keeping close to the ground; young wood downy. Leaves obovate or oval, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in. wide; margins incurved, apex usually rounded, downy on the lower surface when young, ultimately quite smooth on both sides; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long; veins in four to six pairs. Flowers solitary, occasionally in pairs, on downy stalks $\frac{1}{4}$ in. long, pure white, $\frac{1}{3}$ to $\frac{1}{2}$ in. diameter; calyx downy, with broad triangular lobes. Fruit coral-red, globose or rather top-shaped, $\frac{1}{4}$ in. wide.

Native of Central China; found by Henry near Ichang, and introduced in 1900 by Wilson from W. Hupeh, where it occurs at 5000 to 7000 ft. altitude. It is quite hardy, and is very distinct among Cotoneasters for its perfectly prostrate habit. Its fruits are brightly coloured, and the plant will no doubt prove useful as an evergreen carpet-shrub, also for covering sunny slopes, as it is very vigorous. It occurs wild on heaths and rocky ground.

C. INTEGERRIMA, *Medicus*. COMMON COTONEASTER.

(*C. vulgaris*, *Lindley.*)

A deciduous shrub, 4 to 7 ft. high, of rounded, bushy habit; young wood woolly. Leaves $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, varying in outline from broadly ovate

to almost round; sometimes pointed, sometimes rounded at the apex; smooth or nearly so above, always densely grey-felted beneath; stalk $\frac{1}{4}$ in. or less long. Flowers white, rose-tinted, produced two to four together in short nodding clusters. Fruit round, $\frac{1}{4}$ in. across, red.

Native of Europe and N. Asia, and interesting as the only Cotoneaster truly native of Britain. In 1783 it was discovered on the cliffs of Great Orme's Head, near Llandudno, by Mr J. W. Griffith. This appears to be its only habitat in the British Isles, and even there it is now reduced to very few plants. I have spent a good deal of time wandering over the Head, but have never seen it there. The species flowers in April and May, but has little garden value. From its immediate allies, *C. laxiflora* and *C. tomentosa*, this differs in its short, few-flowered inflorescence and glabrous calyx respectively.

C. LAXIFLORA, Jacquin.

(Bot. Reg., t. 1305.)

A deciduous shrub, 4 to 8 ft. high, of bushy habit; young wood downy. Leaves broadly oval or ovate, blunt or rounded at the apex, up to $1\frac{1}{2}$ or 2 ins. long, dark green and often hairy above when young, always greyish woolly beneath. Flowers pinkish white, borne in gracefully pendulous cymose panicles 1 to 2 ins. long, some of the larger panicles carrying twenty to forty flowers; calyx smooth. Fruit $\frac{1}{4}$ in. across, globose, black.

Native of Siberia; introduced to England from Vienna in 1826. Among the black-fruited Cotoneasters this is distinguished by its comparatively large panicles of blossom, which give it quite a pretty aspect in May, and render it the most attractive of this group.

C. LINDLEYI, Steudel.

(*C. arborescens, Zabel; C. nummularia, Lindley.*)

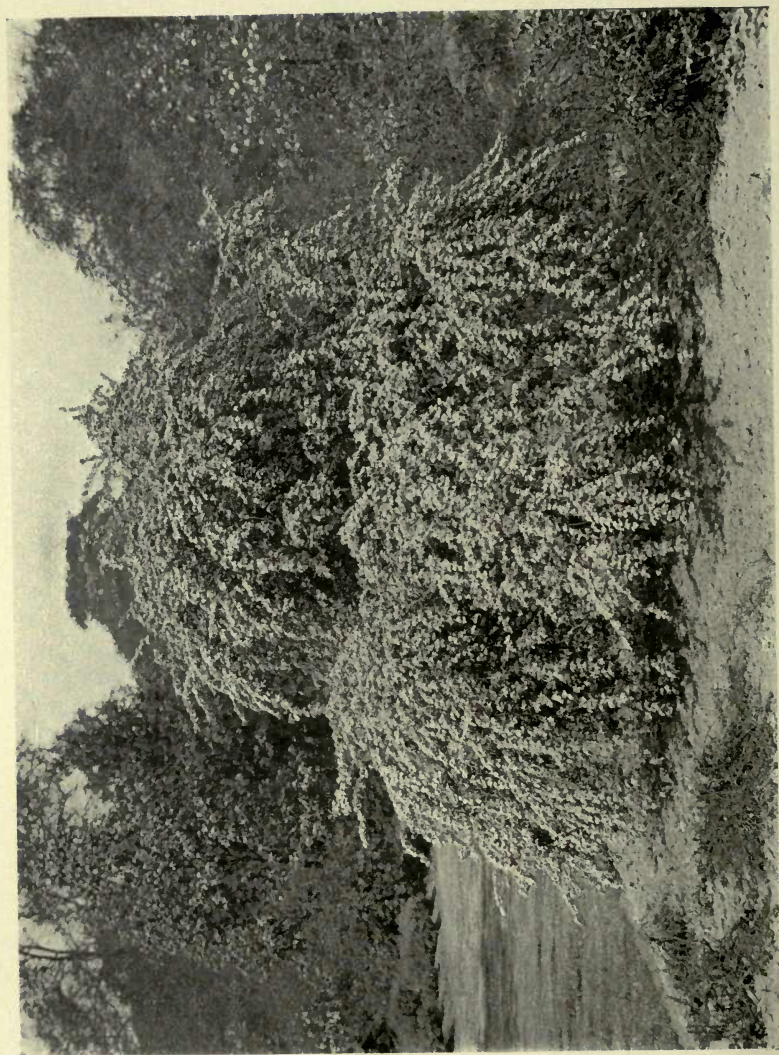
A deciduous shrub, 10 ft. or more high, with long, slender young branches covered with down when young, but becoming bare towards the end of the summer, and of a very dark brown. Leaves roundish oval, or broadly ovate, 1 to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. broad, rounded at the base; the apex pointed, rounded, or even notched, but nearly always ending in a short bristle-like tip; dark green and sparsely hairy above when young, covered with pale greyish felt beneath; stalk $\frac{1}{4}$ in. or less long. Flowers white, in corymbs of five to twelve; calyx covered with a grey felt. Fruit black, roundish, about $\frac{1}{4}$ in. diameter.

Native of the north-western Himalaya; introduced in 1824. This is one of the taller and stronger-growing species, and is often grown in gardens as *C. nummularia*. There is considerable confusion in books in regard to the name *C. nummularia* (*q.v.*), owing to its having been given to two, perhaps three, distinct plants. The true *C. nummularia* of Fischer has smaller leaves and red fruits.

C. LUCIDA, Schlechtendal.

(*C. acutifolia, Lindley*—not of Turczaninow.)

A deciduous shrub of bushy habit, up to 6 or 8 ft. high; young wood hairy. Leaves polished green and quite smooth or nearly so above, sparsely hairy and paler beneath, ovate or oval, pointed; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{2}$ to 1 in. wide. Flowers rosy white, produced from three to ten together in short corymbs with slightly hairy stalks; calyx woolly at the edges of the triangular teeth. Fruit black, globose, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide.



COTONEASTER MULTIFLORA.

[Face p. 413.]

Native of Siberia and other parts of N. Asia. Long known in gardens, this species is but little cultivated now, although it is one of the handsomest of the black-fruited Cotoneasters. From *C. acutifolia*, *Turczaninow*, it differs in its glossy green leaves, its generally less hairy or downy character, and in its sturdier habit.

C. MICROPHYLLA, *Wallich*.

An evergreen shrub of low, spreading, or even prostrate habit, rarely more than 2 to 3 ft. high unless trained. Branches often slender but rigid, woolly when young. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ in. long, half or less than half as wide; ovate or obovate, deep glossy green above, grey and woolly beneath, pointed, rounded or notched at the apex. Flowers white, $\frac{1}{2}$ in. across, generally solitary (occasionally two or three). Fruit round, scarlet-red, $\frac{1}{4}$ in. in diameter.

Native of the Himalaya up to 11,000 ft.; introduced in 1824. This pleasing evergreen is nearly related to *C. buxifolia* on one side, and *C. thymæfolia* on the other. They may be forms of one species, but from *buxifolia* this and *C. thymæfolia* are distinguished by fewer flowers in the cluster, and the dwarf habit. The present plant makes a very pretty covering for sloping banks, forming eventually a dense low thicket. Single plants make a pretty evergreen furnishing for the rock garden, but *C. thymæfolia* and *C. congesta* are to be preferred.

Var. *GLACIALIS*.—See *C. congesta*, *Baker*.

C. MULTIFLORA, *Bunge*.

(*C. reflexa*, *Carrière*.)

A deciduous shrub or small tree, 10 to 12 ft. high; branches slender, pendulous or arching, and smooth except when quite young. Leaves thin in texture, varying in shape from ovate and oval to roundish; $\frac{3}{4}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; usually blunt or rounded at the end, hairy when quite young, but soon becoming smooth above; pale and often smooth, never permanently woolly beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers white, produced in branching clusters of three to twelve or more, not pleasantly scented. Fruit round or pear-shaped, red.

Native of Soongaria and other parts of the north-western borders of China; introduced in 1837. This is one of the most elegant of Cotoneasters. There is a specimen at Kew with a single well-formed trunk supporting a crown of pendulous or arching branches; the whole 10 to 12 ft. high. When the branches are wreathed with the abundant blossom in May and June, this tree makes a most charming picture. The same or a closely allied shrub has recently been introduced by Wilson from W. China, but 1500 or more miles to the south-west of the first habitat.

Var. *GRANATENSIS*, *Wenzig* (*C. granatensis*, *Boissier*).—On the slopes of the Sierra Nevada, in Spain, is found a variety of *C. multiflora*. It differs chiefly in its more lax corymbs, somewhat hairy calyx, and more downy leaves.

C. NUMMULARIA, *Fischer*.

A deciduous shrub up to 6 or 8 ft. high, with slender branches, grey-felted when young, becoming smooth and reddish brown later. Leaves oval or ovate, sometimes roundish, tapering towards the base, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. in length, dark green and ultimately smooth above; grey-felted beneath. Flowers white, in clusters of four to twelve or more on felted stalks. Fruit roundish, bright red.

Native of S.E. Europe, Asia Minor, etc. Its identity has been much obscured owing to a confusion with *C. Lindleyi*—a taller, more robust shrub with much larger leaves and black fruits, also known as *C. nummularia*.

C. PANNOSA, Franchet.

An evergreen shrub of free and elegant habit, 10 ft. or more high; branches arching and slender, covered with whitish felt when young. Leaves oval, tapering towards both ends, $\frac{1}{2}$ to 1 in. long, about half as wide; always dull green above, covered with whitish felt beneath; stalk up to $\frac{1}{4}$ in. long. Flowers $\frac{1}{4}$ to $\frac{3}{8}$ in. across, borne in corymbs of as many as fifteen or twenty; petals white, spreading; calyx woolly. Fruits scarcely $\frac{1}{4}$ in. long, dull red.

Native of Yunnan, China, up to 9000 ft. altitude; raised in Paris in 1888, from seed sent there by the Abbé Delavay. Introduced to Kew in 1892. The differences between this species and *C. Francheti* have already been alluded to under that species. Both are characterised by extreme elegance of habit, and by being very woolly on young bark, flower-stalk, calyx, and under-surface of leaves; but *C. pannosa* has duller leaves, less hairy when young on the upper surface, more spreading whiter petals, and shorter, rounder fruits of a deeper red.

C. ROTUNDIFOLIA, Wallich.

(Bot. Mag., t. 8010; *C. disticha, Lange*.)

A semi-evergreen or deciduous shrub, 4 to 8 ft. high, with stiff branches often arranged in two opposite rows; branchlets downy. Leaves usually in two rows, dark glossy green, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, roundish, broadly ovate or oval, with a short, abrupt point; hairy on both sides when young, especially above, becoming smooth later. Flowers white suffused with pink towards the centre, scarcely $\frac{1}{2}$ in. diameter, produced usually singly, occasionally in pairs, on short lateral twigs; calyx almost smooth. Fruit $\frac{1}{2}$ in. long, scarcely so wide, broadest towards the top, tapering to a short stalk, bright scarlet-red.

Native of the Himalaya; introduced in 1825. In the beauty of its fruits this is the best of the dwarfer Cotoneasters. They are not only among the largest and brightest coloured; they are usually very abundant, and remain on the plants throughout the winter until February or March. Whilst birds are quite keen for the fruits of *C. frigida* at the first touch of cold, for some reason they leave those of this species alone. Although scarcely a true evergreen, it retains its leaves very late, especially in mild winters—often until March—and it rarely becomes quite bare. In mode of growth it bears a distinct resemblance to *C. horizontalis*, but it is not so low and flat as that quite deciduous species, its fruits are larger, and its calyx less downy. A group of a dozen plants makes a most pleasing winter picture.

C. SALICIFOLIA, Franchet.

I do not know that the typical *C. salicifolia* is in cultivation. It is a species of W. Szechuen, China, discovered by the Abbé David nearly thirty years ago. It has white flowers and red, ovoid fruits, $\frac{1}{6}$ in. long. The two following varieties are in cultivation:—

Var. *FLOCCOSA, Rehder and Wilson*.—An evergreen shrub 6 to 12 ft. high, the branchlets very slender, downy at first, but becoming smooth and of a dark reddish brown by the end of the season. Leaves leathery, lanceolate or narrowly ovate, wedge-shaped at the base, tapering to a sharp point; $\frac{3}{4}$ to 2 $\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in. wide; the upper surface glossy green, wrinkled, not downy; the lower one covered at first with silky white floss, some of which falls away by the end of the year, showing the grey-white surface beneath; veins in seven

to fourteen pairs; leaf-stalk about $\frac{1}{2}$ in. long. Corymbs about 1 in. wide, carrying nine to fifteen flowers; stalks and calyx woolly, the teeth of the latter triangular. Fruit roundish, about $\frac{1}{4}$ in. diameter, bright red, containing usually three stones.

Introduced by Wilson (No. 1133a) from Western China in 1903, and again in 1910. A very graceful, distinct, and attractive evergreen, highly recommended by its collector for the beauty of its fruit.

Var. *RUGOSA*, *Rehder and Wilson* (*C. rugosa*, *Pritzl*).—In this variety the leaves are larger, up to 3 ins. long and $1\frac{1}{2}$ ins. wide, the veins numbering six to twelve pairs. The fruit is coral red, larger than in var. *floccosa*, and contains usually two stones. The plant is more vigorous, coarser looking, and with bigger leaves than var. *floccosa*, but in many respects similar.

Introduced by Wilson (No. 335) in 1907 from W. Hupeh, where he found it 9 ft. high.

C. SIMONSII, *Baker*.

A deciduous, sometimes semi-evergreen shrub of erect, somewhat stiff habit, and up to 10 or 12 ft. high; young branches covered with a dense, brown wool. Leaves arranged in opposite rows, $\frac{3}{4}$ to 1 in. long, $\frac{1}{2}$ to $\frac{5}{8}$ in. diameter; oval, roundish, or somewhat lozenge-shaped, tapering equally towards both ends; dark green, glossy and smooth above except for scattered silky hairs when young, paler and hairy beneath; stalks less than $\frac{1}{2}$ in. long. Flowers white, $\frac{1}{2}$ in. diameter, produced usually two to four together on very short woolly stalks from small twigs. Fruit scarlet, $\frac{1}{2}$ to $\frac{2}{3}$ in. long; about the size and shape of common haws.

Native of the Khasia Mountains. The introduction of this shrub is not recorded, and for a long time its origin was doubtful. Its native home was definitely ascertained in 1886, when it was found by the late Mr C. B. Clarke at Lailankote, in the Khasia. It had, no doubt, been introduced by, and named after, a Mr Simons, who had collected largely in the Khasia Mountains many years previously. *C. Simonsii* is a handsome vigorous shrub, very suitable for grouping in shrubberies, where it is well able to take care of itself. It differs from *rotundifolia* in having more flowers in a cluster.

C. THYMÆFOLIA, *Baker*.

A dwarf or prostrate, close-habited, evergreen shrub, with numerous rigid branches, rather woolly when young. Leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. long, narrowly obovate, always blunt at the apex, recurved at the margins, deep shining green above, whitish and woolly beneath; they are narrower than in *C. microphylla*, and are made to appear still more so by the curling under of the margins. Besides being narrower, they also differ in being uniformly blunt at the apex and broadest towards the end. Flowers pinkish white, mostly solitary, $\frac{1}{4}$ in. across. Fruit round, $\frac{1}{2}$ in. diameter, bright red.

Native of the Himalaya at high elevations, perhaps merely an alpine form of *C. microphylla*. I do not think it is anything more than a variation of that species, smaller in all its parts. Young plants raised at Kew some years ago from seed of *C. thymæfolia* varied considerably, but some were in no way distinguishable from *C. microphylla*. As the parent plant, however, was growing in the same border as typical *C. microphylla*, and may have been hybridised by bees, this is not conclusive evidence of their specific identity. Still *C. thymæfolia* as known in gardens—a close, tight, bright-leaved evergreen—should always be propagated by cuttings. It is a quaint and interesting plant, very well adapted for the rock garden or a choice selection of miniature shrubs.

C. TOMENTOSA, Lindley.

A deciduous shrub of bushy habit, up to 6 or 8 ft. high, closely allied to *C. integerrima* and differing chiefly in the rounder, larger leaves, the biggest of which are $2\frac{1}{2}$ ins. long and $1\frac{1}{2}$ ins. wide, slightly hairy above, very woolly beneath; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers in short, nodding clusters, from three to six in each cluster, white; calyx very woolly; fruit red.

Native of the mountainous parts of Central and S. Europe; introduced in 1759. It can scarcely be regarded as more than a variety of *C. integerrima*, although a rather superior one. The leaves are larger and more uniformly rounded at both ends, still not invariably so. The best distinction is afforded by the extremely woolly calyx and flower-stalk. (See also *C. ZABELII*.)

C. TURBINATA, Craib.

(Bot. Mag., t. 8546.)

A vigorous evergreen shrub, probably 10 ft. or more high, of graceful habit; young shoots covered with fluffy grey down. Leaves narrowly oval, tapering about equally at both ends to a sharp point; $\frac{3}{4}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{8}$ to 1 in. wide; dark dull green above, covered beneath with a thick, grey-white felt. Flowers $\frac{1}{4}$ in. wide, white, with rose-coloured anthers, produced towards the end of July in hemispherical corymbs $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. across; flower-stalks and calyx covered with grey wool; petals round; calyx-lobes triangular-acuminate. Fruit pear-shaped, $\frac{1}{4}$ in. long, deep red, downy, ripe in October.

Native of China; introduced to Kew in 1910 from Mr de Vilmorin's collection at Les Barres. It is apparently perfectly hardy, and of rapid growth, remarkable and valuable among Cotoneasters in flowering so late—six or eight weeks later than the majority, and a month later than any.

C. UNIFLORA, Bunge.

This name has in gardens been given to several species of Cotoneaster quite distinct from the true plant, most often to the evergreen *C. microphylla*, with which it has nothing in common. The true uniflora of Bunge is a deciduous shrub, found on the mountains of Siberia and Altai. It is, perhaps, only a dwarfed and depauperated *C. integerrima*. In a wild state it is from a few inches to $2\frac{1}{2}$ ft. high, with thin, obovate or broadly oval leaves, $\frac{3}{4}$ to 1 in. long, smooth above, downy when young beneath. Flowers usually solitary, sometimes in pairs; petals whitish, calyx glabrous. Fruit globose, red. This shrub is scarcely worth cultivating, and has probably no real claim to specific rank, but it differs from *C. integerrima* in its dwarfer habit, its fewer flowers, and in the less woolly, smaller, narrower leaves.

C. ZABELII, C. K. Schneider.

A deciduous shrub, 6 to 9 ft. high; young shoots covered with loose greyish hairs, becoming smooth the second year, and dark brown. Leaves $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, half to two-thirds as wide; variable in shape, but usually oval or ovate, mostly blunt to rounded at the apex, but sometimes pointed, the base rounded to truncate; dark dull green above, with loose, appressed hairs, clothed beneath with yellowish grey felt; stalk $\frac{1}{8}$ in. long, felted. Flowers in clusters of four to ten, small, rose-coloured; stamens twenty; flower-stalk and calyx felted. Fruit red, roundish, pear-shaped, downy, $\frac{1}{2}$ in. long.

Native of W. Hupeh, China; introduced in 1907 by Wilson, who described it as the common Cotoneaster of the thickets of W. Hupeh. It is allied to *integerrima* and *tomentosa*; from the former it differs in its felted calyx, and from both in the more numerous flowered inflorescences.

CRATÆGO-MESPILUS. ROSACEÆ.

This name has been devised to distinguish three deciduous trees, one a supposed natural hybrid between the hawthorn (*Cratægus monogyna*) and the medlar (*Mespilus germanica*); the other two hybrids obtained by grafting the medlar on the hawthorn. The two last are trees of particular interest as affording evidence that Adam's story of the origin of Laburnum Adami (*q.v.*) was not, as some people held, unbelievable. (Graft-hybrids have, as a matter of fact, been since obtained of set purpose, see *Kew Bulletin*, 1911, p. 269.) The history of the two forms of *Cratægo-mespilus* is as follows:—On a specimen of medlar grafted on a stock of hawthorn growing in the garden of Mr Dardar, at Bronvaux, near Metz, there was noticed a branch pushing from just beneath the graft which showed characters intermediate between those of the medlar and hawthorn. The leaves and fruits, although smaller, were those of the medlar, but the branches were spiny and the flowers in clusters, as in hawthorn. Plants raised from this branch are now known in gardens, and described below as *C.-M. DARDARI*.

Issuing from nearly the same place on Mr Dardar's tree was another branch quite unlike the first; the leaves on this were lobed as in the hawthorn and the flowers also resembled those of that tree, but the leaves, shoots, and calyx were covered with grey wool, showing thereby the character of the medlar. The branch was propagated by grafting, and the plants so raised are now known, and described below, as *C.-M. ASNIERESII*. The same tree produced a third branch which at its base was purely hawthorn, but towards the extremity changed into *C.-M. Asnieresii*. These branches were shown to Mr E. Jouin of the Plantières nursery, near Metz, about 1895, and he gave the first account of them in *Le Jardin*, Jan. 1899. In 1898 a grafted plant of *C. Dardari*, in the nursery of Messrs Simon-Louis of Plantières, produced a branch of true medlar with the usual solitary flowers, whilst another branch was pure hawthorn. It will thus be seen that the behaviour of these graft-hybrids is very similar to that of Laburnum Adami.

C.-M. ASNIERESII, C. K. Schneider.

(*Kew Bulletin*, 1911, pp. 268-9.)

A small, deciduous, bushy-headed tree with pendulous branches, probably about 15 to 20 ft. high ultimately. Shoots woolly, armed occasionally with hawthorn-like spines. Leaves varying in shape from obovate to broadly ovate; $1\frac{1}{2}$ to 3 ins. long, 1 to $1\frac{1}{4}$ ins. wide; some entire, others deeply lobed like those of the hawthorn, mealy-looking when young, covered with soft down beneath. Flowers in corymbs, similar in form to those of the hawthorn, but larger and with a downy calyx; white, becoming rose-tinted with age. Fruit oblong, brown, downy, about the size of those of the hawthorn. A graft hybrid between *Cratægus monogyna* and *Mespilus germanica* (see above), and a beautiful flowering tree. (Fig. p. 418.)

C.-M. DARDARI, *Jouin*. BRONVAUX MEDLAR.

A deciduous tree probably 15 to 20 ft. high when fully grown, of pendulous habit; branchlets downy and more or less spiny. Leaves oblong, oval or ovate, $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; quite entire or more or less very finely toothed, downy on both sides; stalk $\frac{1}{8}$ in. long. Flowers white, $1\frac{1}{2}$ ins. across, borne in corymbs as many as twelve together, each flower on a downy stalk $\frac{1}{2}$ to 1 in. long; calyx with five narrow, pointed lobes $\frac{1}{3}$ to $\frac{1}{2}$ in. long, very downy. Fruit medlar-like, but smaller and in clusters.

A graft hybrid between *Cratægus monogyna* and *Mespilus germanica*, but more nearly approaching the medlar (see above). On a tree at Kew which has flowered for several years past are three distinct types of growth. The bulk of the tree is C.-m. Dardari, as described above; but there are branches also of C.-m. *Asnieresii*, as described above also, and some of pure medlar, with its much larger leaves and solitary flowers and fruits. A tree at Aldenham has produced a shoot and flowers of hawthorn.



CRATÆGO-MESPILUS ASNIERESII.

C.-M. GRANDIFLORA.

(*Mespilus Smithii*, *De Candolle*; *M. grandiflora*, *Smith*; *Pyrus lobata*, *Nicholson*.)

A deciduous tree up to 30 ft. high, of rounded habit, the lower branches pendulous; branchlets downy. Leaves oval or obovate, 2 to $3\frac{1}{2}$ ins. long, half to two-thirds as wide; often with several angular lobes towards the end, these being most developed on the barren young shoots; margins finely toothed; both surfaces downy; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, hairy. Flowers usually in pairs or threes, terminating short, leafy twigs; each flower 1 in. across, pure white, produced on a short, woolly stalk. Fruit $\frac{3}{4}$ in. diameter, globular, yellowish brown, flesh mealy, tasting like that of a hawthorn, containing two hard stones.

A presumed natural hybrid between *Cratægus monogyna* and *Mespilus germanica*, found wild in France in the departments of Saône-et-Loire and Rhone on the east, and of Gironde on the west. It appears to be sterile, but flowers with the greatest freedom towards the end of May, and makes a picture of extreme beauty and elegance. It is a luxuriantly leafy tree of vigorous growth, an admirable ornament on a lawn.

CRATÆGUS. THORNS. ROSACEÆ.

The thorns in cultivation are deciduous trees or shrubs, nearly always more or less armed, sometimes very formidably, with spines. Some of the species from the southern United States are inclined to be semi-evergreen, but the only truly evergreen ones that have been included in the genus are three species of the *Pyracantha* group, which in this work are treated as a separate genus (see *PYRACANTHA*). *Cratægus* is very sparsely represented in China, Japan, the Himalaya, and in Western N. America. About a dozen species occur in Europe and Asia Minor. Most of the remainder are natives of Eastern and Central N. America, where an extraordinary number of beautiful species exist. A curious ignorance of the wealth of *Cratægi* in this region prevailed until the last twenty years. Sargent, dealing with the genus in his great *Silva of North America*, in 1892, described only fourteen species. Ten years later, in a supplement, the number increased to eighty-four. A census of American *Cratægi* made in Nov. 1911 at Kew, showed that 922 so-called species had by then been described by various authors. It is scarcely credible that anything like so vast a number of genuine species exist there. A great many can differ from each other scarcely more than garden varieties of apples do. The classification of the American thorns must at present be regarded as in an uncertain state. The various authors who have taken up the subject have each a different view as to the limits and characters of the various sections, and there appears to have been a lack of co-operation among them. Many of the species are nevertheless very distinct as well as beautiful, and there is no doubt that the future will see the garden value of the genus much enhanced. But at present only the old and leading types can be satisfactorily dealt with here.

Leaves alternate, always toothed or lobed, often both; those of the vigorous non-flowering shoots of the year being usually much larger and broader at the base than those of the flowering shoots. They have also, as a rule, much larger and more persistent stipules. The stipules of *Cratægus*, however, vary so much, even on the same plant, that they do not afford very good differentiating characters. Flowers $\frac{1}{3}$ to $\frac{3}{4}$ in. in diameter; nearly always white, sometimes yellowish white, sometimes red in garden varieties; produced mostly in May and June, in flattish or rounded corymbs at the end of short, leafy shoots, which spring from the buds of the previous year's growths. In rare instances the flowers are solitary. Petals and calyx-lobes five; stamens five to twenty-five; styles one to five. Fruit a pome, consisting of a fleshy exterior, enclosing as many bony nutlets as there are styles. The fruits are of various colours, mostly red, but also black, yellow, and blue.

The nearest ally to *Cratægus* is *Cotoneaster*, which has, however, entire leaves and no thorns. *Mespilus* is also allied, but has large, solitary, scarcely stalked flowers, with long leaf-like lobes to the calyx. (See also *PYRACANTHA*.)

The cultivation of the thorns presents no problems. They all like a

loamy soil, and have no objection to lime. They are best raised from seeds, and trees so derived are better-growing and longer-lived than grafted ones. This applies especially to grafted trees of which stock and scion are of different species. It has long been the practice to graft the American thorns on *C. monogyna*, but although it is a longer business raising them from seed, it pays in the end. Named and selected forms have, perforce, to be increased by grafting; in that case stocks of the parent species should be selected. The seed of *Cratægus* does not, as a rule, germinate until it has lain a year in the ground. For this reason it is the common practice where large quantities of young plants are needed, as in the case of the common hawthorn, to mix the fruits as soon as gathered with earth or sand, and let them lie in a heap until they are sown the second spring following their ripening. They have to be turned occasionally, especially at first. Of rarer sorts the seed may be sown as soon as received, and the boxes or pans placed on the north side of a hedge to save trouble in watering. They should be watched the second spring, when germination usually takes place, and, if important enough, given the protection of an unheated frame.

The thorns do not transplant well if allowed to remain more than two or three years in a place. They like a good, well-drained soil, and the only pruning they need is the removal of overcrowding branches, and an encouragement of the leading shoot when young by removing rivals.

The thorns have two, frequently three, seasons of beauty—in flower, in fruit, and in the dying foliage. Few genera, indeed, supply so many charming lawn trees. Besides the garden forms of *Oxyacantha* and *monogyna*, the following twelve species may be selected as specially worthy:—*Carrierei*, *coccinea*, *cordata*, *Crus-galli*, *Korolkowi*, *macracantha*, *mollis*, *orientalis*, *prunifolia*, *punctata*, *tanacetifolia*, and *tomentosa*.

C. ALTAICA, *Ledebour*. ALTAI MOUNTAIN THORN.

A small tree with dark purplish brown, smooth twigs. Leaves broadly ovate to triangular; very broadly wedge-shaped, straight, or even slightly heart-shaped at the base; five- to eleven-lobed, the lowest pair of lobes often reaching almost to the midrib; finely toothed, 2 to 4 ins. long, nearly as wide; quite smooth on both surfaces except for occasional small tufts of down in the vein-axils beneath; stalk $\frac{3}{4}$ to $1\frac{1}{8}$ ins. long; stipules half-heart-shaped to sickle-shaped, sharply toothed. Flowers white, $\frac{5}{8}$ in. across, produced during May in corymbs about 3 ins. across; calyx and flower-stalk quite smooth; stamens about twenty; styles mostly five. Fruit globose, yellow, $\frac{1}{2}$ to $\frac{5}{8}$ in. across.

Native of the Altai region. The thorn described above is also known in gardens as *C. Korolkowi* and *C. sanguinea* var. *xanthocarpa*. In foliage and flower it bears a considerable resemblance to *C. pinnatifida*, but that thorn has the leaves, flower-stalks, and calyx downy, and the fruit is never yellow.

C. APIIFOLIA, *Michaux*. PARSLEY-LEAVED THORN.

A shrub or miniature tree in this country, with slender, downy young shoots; thorns 1 to $1\frac{1}{2}$ ins. long. Leaves triangular to kidney-shaped, the lower ones

on the shoot deeply toothed, the upper ones deeply parallel-lobed as well as toothed ; usually more or less hollowed at the base ; 1 to $1\frac{3}{4}$ ins. wide, not so long ; bright green and almost or quite smooth ; stalk $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, slender. Flowers $\frac{3}{4}$ in. across ; borne in May, each on a slender hairy stalk up to 1 in. long, in corymbs. Calyx-tube downy, the lobes smooth ; stamens twenty, anthers bright pink ; styles one to three. Fruit scarlet, $\frac{1}{2}$ in. long, oval.

Native of the southern United States ; introduced early in the nineteenth century, but has frequently quite disappeared from cultivation. It is too tender for all but the milder parts of Britain, and although it may live for several years and flower, as it has done at Kew, I have never seen it bear fruit. It is very distinct in the shape and deep parallel lobing of the leaf.

C. APRICA, *Beadle*.

A small tree up to 20 ft. high, or a shrub ; branchlets zigzag, armed with thorns 1 to $1\frac{1}{2}$ ins. long ; young shoots and leaves soon smooth. Leaves broadly diamond-shaped, obovate, oval or even roundish, more or less tapered at the base, the upper half toothed and either pointed or rounded at the apex ; lobed on strong barren shoots ; $\frac{3}{4}$ to 2 ins. long, nearly or quite as wide ; stalks $\frac{1}{2}$ to $\frac{1}{2}$ in. long, and, like the base of the leaf, very glandular. Flower $\frac{3}{4}$ in. diameter, white, produced three to six together on corymbs $1\frac{1}{2}$ to 2 ins. across ; flower-stalk and calyx shaggy, calyx lobes conspicuously glandular-toothed ; stamens ten ; anthers yellow ; styles three to five. Fruit globose, $\frac{1}{2}$ in. diameter, orange red.

Native of the south-eastern United States ; introduced in 1900. It belongs to the group of which *C. flava* is the type, but promises to be a much handsomer tree than that. It flowers very freely, and its fruits are richly, if not very brightly coloured. It is marked by the very glandular leaf-bases, leaf-stalks, and inflorescence.

C. AZAROLUS, *Linnæus*. AZAROLE.

(*C. Aronia*, *Bosc.*)

A small, very slightly spiny tree, up to 30 ft. high ; young shoots covered with fine down. Leaves wedge-shaped at the base, $1\frac{1}{2}$ to 3 ins. long, nearly as wide ; obovate to rhomboidal, three- or five-lobed (sometimes almost to the midrib), lobes toothed at the end or sometimes entire ; bright green, ultimately nearly smooth above, downy beneath ; stalk $\frac{1}{2}$ to 1 in. long ; stipules deeply toothed, cockscomb-shaped. Flowers white, about $\frac{1}{2}$ in. across, produced during June in densely flowered corymbs 2 to 3 ins. across ; stamens twenty ; style one or two (rarely three). Fruit up to $\frac{3}{4}$ or 1 in. diameter, globose, mostly orange or yellow, but varying to whitish or red, apple-like in flavour.

Native of the Orient ; cultivated in England in the seventeenth century, but never, I think, very common—most of the trees so-called being either *C. orientalis* or *C. sinaica*. The latter is closely allied and very similar in general appearance, but its leaves are smooth. *C. orientalis* is different in general aspect, its leaves are thinner, and with narrower, deeper lobing as a rule, and the flowers have from three to five styles. The species is cultivated in S.E. Europe for its edible fruits, which vary much in size and colour.

C. BERBERIFOLIA, *Torrey and Gray*.

A tree up to 20 ft. high, with crooked, horizontal branches, making a dense flat-topped head ; young shoots at first hairy ; thorns up to $1\frac{1}{2}$ ins. long, abundant. Leaves obovate or oval, always narrowed and entire at the base,

the upper part toothed, and either pointed or rounded ; 1 to 2 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide ; dark glossy green, with flattened hairs above, eventually smooth ; permanently more or less downy beneath ; stalk $\frac{1}{4}$ to $\frac{1}{3}$ in. long, downy at first. Flowers white, $\frac{1}{2}$ in. across, borne during May and June in small, few-flowered corymbs. Flower-stalks and calyx-tube hairy ; calyx-lobes linear, toothed, smooth outside, hairy inside ; stamens up to twenty, anthers yellow ; styles two or three. Fruits yellowish red, $\frac{1}{2}$ in. diameter.

Native of the southern United States, with an apparently restricted habitat in Louisiana. It has been cultivated at Kew since 1878, and, in spite of its southern habitat, is quite hardy. It is, however, one of the inferior thorns, although it is of the *Crus-galli* group, and was once regarded as a variety of that species. The yellow anthers and downiness of the younger parts amply distinguish it from *C. Crus-galli*.

C. BRACHYACANTHA, *Sargent*. POMETTE BLEUE.

A deciduous tree, described by Sargent as 40 to 50 ft. high, forming a broad, compact, round-topped head ; young shoots slightly downy at first, soon smooth ; thorns sturdy, $\frac{1}{3}$ to $1\frac{1}{2}$ ins. long. Leaves oval or ovate, 1 to 2 ins. long, about half as wide, tapered at the base, shallowly round-toothed, glossy dark green, smooth except on the upper surface when young. On vigorous barren shoots, the leaves are often of almost triangular shape, and truncate or even heart-shaped at the base, with stipules 1 in. long. Flowers small, the petals turning orange-coloured with age ; flower-stalks and outside of calyx smooth ; calyx-lobes not toothed ; stamens fifteen to twenty ; styles three to five. Fruit roundish, bright blue, covered with a blue-white bloom, $\frac{1}{3}$ to $\frac{1}{2}$ in. across.

Native of the southern Central United States ; introduced in 1900. The most remarkable character of this thorn is the bright blue fruit. Whether it will thrive well enough to bear fruit in this country, has yet to be proved. It belongs to Sargent's group "*Brachyacanthæ*," or the short-spined *Cratægus*, to which also belongs

C. SALIGNA, *Greene*, introduced in 1902. This is a native of Colorado, at 6000 to 8000 ft. altitude, and promises to be perfectly hardy with us. Its smooth, reddish young shoots are armed with thorns $\frac{3}{4}$ in. or more long. Fruit globose, shining, $\frac{1}{4}$ in. across, red, finally blue-black. A tree 20 ft. high, with firm-textured, deep green, smooth and glossy leaves up to 2 ins. long and 1 in. wide, ovate-lanceolate or oval.

C. CARRIEREI, *Vauvel*.

(*C. Lavallei*, *Herincq*.)

A tree of sturdy, leafy habit up to 15 or 20 ft. high ; young shoots downy, sometimes retaining the down until the second season ; thorns few, stout, 1 to $1\frac{1}{2}$ ins. long. Leaves obovate or oval, tapered at both ends, $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, 1 to $2\frac{1}{2}$ ins. wide ; coarsely and irregularly toothed, glossy dark green above and soon smooth except along the midrib ; permanently downy beneath, especially on the midrib and veins ; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers white, nearly 1 in. across, produced in June in erect corymbs about 3 ins. in diameter. Flower-stalks and calyx very woolly, the lobes of the latter glandular-toothed, linear-lanceolate ; stamens twenty ; styles one to three. Fruits orange-red speckled with brown, globose with a pear-shaped base, $\frac{3}{4}$ in. wide, persisting through the winter.

The origin of this fine thorn is uncertain. Mr Carrière (*Revue Horticole*, 1883, p. 108) says it came from seed of *C. mexicana* (i.e. *C. stipulacea*), and *C. Carrieri* as we know it to-day certainly bears a strong resemblance to that

species. *C. stipulacea* (g.v.) has yellow fruit, not tapered where it joins the stalk, and its calyx-lobes are less conspicuously gland-toothed. It has been suggested that *C. Carrierei* is a hybrid between *C. punctata* and *C. Crus-galli*, although the latter is a glabrous tree, and even *C. punctata* is less shaggy than its supposed offspring. The dotted fruits resemble *C. punctata*, and their persistence on the tree is characteristic of *C. Crus-galli*, but the suggestion is not convincing. It is one of the handsomest of all thorns, either in foliage, flower, or fruit. *C. Lavallei*, which first appeared in the arboretum of Segrez in France, is now generally regarded as the same thing.

C. CHLOROSARCA, Maximowicz.

A small, mostly unarmed tree, of pyramidal habit; young shoots stout, warted, slightly hairy at first, becoming by autumn deep brown-purple, with large, almost black buds. Leaves 2 to $3\frac{1}{4}$ ins. long, nearly as wide at the base, triangular or broadly ovate, broadly wedge-shaped towards the stalk, rather shallowly seven- or nine-lobed, the lobes finely toothed, both sides hairy, the upper one becoming smooth, very dark green; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; stipules gland-toothed. Flowers white, $\frac{1}{2}$ in. across; produced in corymbs 2 ins. in diameter; outside of calyx and flower-stalks hairy; calyx-lobes minutely toothed; stamens twenty; styles five. Fruit black, $\frac{1}{2}$ in. diameter, flattened-globose.

Native of Manchuria and Japan; recently spread in gardens, where it is admired for the deep colouring of its branchlets. It is only likely to be confused with *dsungarica*, which has also black fruit; *C. chlorosarca* is distinguished from it by the shallower lobes of the leaves, their abrupt points, and finer teeth.

C. COCCINEA, Linnæus. SCARLET HAW.

A tree up to 20 ft. high, with a wide-spreading head; young shoots at first more or less covered with loose white hairs which soon fall away, leaving them smooth, shining brown; thorns up to 2 ins. long. Leaves oval, diamond-shaped, or obovate; always wedge-shaped at the base, pointed at the apex, the upper half shallowly lobed, finely toothed, the teeth gland-tipped; 1 to 3 ins. long, $\frac{3}{4}$ to 2 ins. wide; at first downy above, becoming smooth and glossy; hairy on the midrib and chief veins beneath; stalk $\frac{1}{2}$ to 1 in. long. Flowers white, $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, borne during May in corymbs 2 to 3 ins. across; flower-stalks and calyx more or less shaggy with whitish hairs; stamens ten, anthers yellow; styles three or four. Fruit pendulous, red, globose but rather flattened at the top, $\frac{1}{2}$ in. or less in diameter.

Native of N. America from Newfoundland to Connecticut; introduced, according to Aiton, in 1683. Long confused in gardens with *mollis* (g.v.).

Var. *ROTUNDIFOLIA*, *Sargent* (*C. glandulosa*, *Aiton*; *C. rotundifolia*, *Moench*).—A distinct variety, sometimes regarded as a species. Except for a slight down sometimes on the flower-stalks and inside of the sepals, it is quite smooth. It is also a smaller, more shrub-like tree than *C. coccinea*, and its thorns, perhaps, are more plentiful.

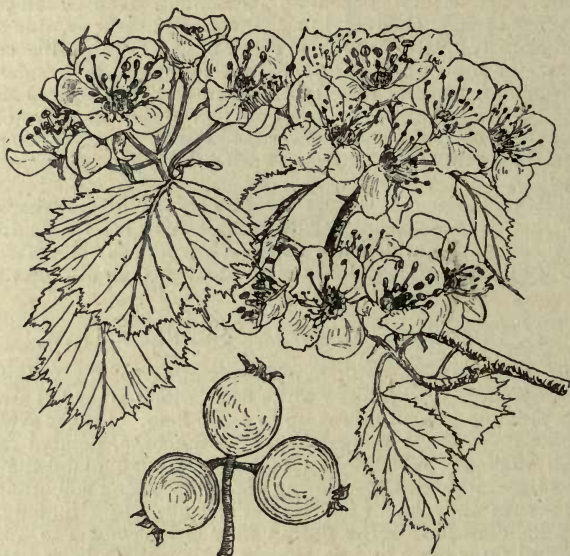
Allied to *C. coccinea* is *C. HOLMESIANA*, *Ashe*, but it differs in having the flower-stalks smooth or nearly so, and the stamens only five to seven to each flower. Native of N. America from Montreal to Pennsylvania, etc. Introduced under its present name first in 1901, but probably in cultivation before as *C. coccinea*.

Other species of the same group are *C. ACUTILOBA*, *Sargent*, and *C. COCCINIOIDES*, *Ashe*. They have leaves much broader at the base, and rounded, truncate, or even slightly heart-shaped. *C. acutiloba*, for long known in gardens as *C. coccinea* var. *indentata*, is found wild in the province of Quebec; its leaf-

margins are beautifully cut up into narrow, triangular lobes $\frac{1}{4}$ to $\frac{1}{2}$ in. deep, each lobe with a long, slender, very sharp point, and with slender, sharp teeth; the young shoots are soon quite smooth, and the leaves are only downy above for a short time. Stamens fifteen to twenty. Fruit red. (See fig.) *C. coccinioides* has similarly shaped leaves, downy on the veins beneath. Stamens twenty. Fruit dark crimson.

C. CORDATA, *Aiton*. WASHINGTON THORN.

An elegant tree up to 30 ft. high, with a slender trunk supporting a dense, rounded head of leafy branches; young shoots slender, smooth; thorns sharp, slender, up to 3 ins. long, sometimes branched. Leaves triangular, broadly



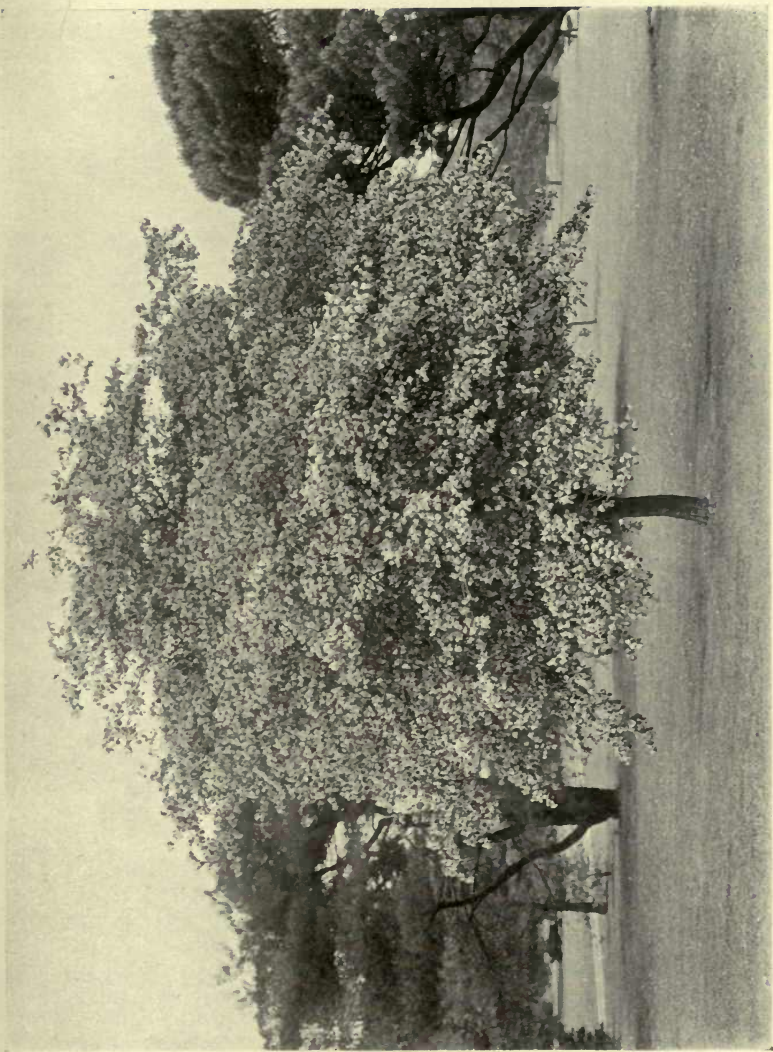
CRATÆGUS ACUTILOBA.

ovate, heart-shaped or slightly rounded at the base, pointed, often lobed towards the base, sharply toothed; 1 to 3 ins. long, $\frac{3}{4}$ to 2 $\frac{1}{4}$ ins. wide; of a vivid lustrous green, and smooth except when first expanded; stalk up 1 in. long. Flowers white, $\frac{1}{2}$ in. across, produced during July in terminal and axillary corymbs 2 to 3 ins. wide. Calyx and flower-stalk quite smooth; stamens twenty; anthers pink; styles two to five. Fruit scarlet, orange-shaped, $\frac{1}{4}$ in. diameter, persisting on the tree until spring.

Native of the eastern United States; introduced in 1738. This handsome species is one of the most distinct of all the thorns. It flowers the latest of all the better-known kinds, and its small, bright fruits are beautiful through the winter.

C. CRUS-GALLI, *Linnaeus*. COCKSPUR THORN.

A small, usually more or less flat-topped tree, with spreading, often horizontal branches; young shoots quite smooth; thorns rigid, 1 $\frac{1}{2}$ to 3 ins.



WASHINGTON THORN, *Crataegus cordata*.

[Face p. 424.

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long, ultimately twice as long, and branched. Leaves obovate, always tapered and without teeth towards the base, the apex toothed, rounded or abruptly pointed; 1 to 4 ins. long, $\frac{1}{3}$ to $1\frac{1}{2}$ ins. wide; dark glossy green and perfectly smooth; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers white, $\frac{2}{3}$ in. across, produced in June on smooth-stalked corymbs 2 to 3 ins. wide; stamens ten, anthers pink; styles usually two. Fruit nearly globose, $\frac{1}{2}$ in. diameter, deep red.

Native of Eastern N. America; introduced in 1691. This beautiful and distinct thorn has much to recommend it. Its habit is striking and picturesque, it blossoms freely, its leaves change to brilliant scarlet in autumn, and its fruits, ripening in October and persisting until spring, make one of the brightest of early winter pictures. The species is, moreover, one of the hardiest and most thriving of its kind. Several forms assigned to it are cultivated in gardens.

Var. ARBUTIFOLIA.—Leaves obovate to oval, from $\frac{5}{8}$ to over 2 ins. wide. In their size and to some degree their shape, this variety suggests *C. prunifolia* (*g.v.*), but it is quite free from down in all its parts, it has not more than ten stamens, and its fruits remain after the leaves. A handsome variety.

Var. LINEARIS, *De Candolle*.—In the entire absence of down from this tree, it would appear to be a true *Crus-galli* form intermediate between *arbutifolia* and *pyracanthifolia*.

Var. PYRACANTHIFOLIA, *Aiton*.—A small, slender-stemmed tree, with a flat, spreading head of branches and narrowly obovate leaves, and smaller flowers and fruit.

Var. SALICIFOLIA, *Aiton*.—Leaves still narrower, oblanceolate; habit flat-topped. (For various thorns with larger leaves, often put under *Crus-galli* as varieties, viz., *ovalifolia*, *prunifolia*, and *splendens*, see *C. PRUNIFOLIA* and *C. FONTANESIANA*.)

C. CUNEATA, *Siebold*.

A twiggy shrub with slender, hairy, reddish young shoots; thorns about $\frac{1}{4}$ in. long, slender. Leaves obovate or somewhat spoon-shaped, much tapered and entire at the base, the apex rounded or abruptly tapered, slightly lobed and toothed; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; pale bright green, and soon quite smooth above; slightly hairy beneath; stalk $\frac{1}{2}$ in. long, or with the leaf-blade almost reaching to the base, hairy; stipules semi-heart-shaped, coarsely toothed, $\frac{1}{2}$ in. long. Flowers white, $\frac{1}{2}$ to $\frac{3}{4}$ in. across, produced during May and June in few-flowered corymbs; stalks hairy; stamens twenty; styles five, hairy at the base. Fruit globose or slightly pear-shaped, red, $\frac{1}{2}$ to $\frac{3}{8}$ in. diameter.

Native of Japan and Central China; long known in cultivation, but always rare. So far as I have seen, it has little to recommend it, although wild specimens show it to be a pretty bush in nature. I suspect it is spring tender.

C. DOUGLASII, *Lindley*. DOUGLAS THORN.

A tree 30 ft. or more high, with a rounded head of branches; young shoots reddish brown, smooth; thorns often absent; when present, $\frac{3}{4}$ to 1 in. long, stout. Leaves obovate to ovate, always tapered at the base, mostly pointed, sometimes rounded at the apex, upper part slightly lobed or double-toothed, or sometimes with two deep lobes near the base; $1\frac{1}{2}$ to 4 ins. long, 1 to 3 ins. wide; dark glossy green and downy along the midrib above, ultimately quite smooth below; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers white, $\frac{1}{2}$ in. diameter, produced during May in corymbs 2 ins. across; calyx-tube and flower-stalk quite smooth; calyx-lobes narrow, glandular-toothed, downy inside. Stamens twenty; styles two to five. Fruit black, $\frac{1}{2}$ in. diameter, falling early.

Native of N. America from Michigan to California and Oregon; introduced about 1828. It is one of the largest, but not, so far as I have seen, one of the most ornamental of thorns, its corymbs being rather small and its fruits ineffective. It is much confused in gardens with the following:—

C. RIVULARIS, *Nuttall* (*C. Douglasii* var. *rivularis*, *Sargent*).—This is closely allied to *C. Douglasii*, but is a more pyramidal tree; the leaves have shorter stalks and tufts of down in the vein-axils till late summer at least, and the calyx-lobes are shorter, broader, and mostly entire. It has been regarded as a variety of *Douglasii*, and has about the same garden value.

C. DSUNGARICA, *Zabel*.

A small tree, armed with spines $\frac{1}{2}$ to $\frac{3}{4}$ in. long; young shoots smooth, becoming bright purplish brown. Leaves of the barren shoots triangular, broadly wedge-shaped or cut almost straight across at the base, three- to seven-lobed, $1\frac{1}{2}$ to $3\frac{1}{4}$ ins. long and wide, the lowest pair of lobes large, spreading; leaves of the flowering shoots smaller, more ovate or diamond-shaped and tapered at the base, lobes sharply pointed and sparsely toothed; downy on both sides when quite young, soon becoming smooth except in the vein-axils beneath; stalk $\frac{1}{2}$ to $1\frac{1}{8}$ ins. long; stipules cockscomb-shaped, up to 1 in. diameter. Flowers white, $\frac{5}{8}$ in. diameter, produced about the middle of May in corymbs 2 to 3 ins. across; sepals and flower-stalks smooth; stamens twenty; styles three to five; fruit globose, shining black, $\frac{1}{2}$ in. diameter.

A handsome thorn of doubtful origin, probably native of S.E. Siberia and Manchuria. In foliage it much resembles *C. altaica* and *C. pinnatifida*, but its black fruits distinguish it from these and all of the sanguinea group, except *C. chlorosarca* (*g.v.*).

C. DUROBRIVENSIS, *Sargent*.

A shrub 10 to 16 ft. high, with smooth young shoots; thorns $1\frac{1}{2}$ to 2 ins. long. Leaves broadly ovate, the base broadly wedge-shaped or rounded, the upper part sharply toothed, and cut up at each side into two or four triangular lobes $\frac{1}{4}$ to $\frac{1}{2}$ in. deep; $1\frac{1}{2}$ to 3 ins. long, 1 to $3\frac{1}{2}$ ins. wide; quite smooth on both surfaces except at first; stalk slender, glandular, up to $1\frac{1}{8}$ ins. long. Flowers white, $\frac{3}{4}$ to 1 in. diameter, stalks and outside of calyx smooth; stamens twenty, anthers pink; styles five. Fruit globose, $\frac{5}{8}$ in. diameter, dark shining crimson.

Discovered in May 1900 by Mr J. Dunbar, on the banks of the Genessee River at Rochester, New York. Its flowers are amongst the largest in the genus, and the handsome fruits remain on the branches till mid-winter. *Sargent* describes it as one of the most ornamental thorns of the northern United States. Introduced in 1901. Allied to *C. coccinioides*.

C. FLAVA, *Aiton*. YELLOW HAW.

A tree 20 ft. or more high, with smooth young shoots; thorns about 1 in. long. Leaves obovate or diamond-shaped, always tapered and glandular at the base; pointed, sometimes three-lobed at the apex; doubly toothed; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; smooth on both sides; stalk $\frac{1}{4}$ to 1 in. long, glandular. Flowers white, $\frac{3}{4}$ in. diameter, produced in early June in corymbs of three to seven blossoms; flower-stalks glandular, smooth (or at first somewhat downy); calyx smooth, or downy only on the inner face, the lobes glandular; stamens ten to twenty. Fruit roundish, pear-shaped, greenish yellow, about $\frac{5}{8}$ in. long.

Native almost certainly of Eastern N. America, but not apparently known wild now in the form described by *Aiton* in 1789. A specimen from Bishop

Goodenough's herbarium, dated 1781, is preserved at Kew, and is no doubt authentic, as it is ascribed to Solander, Aiton's coadjutor; this differs from the trees now cultivated at Kew by having about twenty stamens to each flower, and in being perfectly glabrous in flower and leaf. The species is of historical interest, and as being the type of a considerable group of thorns from the south-eastern United States; but in its few flowers and sparsely borne, dull-coloured fruits it is one of the least ornamental.

C. FONTANESIANA, *Steudel*.

(C. Crus-galli var. *Fontanesiana*, *Wenzig*.)

Of obscure origin, this thorn belongs apparently to the Crus-galli group, and is probably a hybrid between that species and *C. prunifolia*. It has dark, purplish brown branchlets with thorns up to 1 in. long. Leaves narrowly obovate, 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; pointed and toothed at the upper part; tapered, and entire below; smooth and dark glossy green. Corymbs many-flowered, 2 to 3 ins. across, with downy stalks. Flowers white, $\frac{1}{2}$ in. across; stamens fifteen to eighteen. Fruit roundish oval, dull red, $\frac{1}{2}$ in. long. The downy flower-stalks are like those of *C. prunifolia*, but the longer, narrower leaves, and dark young shoots are quite distinct. It is probably of garden origin, and has been known in cultivation over one hundred years.

C. HETEROPHYLLA, *Flügge*.

A tree up to 20 ft. high, forming a round dense head of branches; young shoots smooth; not, or but little, armed. Leaves of two distinct types, viz.—(1) those of the barren shoots: diamond-shaped, tapered and entire at the base, the upper part sharply pointed, deeply lobed (after the fashion of monogyna), the lobes sharply and irregularly toothed; $1\frac{1}{2}$ to 3 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; (2) those of the flowering shoots: much smaller, oblong, obovate or oval, sometimes entire or with a few teeth at the apex only, sometimes the upper leaves of the shoot conspicuously three-lobed at the apex; 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide. All the leaves are glossy dark green and quite smooth. There are large, coarsely toothed stipules on the barren shoots, none on the flowering ones. Flowers white, $\frac{3}{4}$ in. across, borne during May and June in corymbs 2 to 3 ins. across; flower-stalks and calyx smooth; stamens fifteen to twenty, styles solitary. Fruit bright red, slenderly oval, $\frac{1}{2}$ to $\frac{5}{8}$ in. long.

Native of Armenia; cultivated since the beginning of the nineteenth century; not now very frequently seen, although there are several splendid examples in the fine collection of thorns in the Bath Botanic Garden. It is a beautiful thorn of the *Oxyacantha* group, bearing its large flowers and bright fruits freely. It is also one of the most distinct by reason of its variously shaped leaves, its long narrow fruits, and the absence of down from the younger parts.

C. KOROLKOWI, *Regel*.

(C. *tatarica*, *Hort*.)

A tree up to 25 ft. high, forming a dense, heavy, very leafy head of branches. It is really a very vigorous, large-leaved form of *C. pinnatifida*, and has been named *C. p. var. major*, *N. E. Brown*. The leaves are harder and thicker than in *C. pinnatifida*, and not so flat; 3 to 6 ins. long and nearly as much wide; the lobes not so deep but broader; except for a slight hairiness along the midrib and larger veins, they are smooth. They are of a rich dark lustrous green, the midrib, veins, and young wood tinged with red. Flowers

similar to *pinnatifida*; calyx and flower-stalks downy. Fruits deep shining red, marked with minute dots, between pear-shaped and globose, 1 in. across, deeply hollowed at the top. When a tree is well furnished with the pendulous clusters of these large fruits it is remarkably handsome. This is, indeed, one of the most striking and effective of all the thorns. It is only slightly or not at all spiny. In October 1886, it was awarded a first-class certificate by the Royal Horticultural Society, but had been in cultivation long previously. Native of N. China.

C. HENRYI, *Dunn*, is nearly allied to the above, but its ovate or lozenge-shaped leaves are only shallowly lobed, 3 to 4½ ins. long, smooth except for tufts of down in the vein-axils beneath; stalk 1¾ ins. long. Flowers ¾ in. across; stalks and calyx smooth. Discovered in Yunnan by Henry, and later by Wilson in W. Hupeh, China. Probably in cultivation as young plants.

C. LEEANA, *Loudon*. LEE'S THORN.

(C. Dippeliana, *Lange*; C. Celsiana, *Dippel*.)

The origin of this handsome thorn is unknown. It was at one time believed to have been raised in Lee's nursery at Hammersmith, and is, no doubt, of garden origin—a hybrid in whose origin one of the *orientalis* group of thorns has shared. The suggestion has been made that it is a hybrid between *tanacetifolia* and *punctata*, but it is difficult to see where the latter species is in evidence. Leaves 1½ to 3 ins. long, ¾ to 2 ins. wide; broadly ovate, sometimes obovate, with seven to eleven lobes reaching from one-third to half-way to the midrib; coarsely toothed; deep green and hairy at first above, becoming almost smooth by the end of the season; more densely and permanently hairy beneath; stalk up to ⅝ in. long. Flowers ¾ to 1 in. diameter, white, produced very freely in mid-June; calyx and flower-stalk hairy like the young twigs; stamens eighteen to twenty-two. Fruit dull red, ½ to ⅝ in. across. No doubt closely allied to the tansy-leaved thorn, this is quite as handsome in flower, and it grows more robustly. The leaves are larger; the fruit smaller and red.

C. MACRACANTHA, *Koehne*.

A tree up to 15 ft. or more high, and perhaps the most formidably armed of all thorns, the spines being sometimes 4 or 5 ins. long, and very abundant; young shoots reddish brown, smooth. Leaves roundish oval or obovate, 2 to 4 ins. long, 1½ to 3 ins. wide; tapered more or less at the base, pointed at the apex, the upper part usually more or less lobed, sharply toothed; dark green, leathery, smooth above except when young; remaining downy beneath, although finally only on the parallel veins (of which there are six or seven pairs) and the midrib; stalk ¼ to ⅓ in. long. Flowers white, ¾ in. across, produced in May and June in corymbs 2 or 3 ins. wide; flower-stalk either downy or not; calyx-lobes narrow, downy inside, glandular-toothed; stamens eight to ten, anthers yellow. Fruit globose, bright crimson, ⅓ to ½ in. diameter.

Native of Eastern N. America; introduced in 1819. It is one of the most remarkable of all thorns in the extraordinary number and size of its thorns, even larger than in *Crus-galli*. It is also one of the handsomest in fruit, a good grower, and very hardy. It was at one time associated with *C. coccinea* as a variety, but the longitudinal cavities on the inner face of the seed (nutlet) are regarded as showing its relationship with the *tomentosa* group. It differs from both *C. tomentosa* and *C. succulenta* in having not more than ten stamens, and yellow anthers.

C. MOLLIS, Scheele. RED HAW.

A tree up to 30 or 40 ft. high, with a wide-spreading head of smooth, grey branches; young branchlets covered with whitish hairs the first season; thorns 1 to 2 ins. long. Leaves broadly ovate, rounded, truncate or heart-shaped at the base, pointed, with four to seven shallow lobes at each side, and very sharply glandular-toothed; 2 to $4\frac{1}{2}$ ins. long, and nearly or quite as broad; both surfaces, but especially the lower one, downy, the upper becoming rather rough in the latter part of the season; stalk 1 to 2 ins. long. Flowers white, 1 in. across; flower-stalks and calyx thickly coated with white hairs; calyx-lobes toothed and glandular, stamens about twenty; anthers pale yellow; styles four or five. Fruit sub-globose, $\frac{3}{4}$ to 1 in. diameter, red, downy.

Native of the Central United States; long introduced, but much confused with *C. coccinea*, a thorn with shoots glabrous, leaves more or less tapered at the base, flowers with only ten stamens, and fruit only $\frac{1}{2}$ in. across. *C. mollis* is also well distinguished by its larger leaves being always downy (very much so when young). As a flowering tree it is one of the most beautiful of thorns, and as a fruit-bearer is also handsome, but its fruits drop early (in September), a month or six weeks in front of those of *C. coccinea*.

C. mollis is made the type of a group of American thorns by Sargent, which contains a number of very fine species, amongst which the following may be mentioned:—

C. ARKANSANA, Sargent.—A tree 20 ft. high, native of Arkansas; differing from *C. mollis* in the fruits being of longer, more oblong shape, and ripening in October; the leaves also are generally more tapered at the base. I saw a fine specimen in the Arnold Arboretum a few years ago, and was struck by its great elegance of habit. Introduced in 1902.

C. ARNOLDIANA, Sargent.—A tree 15 to 20 ft. high, native of Massachusetts and Connecticut, with apparently a very local distribution. This species has only ten stamens to each flower. Introduced in 1901. It is a sturdy tree with a dense head of very thorny zigzag branches; thorns up to 3 ins. long. It is thriving vigorously in this country.

C. CHAMPLAINENSIS, Sargent, a native of E. Canada, introduced in 1901, has also ten stamens to each flower; leaves of the barren shoots more heart-shaped at the base than in *C. Arnoldiana*.

C. MONOGYNA, Jacquin. COMMON HAWTHORN or MAY.

The common hawthorn, as popularly known, consists of two very distinct forms now usually regarded as separate species, viz., *C. monogyna* and *C. Oxyacantha* (*g.v.*). *C. monogyna* is the commoner one, and is distinguished from the other by being, as a rule, a larger tree (up to 35 ft.); its leaves are larger and more deeply three- to seven-lobed; its flowers have but one style, and its fruits but one stone. The fruit also is rounder and less elongated. It is, within its own limits, a very variable tree, and numerous named varieties are in cultivation. Many of these have little interest or value; the best and most distinct are noted below. Although the typical forms of *Oxyacantha* and *monogyna* are absolutely distinct, they are united by others of an intermediate character, having flowers with one or more styles, and fruits with one or more stones. Those who regard the two as a single species have much to support their view.

Cratægus monogyna, being more formidably armed than *C. Oxyacantha*, is the one in common use for making hedges. On the whole, it may safely be said that no other tree or shrub is, in our climate, so good for the purpose. Easily raised, transplanting well when small, and bearing any amount of clipping,

it fills a unique place in the English landscape in constituting tens of thousands of miles of hedgerow. Besides its efficacy as a hedge, due to its thorny nature and dense growth, it has in its rich, polished, green foliage much beauty as well, although well-kept hedges do not flower much, owing to the flowering wood being cut away in autumn.

The naturally grown hawthorn has a singular beauty of habit. It forms a comparatively slender trunk (1 to 2 ft. in diameter, however, in old specimens), supporting a rounded head of dense branches gracefully pendulous at the ends. When in blossom no object of our waysides has greater beauty, and its charm is heightened by one of the sweetest of open-air perfumes. The flowers of the hawthorn open from the middle of May until early June. In accounting for its associations with the games and festivals of early May-time, we must remember that these grew up under the Old Style calendar, when May 1st occupied the same place in relation to the equinox that May 13th does at the present time. The hawthorn is very rarely in bloom on our present first of May.

Var. *AUREA*, *Loudon*.—Fruits yellow. A form called *FRANÇOIS RIGAUD* has also yellow fruits and yellowish branches.

Var. *ERIOCARPA*.—Fruit woolly when young, deep red.

Var. *FILICIFOLIA*.—Leaves finely cut.

Var. *FLEXUOSA*, *Smith* (*C. tortuosa*, *Hort.*)—Branches curiously twisted and curled.

Var. *GRANATENSIS*.—Nearly or quite unarmed; branches pendulous.

Var. *HORRIDA*.—Branches extremely thorny; forming conspicuous nests of thorns at the joints.

Var. *INERMIS COMPACTA*.—Very dwarf and quite unarmed; a remarkable form.

Var. *LACINIATA*, *Loudon* (*C. fissa*, *Bosc*).—Leaves up to 3 ins. long and wide, very deeply pinnately lobed and with a wide space between each lobe, the lobes doubly toothed.

Var. *LUTESCENS*.—Leaves yellow.

Var. *PENDULA*.—A very graceful form with pendulous branches; there is a form of it with variegated leaves—*PENDULA VARIEGATA*.

Var. *PRÆCOX*, *Glastonbury Thorn*.—This remarkable variety, besides bearing a crop of blossom at the ordinary season, flowers and produces young foliage in winter. The popular belief that it breaks into flower about Christmas Day has frequent support in fact, although much depends on the season. In the south and west of England, if November and December be mild, it will have some flowers open on Old Christmas Day (January 7th). If those months are cold and the winter severe and long, the flowers may not expand until March or April. On the other hand, I have gathered flowers in November. The legend of the Glastonbury Thorn is, briefly, as follows:—

Joseph of Arimathea, after the crucifixion of Christ, came to England to found Christianity. He went to Glastonbury, where, his exhortations having but little influence on the inhabitants, he prayed that a miracle might be performed in order that they might be convinced of the divine nature of his mission. God granted his prayer, for, on thrusting his staff into the ground, it immediately burst into leaf and flower, although it was then Christmas Day. The wonder was repeated on every anniversary of that day.

An old tree grew in the vicinity of Glastonbury Abbey until about the beginning of the nineteenth century, to which popular belief attached this legend. The variety is worth growing, not only for the sake of the old legend, but because of its interest in flowering in mid-winter. The flowers are not borne so abundantly as in May, but they have the true hawthorn fragrance, and this brings vividly to one's mind (as odours do), with pleasurable

sadness or perhaps pleasurable hope, the most glorious season of the year, when, in Milton's words,

"... The milkmaid singeth blythe,
And the mower whets his scythe,
And every shepherd tells his tale,
Under the hawthorn in the dale."

Var. *RAMULIS AUREIS*.—Branches yellow.

Var. *REGINÆ*.—A name given to the descendants of a tree which once grew in a garden near Edinburgh that belonged to the Regent Murray. Mary, Queen of Scots, was said to have spent many hours beneath it. It is, apparently, ordinary *C. monogyna*.

Var. *SEMPERFLORENS*, *Carrière* (*C. Bruanti*, *Hort.*)—Blossoms continuously or at intervals from the ordinary time until August. It has tiny leaves $\frac{1}{2}$ to 1 in. long, and slender branches, and is of shrubby habit and very slow-growing. A remarkably distinct dwarf variety.

Var. *SESTERIANA*.—Flowers double red.

Var. *STRICTA*, *Loddiges* (*C. fastigiata*).—Branches erect; a curious and striking form with a fastigiate habit.

Var. *VARIEGATA*.—Leaves blotched with white.

C. NIGRA, *Waldstein*. HUNGARIAN THORN.

A tree 20 ft. high, forming a rounded head of rather stiff branches; young shoots felted with a grey down, becoming smoother and purplish; thorns about $\frac{1}{2}$ in. long, often almost absent. Leaves triangular to ovate, wedge-shaped to almost straight across at the base; $1\frac{1}{2}$ to 4 ins. long, usually two-thirds to quite as wide; seven- to eleven-lobed, the lower lobes reaching not more than half-way to the midrib, the upper ones shallower; sharply toothed, dull green, both surfaces downy; stalk rarely more than $\frac{3}{4}$ in. long, very downy; stipules sharply and coarsely toothed. Flowers white, turning rosy with age, $\frac{5}{8}$ in. across, produced during May in rather small corymbs. Calyx and flower-stalks grey-hairy; stamens twenty; styles five. Fruit flattened, globose, up to $\frac{1}{2}$ in. diameter, shining black and soft.

Native of Hungary; introduced in 1819. Very distinct in its dense grey covering from other thorns, it is not, however, one of the most attractive. The inflorescences are too small and the foliage too far advanced at flowering time to make a good display.

C. OLIVERIANA, *Bosc*.

(*C. Oxyacantha* var. *Oliveriana*, *Lindley*, *Bot. Reg.* t., 1933.)

A shapely small tree with the habit of the common hawthorn, but not so tall; young shoots grey, downy. Leaves 1 to 2 ins. long, often as wide; three- or five-lobed, the basal lobes deep; grey with down on both sides, especially beneath, remaining downy until they fall, even on the upper side; stalks $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Flowers white, $\frac{5}{8}$ in. across, in compact corymbs about 2 ins. across. Calyx and flower-stalk very woolly. Fruits about $\frac{1}{4}$ in. long, egg-shaped, black-purple, at first hairy, abundant.

Native of S.E. Europe. This rather striking thorn has by some authors been placed under *C. pentagyna*, to which it is, no doubt, closely allied. But, as represented at Kew, it differs plainly from it in the small fruits, in the deeper, more finely toothed lobes of the leaf, in the abundant and more persistent down, and in the entire or less deeply toothed stipules. It is, I think, undoubtedly the thorn mentioned by Loudon under the synonym given above and figured by Lindley in the *Bot. Reg.*, t. 1933.

C. ORIENTALIS, Pallas.(C. odoratissima, *Lindley*, Bot. Reg., t. 1885.)

A small, nearly unarmed tree, 15 to 20 ft. high, with a rounded or flattish, spreading head of branches, often pendulous at the ends; young branchlets at first covered with whitish hairs, many of which fall away by the end of the season. Leaves mostly triangular or lozenge-shaped; 1 to 2 ins. long, nearly or quite as much wide; wedge-shaped to almost square at the base, more or less deeply cut (often nearly to the midrib) into five to nine narrow oblong lobes, which are themselves jaggedly toothed at the points; dark green above, grey beneath, downy on both sides; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long; stipules $\frac{1}{3}$ in. across, with a few large teeth. Flowers $\frac{3}{4}$ in. across, white, produced in early June in corymbs of twelve or more blossoms; calyx and flower-stalks grey-woolly; stamens twenty. Fruit coral red or yellowish red, $\frac{3}{4}$ in. diameter, globose, downy.

Native of the Orient; introduced in 1810. This beautiful thorn is much planted in the south of England, and is common in some of the London parks. Both in flower and fruit it is a charming tree.

Var. *SANGUINEA*, *Loudon* (*C. orientalis*, *Lindley*, in Bot. Reg., t. 1852).—Laxer than the type in habit, but with the lobes of the leaf broader on the whole. Fruit not so downy, and of a dark dull or purplish red. Not so effective in fruit as the type. This appears to be the same as *C. Tournefortii*, *Grisebach*.

C. OXYACANTHA, Linnaeus. HAWTHORN or MAY.

A small thorny tree, up to 15 or 20 ft. high, with thorns 1 in. long. Leaves mostly obovate, three- or five-lobed, wedge-shaped at the base, the lobes rounded or pointed; toothed, dark glossy green, smooth except when quite young; $\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, two-thirds to as much wide; stalks slender, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. On strong, barren shoots the leaves are often more deeply lobed, and with large, gland-toothed stipules. Flowers white, $\frac{5}{8}$ in. diameter, produced during May six to twelve together in corymbs, the leaves at the time almost fully grown; calyx and flower-stalks smooth; stamens about twenty, anthers red; styles two or three. Fruits roundish ovoid, $\frac{1}{3}$ to $\frac{3}{4}$ in. long, red, containing two, sometimes three stones.

Native of Europe, including Britain, and one of the two forms (now usually regarded as distinct species) known popularly as "may" or "hawthorn." The other is *C. monogyna* (*g.v.*), which is best distinguished by having only one style and one stone in the fruit. Although *C. Oxyacantha* has not broken up into so many varieties as *monogyna*, to it belong some of the very best garden forms of hawthorn. None make lovelier lawn trees.

Var. *ALBA PLENA*.—Flowers white, double, changing to pink with age.

Var. *CANDIDA PLENA*.—Flowers double, white, remaining pure.

Var. *COCCINEA*.—Flowers scarlet, single.

Var. *COCCINEA PLENA*, *Paul's* double scarlet thorn.—The best of all double-flowered red thorns. Var. *SALISBURIFOLIA* is a variant of it, with curly, distorted branches and dwarf habit. There are various minor forms of red thorns, both single and double, with such names as "punicea," "rosea," and "rubra," which represent slight variations of colour.

Var. *FRUCTU-LUTEO* (*xanthocarpa*).—Fruit yellow.

Var. *GIREOUDI*.—Leaves of the later growths mottled with white and pink.

C. PENTAGYNA, Kitaibel.

A small tree, 15 to 20 ft. high, with hairy young shoots; thorns few, $\frac{1}{2}$ in. long. Leaves broadly tapered or nearly straight at the base, lobed; 1 to 3

ins. long, nearly or quite as wide. On the barren shoots they are broadly ovate, the basal pair of lobes often deep; on the flowering shoots the leaves are narrower, diamond-shaped or obovate, with a more tapered base; all dark green and somewhat hairy above, paler and more hairy below, ultimately almost smooth; stalk $\frac{1}{2}$ to 1 in. long, stipules large, deeply toothed. Flowers white, $\frac{5}{8}$ in. diameter, produced during May and June in rather lax corymbs 2 to 3 ins. across. Calyx and flower-stalks clothed with grey down; stamens twenty, anthers red; styles four or five. Fruit black-purple, oval, $\frac{1}{2}$ in. long.

Native of E. Europe. The group of thorns to which this belongs is somewhat doubtful in its inter-relationships. *C. melanocarpa*, *Bieberstein*, and *C. Oliveriana*, *Bosc*, are included under it by Lange and others. (See note under *C. Oliveriana*.) From *C. nigra* it differs in its less downy shoots and leaves, and in its oval fruits.

C. HIEMALIS, *Lange*, is supposed to be a hybrid between the above and *C. Crus-galli*, and the way seedlings of *C. hiemalis* have reverted to a pure glabrousness like that of *Crus-galli*, especially in the inflorescence, supports this theory.

C. PINNATIFIDA, *Bunge*.

A small tree up to 15 ft. or more high; thorns absent or quite short; young shoots smooth. Leaves wedge-shaped to straightly cut at the base, varying in general outline from broadly ovate and triangular to lozenge-shaped; 2 to 4 ins. long, nearly as much or rather more in width, usually with a deep lobe reaching nearly to the midrib at the base on each side, the terminal portion being also lobed, but not so deeply; margins sharply, often doubly toothed, deep glossy green above, paler beneath, both sides downy along the midrib and chief veins; stalk 1 to $2\frac{1}{4}$ ins. long, stipules cockscomb-shaped, coarsely toothed, often over 1 in. across. Flowers white, $\frac{3}{4}$ in. across, produced at the end of May and early in June on downy-stalked corymbs about 3 ins. across; calyx hairy; stamens twenty; styles three or four, Fruit red, minutely dotted, about $\frac{3}{8}$ in. diameter.

Native of N. China. Very distinct from all but its immediate allies (*Korolkowi* and *Henryi*, *q.v.*) in the long leaf-stalks and large leaves.

Var. *PSILOSA*, *C. K. Schneider*.—The leaves of this form are quite smooth, and have deeper, narrower lobes than the type; flower-stalks and calyx also smooth. Native of Amurland, Corea, etc., and like many trees of those regions, apt to start very early into growth, and suffer accordingly. Inferior to the type, which itself is not so fine a tree as *Korolkowi*.

C. PRUINOSA, *Koch*.

A tree up to 15 or 20 ft. high, with horizontal branches; young twigs and leaves quite smooth; thorns 1 to $1\frac{1}{2}$ ins. long. Leaves broadly ovate, broadly wedge-shaped to nearly truncate at the base, pointed at the apex, doubly and sharply toothed or triangular-lobed at the upper part; 1 to $2\frac{1}{2}$ ins. long, two-thirds to fully as wide; reddish when they unfold, becoming dark green above and glaucous beneath; stalks slender, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long. Flowers $\frac{3}{4}$ to 1 in. wide, borne in May in rather loose corymbs; flower-stalks and calyx quite smooth; stamens twenty; styles five. Fruit five-angled, $\frac{5}{8}$ in. diameter, globose, at first apple-green covered with a purple bloom, finally dark red, shining, and much dotted.

Native of the southern United States, probably sometimes confused in gardens with *C. coccinea*, from which it differs in the glaucous under-surface of the leaf, and the plum-coloured young fruits, also the thinner, longer leaf-stalks and flower-stalks.

C. PRUNIFOLIA, *Bosc.*(Bot. Reg. t., 1868 ; C. Crus-galli var. prunifolia, *Torrey and Gray.*)

Although undoubtedly related to the Crus-galli group of thorns, this does not appear to have been found undoubtedly wild in N. America, unless, as has been suggested, a presumed hybrid between Crus-galli and macracantha is the same. This theory is supported by the shape of the nuts, which have hollows on the inner faces as in macracantha, only not so deep. Whatever its origin, C. prunifolia is one of the most admirable of all thorns. It is a tree up to 20 ft. high, forming a rounded head of branches, wider than high, often reaching to the ground, and densely leafy ; young shoots smooth ; spines rigid, sharp, $1\frac{1}{2}$ to 3 ins. long. Leaves varying from roundish ovate or oval to obovate ; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide ; toothed nearly to the base, smooth and brilliant dark green above ; pale, dull and either smooth or slightly downy on the midrib and veins beneath. The leaves turn a rich glowing crimson in autumn. Flowers $\frac{3}{4}$ in. diameter, produced during June in rounded corymbs with hairy stalks ; calyx-lobes glandular-toothed, not downy ; stamens ten to fifteen. Fruit rich red, $\frac{5}{8}$ in. long, globose, falling with the leaves in October. From Crus-galli it is well distinguished by its wider leaves, hairy flower-stalks, and early falling fruit.

C. OVALIFOLIA, *De Candolle* (Bot. Reg., t. 1860), differs in the following respects from prunifolia :—leaves somewhat downy on both surfaces ; stamens fifteen to eighteen ; but there are intermediate forms.

C. SPLENDENS, *Loddiges*.—Loudon makes this synonymous with C. Crus-galli var. arbutifolia, a quite glabrous tree, whereas all the trees I have seen under the name of C. splendens are simply C. prunifolia as described above, i.e. with invariably downy flower-stalks, and leaves smooth, except sometimes on the chief veins beneath.

C. PUNCTATA, *Jacquin.*

A tree 20 to 35 ft. high, with a rounded head of often horizontal branches more in diameter ; trunk 10 to 20 ins. through ; branches more or less armed with spines 2 to 3 ins. long ; young shoots grey, hairy at first, then smooth. Leaves broadly ovate, rounded or rather abruptly pointed at the apex, always tapered at the base ; 2 to 4 ins. long, $1\frac{1}{4}$ to $2\frac{3}{4}$ ins. wide ; toothed, the larger leaves of the barren shoots more or less lobed above the middle ; veins parallel in five to ten pairs, deeply sunk above ; upper surface dark green, both surfaces at first downy, afterwards almost or quite smooth above, more persistently downy beneath ; stalk $\frac{3}{4}$ in. or less long. Flowers white, $\frac{3}{4}$ in. diameter, opening early in June on corymbs up to 4 ins. across ; the calyx-tube, the inner surface of the narrow, almost entire lobes, and the flower-stalk hairy ; stamens twenty ; styles five. Fruit deep red, specked with pale dots ; $\frac{3}{4}$ to 1 in. diameter, slightly pear-shaped or almost globose.

Native of Eastern N. America ; introduced in 1746. It is certainly one of the most attractive and well-doing of American thorns, giving great crops of its white blossom and crimson fruits. Perhaps the finest example in the country is at Aldenham, Herts, a tree planted in 1845 being now 33 ft. high, its head of branches over 40 ft. across. The following varieties are in cultivation :—

Var. RUBRA.—Fruit of a deep cherry-like red, becoming almost black before falling.

Var. STRIATA.—Fruit red, with yellow streaks near the base.

Var. XANTHOCARPA, *Jacquin* (var. aurea, *Pursh*).—Fruits bright yellow. In all the forms of C. punctata the leaves are conspicuously parallel-veined and the fruits are marked by small pale dots. Leaves and fruits fall in October.

C. SANGUINEA, Pallas.

A small, mostly unarmed tree up to 20 ft. high, young shoots slightly hairy at first, soon smooth, and becoming of a deep shining brown-purple. Leaves diamond-shaped to ovate, always tapered at the base, with three, five, or seven shallowish lobes, sharply, sometimes doubly toothed; 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide; slightly hairy on both sides, especially in the vein-axils beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long; stipules semi-heart-shaped, coarsely toothed, $\frac{3}{4}$ in. across. Flowers white, $\frac{5}{8}$ in. across, in dense corymbs; calyx and flower-stalks smooth; stamens twenty, with purple anthers; styles ordinarily three. Fruit bright red, globose, scarcely $\frac{1}{2}$ in. long.

Native of the vast region extending from S.E. Russia across Siberia; introduced early in the nineteenth century. It belongs to the same group as altaica, chlorosarca, and dsungarica. The colour of its twigs is rather striking, but it is amongst the least desirable of thorns.

Closely allied to *C. sanguinea* is *C. DAHURICA, Koehne*, also with branches of a deep brown-purple, but its leaves are smaller (rarely 2 ins. long), scarcely or only finely lobed, almost smooth. Fruit smaller, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, orange-red.

Native of S.E. Siberia and Amurland, and, like many shrubs and trees of that region, starts early into growth. At Kew it blossoms at the end of April and early in May.

Occasionally seen in cultivation also is *C. MAXIMOWICZII, C. K. Schneider* (*C. sanguinea* var. *villosa, Maximowicz*), a species of the sanguinea group, but very distinct in the bristly hairy flower-stalks, calyx, and young fruits—the last smooth and red when ripe. Amurland, N. Manchuria, etc.

C. SINAICA, Boissier. MT. SINAI THORN.

(*C. maroccana, Lindley, Bot. Reg., t. 1855.*)

A tree up to 35 or 40 ft. high, of sturdy habit; young shoots at first downy. the barren ones becoming more or less smooth by the end of the season, and dark coloured. Leaves wedge-shaped at the base; $1\frac{1}{2}$ to 2 ins. long, from $\frac{1}{2}$ to $2\frac{1}{4}$ ins. wide; varying in outline from narrowly obovate with three small, terminal lobes, to deeply five-lobed with two pointed, oblong, sparsely toothed or entire lobes at each side, and a terminal one; quite smooth on both sides; stalk up to $\frac{3}{4}$ in. long. Flowers white, fragrant, $\frac{3}{4}$ in. across; produced during early June in corymbs of twelve to fifteen blossoms; calyx and flower-stalks sparsely and loosely downy; stamens twenty. Fruit globular, yellow or yellowish red, $\frac{5}{8}$ in. diameter, smooth.

Native of Sinai and parts of the Orient; introduced in 1822; at present very rare in cultivation, but represented in the Kew collection. It belongs to the same group as *Azarus* and *orientalis*, but is distinguished by the absence of down on leaf and fruit. In this country it is only armed with a few short, stout spines, about $\frac{1}{2}$ in. long.

C. SPATHULATA, Michaux.

(*C. microcarpa, Lindley, Bot. Reg., t. 1846.*)

A shrub or small tree, with a slender trunk and spreading branches; young shoots smooth or soon becoming so, and reddish brown; thorns either absent or few. Leaves spoon-shaped, diamond-shaped, or obovate; often very distinctly three-lobed, the lobes coarsely round-toothed; apex blunt, the base narrowing to a long thin strip each side of the stalk; often with scattered down on both surfaces when young; the stalk, although apparently long, is really very short, owing to the extension of the blade in a narrow wing down

each side. Excluding this, the leaves of the flowering shoots are $\frac{1}{2}$ to 1 in. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide; on the barren shoots 1 to $1\frac{1}{2}$ ins. long, nearly as much wide. Flowers white, $\frac{1}{2}$ in. diameter, produced towards the end of June in corymbs $1\frac{1}{2}$ ins. across; stamens sixteen to twenty; styles two to five. Fruit $\frac{3}{16}$ in. in diameter, globose, coral-red.

Native of the south and south-eastern United States; introduced in 1806. It ripens its fruits late, not until October, and both they and the leaves remain on the plant until the New Year. This is one of the more tender thorns, and apt to suffer in severe winters. Distinct in its tiny fruits.

C. STIPULACEA, *Loddiges*.

(*C. pubescens* var. *stipulacea*, *Stapp*.; *Bot. Mag.*, t. 8589.)

A small, usually unarmed tree, probably 15 to 20 ft. high; young shoots greyish at first with loose down, afterwards red-brown and roughish with minute warts. Leaves diamond-shaped, obovate or oval; wedge-shaped and entire at the base, the upper part pointed and doubly glandular-toothed; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide; usually much larger on the barren shoots and with large glandular-toothed stipules $\frac{3}{4}$ in. across; at first slightly downy, afterwards smooth and dark green above; grey, dull, and persistently downy on the chief veins beneath; stalk about $\frac{1}{2}$ in. long. Flowers white, $\frac{3}{4}$ in. across, produced in June in corymbs 2 to $2\frac{1}{2}$ ins. across; flower-stalks and calyx woolly, calyx-lobes slightly toothed or entire; stamens fifteen to twenty; styles two or three. Fruit yellowish, dotted, $\frac{3}{4}$ in. long, globose, persisting on the tree a long time.

Native of elevated regions in Mexico; introduced by A. B. Lambert in 1829, and interesting as one of the few trees from that country that are hardy with us. It retains its leaves usually until the New Year. Sometimes known in gardens as *C. mexicana*, *De Candolle*. (See also *C. Carrierei*.)

C. SUCCULENTA, *Link*.

A tree up to 20 ft. high, with smooth branchlets, becoming purplish brown by the end of the season; thorns $1\frac{1}{2}$ to 2 ins. long. Leaves roundish obovate, 2 to 3 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide, broadly wedge-shaped at the base, abruptly pointed, more or less lobed towards the apex, sharply toothed, at first downy beneath, soon smooth; dark green and glossy above; veins parallel, in four to seven pairs. Flowers white, $\frac{3}{4}$ in. across, produced in early June in rounded corymbs, 3 ins. or more across; flower-stalks hairy, and calyx usually so; stamens fifteen to twenty, anthers pink; styles two or three; fruit globose, bright red, $\frac{1}{2}$ in. diameter.

Native of Eastern N. America, and a close ally of *C. tomentosa*. It has the same deep longitudinal pits in the seeds (nutlets), but differs in the midrib and veins of the leaf being more deeply sunken on the upper side, and in the fruit being globose rather than oval, and of a deeper, brighter red. It is also a more vigorous and thorny tree. Although it was known in cultivation in the early nineteenth century, it appears to have been lost sight of until the last two decades.

C. TANACETIFOLIA, *Persoon*. TANSY-LEAVED THORN.

(*Bot. Reg.*, t. 1884.)

A small, mostly unarmed tree up to 35 ft. high, with erect branches and a trunk occasionally 5 ft. in girth; young shoots clothed with a thick grey wool, which persists partially on year-old shoots. Leaves 1 to 2 ins. long, nearly or quite as wide, tapered at the base; obovate or diamond-shaped in outline, but

cut into five or seven parallel, narrow-oblong lobes, often reaching nearly to the midrib; the lobes more or less glandular-toothed, especially towards the points; both surfaces permanently hairy; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long; stipules large, curved, toothed. Flowers fragrant, white, 1 in. across, produced in mid-June in rounded clusters of six to eight blossoms; calyx covered with a pale grey felt; stamens twenty, with red anthers; styles five. Fruit globose, yellow, or suffused with red, partially downy, $\frac{3}{4}$ to 1 in. across, with the scent and somewhat the taste of the apple. Closely attached at and near the base are one or more deeply cut, moss-like bracts.

Native of Asia Minor, Syria, etc.; introduced in 1789. Belonging to the same group as *C. orientalis*, this handsome thorn is not common. *C. orientalis* often does duty for it, but the present tree can always be distinguished by the gland-toothed leaves and glandular lacinate bract, or bracts, attached at the base of the fruit. It is a slow-growing tree. There is a fine specimen at the entrance to Messrs Cunningham & Fraser's nursery at Edinburgh; another at Arley Castle, near Bewdley.

C. TOMENTOSA, *Linnaeus*.

A small tree up to 15 ft. high, with a rounded compact head of grey-barked branches, often very crooked; young shoots more or less downy; thorns infrequent, grey, 1 to 2 ins. long. Leaves ovate to rhomboidal or obovate, pointed, wedge-shaped and entire at the base, the upper part coarsely double-toothed or lobed; 2 to 5 ins. long, $1\frac{1}{2}$ to 3 ins. wide; parallel-veined, downy on both sides, especially beneath, the upper side becoming nearly or quite smooth and dark green; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers white, $\frac{8}{16}$ in. diameter, borne in June in large, erect, loose corymbs 3 to 5 ins. across; calyx and flower-stalks shaggy, calyx-lobes narrow, glandular-toothed; stamens sixteen to twenty, anthers pink; styles two to five. Fruits always erect, pear-shaped or oval, dull orange-coloured, $\frac{1}{2}$ in. long.

Native of the eastern and Central United States; introduced by Lee and Kennedy of Hammersmith in 1765. This is one of the most beautiful of American thorns when in flower, the upright corymbs being of unusual size. The leaves turn a brilliant orange or scarlet in autumn. Although the foliage varies in the amount of down it carries on different plants, the flower-stalks and calyx are always hairy.

C. UNIFLORA, *Muenchausen*.

(*C. parvifolia*, *Adanson*.)

A shrub or miniature tree, rarely more than 6 or 8 ft. high, with hairy young shoots; thorns slender, up to $1\frac{1}{4}$ ins. long. Leaves obovate, always tapered at the base, rounded or bluntish at the apex, rather coarsely (often doubly) round-toothed; 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; dark glossy green and with short scattered hairs above; pale, dull and downy on the midrib and veins beneath; stalk $\frac{1}{8}$ in. or less long. Flowers creamy white, $\frac{1}{2}$ to $\frac{3}{4}$ in. across; solitary or in pairs, occasionally in threes. Flower-stalks and calyx shaggy; calyx-lobes linear, conspicuously glandular-toothed; stamens about twenty, anthers whitish. Fruit pear-shaped to globose, about $\frac{1}{2}$ in. long, yellow or greenish yellow, with the large calyx-lobes adhering at the top.

Native of the south-eastern United States; introduced early in the eighteenth century. It is an interesting and very distinct thorn, but in no way showy. Its small stature, often solitary flowers, and especially the long, persistent, prominently toothed calyx-lobes, distinguish it.

C. VAILLÆ, *Britton*, has recently been introduced. It is allied to

C. uniflora, differing in the leaves being ovate or oval and pointed, in the longer leaf-stalks, in the two- to six-flowered corymbs, and in the more globose red fruit. Native of Virginia and N. Carolina.

C. VIRIDIS, *Linnaeus*.

(*C. arborescens*, *Elliott*.)

A tree 20 to 30 ft. high; young shoots smooth; thorns up to $1\frac{1}{2}$ ins. long, often absent. Leaves ovate or oval, always wedge-shaped at the base, the terminal part toothed, often shallowly lobed as well; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide; dark glossy green above, and when mature, quite smooth, except for tufts of down in the vein-axils beneath; stalk $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long. Flowers white, $\frac{3}{4}$ in. across, borne in May and June in corymbs $1\frac{1}{2}$ to 2 ins. across. Flower-stalks and calyx smooth, except that the lobes of the latter are sometimes downy inside; stamens twenty, anthers pale yellow; styles two to five. Fruit globose, $\frac{1}{4}$ to $\frac{1}{2}$ in. diameter, bright red.

Native of the south-eastern United States. It grows well in cultivation, but is not one of the most attractive of thorns, the flowers, and especially the fruits not being abundant. It is the type species of a group of American thorns, one of which,

C. NITIDA, *Sargent*, is also in cultivation. This differs in having ovate or narrowly obovate leaves; glandular-toothed calyx-lobes; fruit considerably larger, from broadly oval to globose, $\frac{2}{3}$ in. long, covered with a glaucous bloom. S. United States.

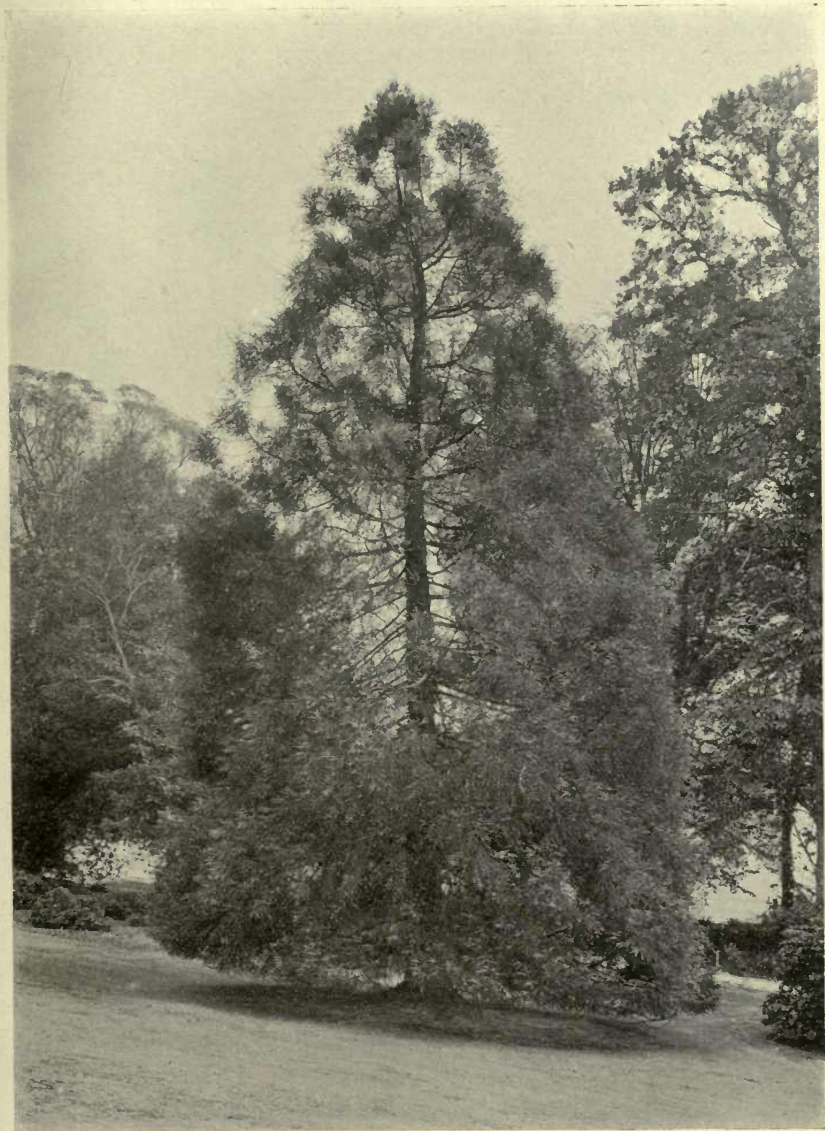
CRYPTOMERIA JAPONICA, *Don*. CONIFERÆ.

An evergreen, pyramidal tree, 100 to 180 ft. high in Japan, with a trunk 3 to 7 ft. in diameter, clothed with a thin reddish brown bark which peels off in long, narrow strips. Leaves dagger-shaped, curved inwards towards the point, four-angled, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, attached by their thickened bases to the branchlet on which they are closely and spirally set, all pointing forwards. Cones brown, globular, about $\frac{1}{2}$ in. in diameter, composed of from twenty to thirty scales, each bearing three to five seeds. The general aspect of the tree is yellowish green in summer, dark green in winter.

Native of China and Japan; introduced to Kew in 1842, but not in quantity until 1844, when Fortune, then in the employ of the Horticultural Society, sent seeds from Shanghai. The *Cryptomeria*, the only species of its genus, is quite distinct from any other hardy tree. Although one of the great timber trees of the world, more used in Japan than any other, it has not proved so generally fine a tree in this country as might have been expected, the best specimens being all in the mildest and moistest parts, and ranging from 60 to 80 ft. in height, with trunks from 2 to $2\frac{1}{2}$ ft. thick. It likes a deep good soil, a sheltered position, and abundant rainfall. It is a very variable tree, and besides two or more varieties found wild, several have originated in Japanese gardens. What may be taken as the typical form has diffuse branches upturned at the ends.

Var. *ARAUCARIOIDES*.—Branchlets long, thin, slender, pendulous.

Var. *LOBBII*, *Veitch*.—In this variety the branches are stiffer and more



CRYPTOMERIA JAPONICA at Claremont.

tufted and bunchy at the ends; the branchlets shorter and more erect; leaves shorter. First sent to this country in 1853, along with *Sciadopitys*, by W. Lobb from the Java Botanic Garden, for which it had been obtained by Siebold in 1825. Not so elegant as the type.

Var. *NANA*.—A dwarf form with stunted branches. Plants at Kew forty years old are only 5 ft. high. The leaves are long, not curved as in the type, and more spreading.



CRYPTOMERIA JAPONICA.

Var. *SPIRALIS*.—A dwarf form of remarkably dense habit, the leaves being much incurved and twisted, so that the branchlet often suggests wire rope. Judging by experience at Kew, it is apt to revert to the type.

C. JAPONICA var. *ELEGANS*, *Veitch*.

This, commonly known in gardens as "*Cryptomeria elegans*," is a remarkable state, in which the foliage of the juvenile plant is retained permanently. The aspect of the tree is totally different from ordinary *C. japonica*, although the bark of the trunk has the same red-brown, peeling character. The leaves are on the whole larger, much softer, more slender, more spreading and

wider apart on the branchlet, than those of the type ; they and the young shoots being a glaucous green in the summer, changing in autumn and winter to a bronzy red, very distinct, and remarkable among evergreens at that season. The leaves are reflexed at the tip, rather than incurved as in ordinary *C. japonica*. The whole tree is more bushy and dense than the type, and often falls over by its own weight ; the trunks are very supple, and allow the crowns of trees 20 ft. high to reach the ground without breaking. This form produces cones (rarely) which do not differ from those of the type. It bears pruning very well, and is often improved by it ; if trees become top-heavy, they may be headed down far enough to become self-supporting. Introduced from Japan in 1861 by Mr J. Gould Veitch. There is a dwarf dense-habited variety of it called *ELEGANS NANA*.



CUDRANIA TRILOBA.

CUDRANIA TRILOBA, Hance. SILKWORM THORN.
URTICACEÆ.

A deciduous shrub or small tree, 20 ft. high, with a dense, rounded head of thorny branches ; young shoots quite smooth. Leaves alternate, oval, obovate, or ovate ; either entire or with three shallow rounded lobes at the apex ; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide ; dark green, smooth ; stalk $\frac{1}{3}$ to $\frac{5}{8}$ in. long, slightly downy. Flowers green, crowded in a little ball about $\frac{1}{3}$ in. diameter, the sexes on different plants. The balls are produced during July, either singly or (usually) in pairs, from the leaf-axils of the current year's growth, each on a downy stalk $\frac{1}{4}$ in. long. The male tree only appears to be in cultivation, and a head of fruit has not yet been produced in this country ; but it is an elliptical, hard, shining mass $1\frac{1}{2}$ ins. broad and 1 in. long, as seen in wild specimens.

Native of China, where it is widely spread ; introduced to Britain in 1872. This tree, which is nearly allied to the Osage orange, but differs in flowering on the current season's growth, in its fewer-veined leaves, and



CUNNINGHAMIA SINENSIS.

very much in the fruits, is perfectly hardy, and flowers frequently at Kew. Its flowers are of no ornament, and the plant itself, although interesting both economically and botanically, has no special merit for the garden. Its leaves are much used in China for feeding the silkworm on, being considered as good for this purpose as the mulberry—to which also it is closely related.

CUNNINGHAMIA SINENSIS, *R. Brown.* CONIFERÆ.

An evergreen tree up to 150 ft. high in a wild state, but not yet half as high in this country, with a scaling bark; young wood hidden on the upper side by the bases of the densely packed leaves, pale green and smooth beneath. Leaves persistent about five years, springing equally from all round the stem, but twisted at the stalkless base so as to come into two opposite, spreading, horizontal ranks; they are linear-lanceolate, 1 to $2\frac{1}{4}$ ins. long, $\frac{1}{12}$ to $\frac{3}{16}$ in. wide; minutely toothed, tapered to a long, fine point; dark glossy bluish green above, with a broad stomatic band beneath along each side the midrib. Cones roundish, rather broader than long, about $1\frac{1}{2}$ ins. wide; scales broadly ovate, with an abrupt, slender point, and irregularly toothed margins.

Native of China; introduced to Kew by William Kerr in 1804. In general appearance it bears considerable resemblance to the Araucarias, especially to *A. brasiliensis*, and it appears to be related to that genus. It represents one of the world's most ancient types of vegetation, a very similar plant being found in a fossil state. As a tree for gardens it is rarely satisfactory except in the south and west of the British Isles. The best trees are at Killerton (68 ft. high), Bicton (56 ft.), Pencarrow (48 ft.). Nearer London the finest trees are at Bagshot Park (48 ft.), and one at Claremont (36 ft.). At Kew it has lived and grown slowly out-of-doors for at least forty years, but suffers badly in severe winters. It likes a sheltered position and a deep, well-drained soil. Mr E. H. Wilson has recently found considerable forests of it in W. China, and he has hopes that the plants raised from the seed he collected there may prove hardier than the type originally found by James Cunningham (after whom it is named), on the Island of Chusan, in 1701.

C. KONISHII, Hayata, is a second species recently discovered in Formosa. According to specimens sent to me by Mr Clinton Baker, it is very distinct from *C. sinensis*, the leaves being only $\frac{1}{4}$ to $\frac{1}{2}$ in. long, curved, linear-lanceolate, $\frac{1}{10}$ in. wide, with stomata on both surfaces. It is not likely to be hardy.

CUPRESSUS. CYPRESS. CONIFERÆ.

A group of some fifteen species of evergreen trees belonging to the conifer family, of great beauty and interest when seen at their best. In their typical form the species are all large or medium-sized trees, but under cultivation a great number of diverse forms have appeared

providing in their entirety a singular variety of form and colour. In the adult state the leaves are always minute, mostly scale-like, and flattened to the branchlet, being superposed in four rows. The ultimate divisions of the branchlet are square or compressed, and either arranged in opposite ranks on the larger branchlets, or irregularly and spirally. In the former case the spray is flattened. Flowers unisexual, both sexes on the same tree, but on different catkins. Males composed of numerous, short-stalked stamens; fruit a globose or elliptical cone composed of mushroom-shaped (peltate) scales with a "boss" or enlargement in the centre. There are two distinct sections of the genus, sometimes regarded as distinct genera:—

I. TRUE CYPRESSES.

Cones over $\frac{1}{2}$ in. in diameter, except in *lusitanica*, *Benthami*, and *funbris*; ripening in the second year; each scale bearing numerous seeds. (See *arizonica*, *Benthami*, *cashmeriana*, *funbris*, *Goveniana*, *lusitanica*, *Macnabiana*, *macrocarpa*, *sempervirens*, and *torulosa*.)

2. CHAMÆCYPARIS. FLAT-LEAVED CYPRESSES.

Cones small, under $\frac{1}{2}$ in. in diameter, ripening (except in *nootkatensis*) the first year; each scale bearing two (rarely more) seeds. Branchlets always flattened in the normal state. (See *Lawsoniana*, *nootkatensis*, *obtusa*, *pisifera*, and *thyoides*.)

The leaves of seedling and juvenile plants of cypress (also of *Thuya*) are very different from those of adult trees, being needle-like or awl-like, up to $\frac{1}{3}$ in. long, and spreading. Individuals of some species have shown the remarkable characteristic of retaining this juvenile type of foliage permanently, or, at any rate, for an indefinite period, and thereby have originated some very pretty garden trees. In the early years of their cultivation in Europe these juvenile forms were thought to belong to a distinct genus, and were called *RETINISPORAS*. Their true character has since been revealed through the raising of seedlings, and by the occasional appearance of adult or typical cypress foliage on the originally introduced "*Retinisporas*." (See *Cupressus pisifera*, also *Thuya occidentalis* and *T. orientalis*.)

A few years ago Messrs Sander put in cultivation a curious little shrub they called *JUNIPERUS SANDERI*, a dwarf, sturdy bush of rounded, dense habit, with stiff, spreading, awl-shaped leaves, $\frac{1}{8}$ to $\frac{1}{6}$ in. long, of a very glaucous blue tint, and borne in decussate pairs. The origin of this shrub is not known, but it does not appear to be a juniper. Dr Masters and Mr Beissner were both of opinion that it was a juvenile state of *Cupressus obtusa*.

The true cypresses are nearly all tender in the average climate of Great Britain, the hardiest being *arizonica*, *Macnabiana*, and especially *macrocarpa*; at Kew even these are tender when young. They thrive in either loamy or peaty soil, well-drained; and should be given a sheltered place, as they are subject to injury by wind, especially where they grow fast. Some species of this group, notably *macrocarpa* and *sempervirens*, show two curiously diverse types of habit, viz., the horizontal-branched and the fastigiate, but most of them are, when young, of columnar or pyramidal form.

The *Chamæcyparis* group, on the other hand, is very hardy, and

comprises some of the very finest of ornamental evergreens. They like abundant moisture and a deep, loamy soil. Most of the cypresses can be increased by means of cuttings, which, although probably not so good as seeds, still make good trees. All the cypresses, if growing in poor soil, are benefited by applications of manure water or by top-dressings of manure. They are subject, especially in poor soils, and during a succession of dry seasons, to attacks by white scale insects. The best remedy is spraying with an emulsion of paraffin and soft soap in March and April, when the young hatch out.

C. ARIZONICA, *Greene*. ARIZONA CYPRESS

A tree usually 30 to 40, sometimes 70 ft. high in a wild state, with the bark of the trunk shredding off in strips. Branchlets irregularly arranged (not in two ranks), the final subdivisions four-sided, $\frac{1}{20}$ in. diameter. Leaves closely overlapping and scale-like, uniform, ovate, pointed, about $\frac{1}{20}$ in. long, glaucous, with a sunken resin-gland at the back. In comparatively young cultivated specimens the branches are thinner, and the leaves larger and more taper-pointed. Cones short-stalked, globose, $\frac{3}{4}$ to 1 in. diameter, glaucous; scales six (rarely eight), slightly rising towards the middle, where is a pyramidal, pointed boss.

Native of Arizona; discovered in 1880, and soon afterwards introduced by Prof. Sargent. It has proved to be one of the hardiest of the true cypresses. The glaucous hue of the leaves, although marked, is not so intense in cultivation here as in a wild state. The tree is related to *C. lusitanica*, but is hardier, and is distinguished by the resin-glands at the back of the leaves. From *C. Benthami* it is distinguished by irregular, spiral branching.

C. CASHMERIANA, *Royle*.

(*C. funebris* var. *glauca*, *Masters*.)

A fine example of this remarkable cypress grows in the Himalayan House at Kew, but when tried out-of-doors in even a very sheltered place, it has never recovered from the effects of the first winter. It will probably succeed in the south-western maritime counties. Its spray is perfectly pendulous, very glaucous, and flat, the branchlets hanging vertically in two opposite ranks. Leaves intermediate in character between the juvenile and adult states of the true cypresses; they are only $\frac{1}{18}$ to $\frac{1}{12}$ in. long, but are not scale-like, and have free, somewhat spreading points. Cones about $\frac{1}{2}$ in. diameter, globose; scales ten, with a triangular, hooked boss in the centre. This cypress is, no doubt, of Asiatic origin, but there appears to be no evidence that it is a native of Kashmir. Henry suggests it may be a juvenile state of *C. torulosa*. It is a tree of singular beauty both in form and colour. The finest tree in Europe is on Isola Madre, Lake Maggiore, Italy. When I saw it in May 1912, I made it to be about 64 ft. high and 6 ft. in girth of trunk, almost white in its glaucousness. Cones are freely borne by the tree at Kew, but the seed, sown several times, has never germinated.

C. FUNEBRIS, *Endlicher*. CHINESE WEeping CYPRESS.

A tree up to 70 ft. high, of very characteristic habit, the trunk being erect and clothed with smooth brown bark, the branches horizontal or ascending, but furnished with vertically pendulous, slender spray. The branchlets are in the same plane in two opposite ranks, with the final subdivisions much

flattened, thin, and about $\frac{1}{20}$ in. wide. Leaves uniformly green, in four rows, $\frac{1}{12}$ to $\frac{1}{8}$ in. long, the terminal part of each triangular and tapered to a fine point; the lateral leaves have the points free and rather spreading, the upper and lower ones closely flattened. Cones $\frac{1}{3}$ to $\frac{1}{2}$ in. across, globose, borne on slender stalks $\frac{1}{8}$ to $\frac{1}{4}$ in. long; scales with a small boss in the centre.

Native of Central China, and now spread widely over that country in cultivation. First noticed by the members of Lord Macartney's mission to China in 1793, but introduced by Fortune in 1849. It is too tender for any but the mildest parts of the British Isles, and young trees have been killed time after time at Kew. There are good examples at Penjerrick, in Cornwall, and in Ireland. It is grown in winter gardens for its elegant habit, and produces cones at an early age. The curiously dissimilar foliage of seedlings always attracts attention, the leaves in that state being in whorls of three or four, linear or awl-shaped, and $\frac{1}{4}$ to $\frac{1}{3}$ in. long; pale soft green. In its flat adult branchlets it bears some resemblance to the *Chamæcyparis* group, also in its small cones, and few seeds (three to five) to each scale.

C. GOVENIANA, *Gordon*. GOWEN'S CYPRESS.

In many respects this is very similar to and is a close ally of *C. macrocarpa*. It is, like that species, a native of California, but enjoys a much more extended distribution. It is a tree sometimes 50 ft. high, usually much smaller, frequently shrubby. The leaves are like those of *C. macrocarpa*, being in four ranks, scale-like, and flattened to the branch; but differ in being pointed as well as rather smaller. In both species the leaves are dark green, obscurely or not at all glandular. The cones differ in being smaller, usually $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, globose, borne on stalks up to $\frac{1}{3}$ in. long; the scales numbering only six or eight, each with a central boss; seeds bright brown, $\frac{1}{8}$ to $\frac{1}{6}$ in. long. It is rare in cultivation, and rarely seen to advantage except in mild localities. Discovered by Hartweg in 1846, and soon afterwards introduced.

Var. *PYGMÆA*, *Lemmon* (*C. pygmæa*, *Sargent*), is a smaller tree with black seeds. Both these cypresses in a juvenile state have longer, awl-like, sharply pointed, more spreading leaves, as does *C. macrocarpa* also.

C. LAWSONIANA, *Murray*. LAWSON CYPRESS.

(Bot. Mag., t. 5581.)

A tree frequently 200 ft. high in a wild state, the trunk 7 ft. or more in diameter above the buttressed base; bark reddish brown. As seen in cultivation it is a slenderly to broadly pyramidal tree, densely furnished to the ground with frond-like branches. The leaf-bearing branchlets are borne in two horizontally spreading ranks, usually more or less pendulous at the ends, the final subdivisions flattened, $\frac{1}{16}$ to $\frac{1}{12}$ in. wide. Leaves minute, scale-like, in four rows; the lateral leaves considerably the longer, those underneath usually glandular; they have minute, abrupt points. The foliage is extremely variable in shade, from deep green to a more or less glaucous green. Cones globose, glaucous (finally brown), $\frac{1}{3}$ in. diameter; scales eight.

Native of Western N. America in Oregon and California; introduced in 1854 to Lawsons' nursery at Edinburgh. It is now the commonest and most valued of all cypresses, perhaps of all conifers, in gardens. It is very hardy, but likes a good loamy soil and a moist climate. In poor soils it is much benefited by artificial watering during dry periods, also by occasional supplies of manure water. It is remarkably prolific of seeds even in a young state, and trees raised from them are no doubt best for forestry purposes. In N. America it yields a very valuable timber, and is well worth trying under forest conditions in this country. No conifer has produced so much variety in foliage and habit



Group of varieties of LAWSON CYPRESS, *Cupressus Lawsoniana*.

under cultivation. In almost any batch of seedlings a number of more or less differing forms may be observed. Some extraordinarily different varieties have been raised, so different that unless their origin were known they would be regarded as distinct species. These are best raised from cuttings which, taken in late summer, root readily—or they are easily grafted on seedlings. Such plants make nice trees, but have a tendency to produce several leads, at least in isolated positions. This, however, in the opinion of many may not detract from their beauty, and in any case may be obviated by cutting off the rival leaders as soon as noticed. Many of the named varieties are not worthy of distinction, and some with age have become indistinguishable from the type. The following are some of the most noteworthy, and are subdivided according to the leading character, but some unite peculiarities both of colour and form, *e.g.* *Smithii* (columnar and glaucous) and *gracilis aurea* (pendulous and golden):—

I. COLOUR VARIETIES.

Var. *ALBO-MARGINATA*.—Slow-growing, rather dwarf, with the young foliage picked out in white, the effect usually poor and spotty. The forms called *albo-picta*, *albo-spica*, *albo-variegata*, and *argenteo-variegata* are nearly or quite the same.

Var. *AUREO-MARGINATA*.—Marked similarly to the preceding, but with yellow.

Var. *ARGENTEA*.—Among the numerous glaucous forms this is the most silvery; those called *glaucia*, *Silver Queen*, and *Triomphe de Boskoop* are of the same type.

Var. *AUREA*, *Waterer*.—Young shoots yellow the first summer, gradually becoming green. A very good form of this was grown by the late Earl Annesley at Castlewellan, Co. Down, which he called *GRACILIS AUREA*. The young shoots are golden, densely plumose, and pendulous.

Var. *LUTEA*.—The yellowest of all the forms; the young growths being pale yellow changing to golden, and remaining so the first winter; habit stiff and erect.

Var. *WESTERMANNI*.—Habit sturdy, pyramidal; ultimate branchlets pale yellow.

II. COLUMNAR OR FASTIGIATE VARIETIES.

Var. *ALLUMI* (*Fraseri*).—Spire-like in habit; very glaucous.

Var. *ERECTA VIRIDIS* (*stricta*).—Of erect, columnar habit, green; perhaps the most striking columnar evergreen available for cultivation in the open air, but best in a young state, as it is apt later to become naked or shabby at the base. Raised in the Knap Hill nursery in 1855.

Var. *SMITHII*.—Glaucous foliage; columnar habit.

Var. *WISSELI*.—A curious, rather than beautiful form, of columnar habit, very glaucous; the branchlets very short, and produced in crowded tufts. The plant is too thinly furnished to be pleasing.

III. DWARF VARIETIES.

Var. *NANA* (*densa*).—A green, rounded bush, broader than high, the branches arranged edgewise (as in *Thuya orientalis*), rather than horizontally. *NANA ALBA*, of similar habit, young shoots creamy white. *NANA GLAUCA* (*compacta*; *minima glauca*), also of similar habit, but glaucous. Var. *nana* was raised in 1861, by Dauvesse of Orleans; specimens planted in the cypress collection at Kew about 1873 are still only 4 ft. high.

IV. PENDULOUS AND SPREADING VARIETIES.

Var. *FILIFERA*.—In some respects this is the most striking and elegant, as well as the most distinct, of Lawson cypresses. It has a medium rate of

growth, the branching is spiral (not two-ranked), and the terminal branchlets hang vertically, often 1 to 2 ft. long, scarcely branched, cord-like, very dark green. Extremely effective as an isolated specimen.

Var. *GRACILIS*.—A free, elegant form, the spray pendulous, points of leaves usually spreading. *GRACILIS PENDULA* is more weeping.

Var. *INTERTEXTA*.—Another very striking and elegant form; the branches decurved rather than turned up at the ends; branchlets weeping, the ultimate divisions stout and far apart. It is the stoutness and remoteness of the final ramifications that give this variety its unique appearance. Of glaucous hue and vigorous growth. According to a letter at Kew from Lawsons', of Edinburgh, it was raised in their nursery about 1869.

Var. *KRAMERI*.—A curiosity. Habit thin and open; branches contorted; terminals often unbranched and cord-like.

Var. *LYCOPODIODES*.—Branching spiral and irregular; branchlets twisted; a curiosity merely.

Var. *PENDULA*.—There appear to be two forms in cultivation under this name; one with horizontal branches, but with the spray pendulous from underneath the branch (as in *C. nootkatensis pendula*); in the other, sometimes distinguished as *PENDULA VERA*, the branches as well as the branchlets are weeping.

C. LUSITANICA, *Miller*. CEDAR OF GOA.

A tree up to 100 ft. high (rarely more than half as high in the British Isles), with wide-spreading branches and pendulous spray; the branching not two-ranked, but spiral and irregular. Branchlets four-sided. Leaves in four rows, scale-like, $\frac{1}{16}$ to $\frac{1}{12}$ in. long, with the terminal part elongated, triangular, finely and sharply pointed, free at the tip. Cones very glaucous, and about the size of peas the first year; scales six or eight, with a conical, hooked crest in the centre; the cones become $\frac{1}{2}$ in. in diameter, and shed their seeds the second year, and lose much of their glaucous hue. Seeds brown.

The native country of this cypress was long a matter of speculation. It appears to have been cultivated in England since the latter half of the seventeenth century, having been first introduced from Portugal; hence the name "*lusitanica*." But it was never found wild either in Portugal or the Portuguese settlement of Goa in Western India, in spite of its common name. It is now certain that it is a native of Mexico, and was, no doubt, introduced to the Peninsula by mariners or members of the religious fraternities, probably in the sixteenth century. The most celebrated plantation of this tree is at Busaco, in Portugal.

For the ordinary climate of the British Isles this tree is not suited, needing more heat than it affords. Still, in the milder parts, such as Cornwall, S. Ireland, etc., some excellent examples may be found. Near London, young trees are killed in moderately severe winters, and even older ones, although they survive, are not happy. Except from *C. Benthami* and *C. arizonica*, it is well distinguished from all the true cypresses by its small, vividly glaucous cones.

C. BENTHAMII, *Endlicher* (*C. lusitanica* var. *Benthami*, *Carrière*; *C. Knightiana*), is closely allied to *C. lusitanica*, perhaps only a form of it. Its cones are identical in colour, shape, and size, but the branching and habit are remarkably distinct. The tree is of pyramidal form, the branchlets flattened and arranged in two opposite ranks, both on the same plane; leaves ovate, triangular-pointed, with a roundish hollow in the centre. Native of Mexico; introduced about 1838. Of about the same hardiness as *C. lusitanica*. The name "*Knightiana*" is sometimes given to a slightly more glaucous form.

C. MACNABIANA, *Murray*. MACNAB'S CYPRESS.

A shrub or small bushy tree, sometimes 30 to 40 ft. high, ultimate divisions of the spray very slender. Leaves about $\frac{3}{16}$ in. long, scale-like, dark green, thick, convex and blunt, with a conspicuous pit containing resin at the back. Cones short-stalked, globose, about $\frac{3}{4}$ in. across; at first rather glaucous, becoming brown; scales usually six, rarely eight, those at the apex developing thickened, horn-like crests, those at the base with thin, recurved bosses; seeds brown.

Native of California; discovered by Jeffrey in the Sierra Nevada in 1853, introduced by W. Murray the following year for the Lawsons of Edinburgh. It is now very rare in this country, and although apparently one of the hardiest of the true cypresses, appears to be short-lived under cultivation. It is one of the most easily recognised of a difficult group, first, by the resin pit at the back of the leaf (quite conspicuous under the lens); second, by the prominent horn-like development on the upper scales of the cone. The foliage has a very pleasant aromatic fragrance.

C. MACROCARPA, *Hartweg*. MONTEREY CYPRESS.

(C. Lambertiana, *Gordon*.)

A tree 60 to 90 ft. high in cultivation, not more in a wild state; of pyramidal habit when young, becoming eventually flat-topped and with horizontal branches like a cedar of Lebanon. Branchlets much divided in an irregular (not two-ranked or horizontal) manner; the final ramifications terete or somewhat four-sided, $\frac{1}{16}$ in. thick. Leaves scale-like, $\frac{1}{16}$ in. long, uniform, closely flattened to the branchlet in four rows, overlapping each other at the base, the exposed part diamond-shaped, thick and rounded at the end. Cones oblong or globose, on short stout stalks; 1 to $1\frac{1}{2}$ ins. long, $\frac{3}{8}$ to 1 in. wide; scales eight to fourteen, flattish, with a ridge-like projection in the centre. Seeds brown, warted.

Native of California, where it is confined to two groves near the Pacific, south of Monterey. The larger, Cypress Point Grove, is 2 miles long and about a furlong wide; the other, Point Lobos Grove, is much smaller. The trees grow on the shore cliffs, and being undermined by the sea, occasionally fall into it. At this spot they appear as rugged veterans, identical in habit with the cedar of Lebanon. The species was introduced about 1838, and has proved to be the hardiest of the true cypresses. It succeeds much the best in warm maritime localities, but even in inland places like Kew it is over 40 ft. high. When young it is more tender, and at this state is so distinct in general appearance as to show no apparent relationship to the adult type. The leaves are $\frac{1}{8}$ in. long, awl-shaped, with sharp, outwardly spreading points; the shoots much longer and more attenuated, the leaves well apart. As the plants increase in age, they gradually assume the adult state described above; but when, as they sometimes are in mild counties, used for hedges and clipped back annually, the young growths retain this juvenile type of foliage and branchlet. The young growths are sometimes distinctly lemon-scented.

Var. FASTIGIATA, *Masters*.—Branches permanently erect-growing, giving the tree a columnar or fastigiate form.

Var. LUTEA, *Dickson*.—Of similar habit to fastigiata, but with the young shoots and leaves of a beautiful yellow. Raised by Dicksons of Chester, in 1889.

The form known as CRIPPSII is a juvenile state with stiff branches. Raised at Tunbridge Wells.

C. NOOTKATENSIS, *Lambert.* YELLOW CYPRESS.(Thuyopsis borealis, *Carrière.*)

A tree 120 ft. high, with a trunk 5 or 6 ft. in diameter; as known in cultivation of rather slender, pyramidal form when young, becoming proportionately broader later; the smaller branches two-ranked, more or less pendulous; the ultimate divisions $\frac{1}{8}$ to $\frac{1}{2}$ in. wide, sometimes terete, oftenest four-angled, but broader than thick. Leaves in four ranks and of about equal size, $\frac{1}{2}$ to $\frac{3}{8}$ in. long, abruptly and sharply pointed, not often glandular, dark green. Cones $\frac{1}{3}$ to $\frac{1}{2}$ in. across, globose, rather glaucous, with usually four (sometimes six) scales that are furnished in the middle part with a triangular-pointed boss; ripening the second year.

Native of Western N. America from Alaska to Oregon; discovered by Menzies in 1793, and introduced about 1853. It is, from a garden point of view, undoubtedly one of the finest and most desirable of the cypresses, growing rapidly, being very hardy, and almost invariably preserving a healthy, vigorous appearance. Nor does it seem fastidious as to soil. Among the *Chamaecyparis* group of cypresses it is distinguished by the four-angled branchlets, due to the ridged centre of the leaves.

Var. COMPACTA.—A dwarf form of dense habit.

Var. LUTEA.—Young shoots yellow, finally green. A vigorous and handsome form.

Var. PENDULA.—A very striking variety in which the trunk is erect, the primary branches about horizontal, and the leaf-bearing branchlets hanging as slender streamers from the lower side of the branches in a quite vertical line.

There are various variegated forms, but except for var. lutea above mentioned, they are not of much value; var. ARGENTEO-VARIEGATA has a proportion of the young shoots creamy white, in AUREO-VARIEGATA they are quite yellow.

C. OBTUSA, *Koch.* HINOKI CYPRESS.(Retinispora obtusa, *Siebold.*)

A tree 100 to 120 ft. high in Japan, with a reddish brown trunk 3 or 4 ft. in diameter. Branches horizontal or depressed, bearing the successive ramifications in two opposite horizontally spreading rows. The final leaf-bearing subdivisions are, leaves and all, about $\frac{1}{6}$ in. wide, and rather flattened. Leaves scale-like, not glandular, of two sizes, the lateral pairs the larger, about $\frac{1}{2}$ in. long, somewhat boat-shaped, clasping the smaller ones above and beneath; all are blunt, thick, and fleshy, rich green above, paler beneath. The margin of every leaf beneath is defined by a thin line of glaucous bloom, which gives a variegated appearance. Cones solitary on a short branch, $\frac{1}{3}$ in. diameter, brown; scales usually eight, the surface slightly hollowed towards the centre, where is a small projection.

Native of Japan, and long cultivated there for its beauty and for its timber; introduced by John Gould Veitch in 1861. It yields the most valuable of Japanese timbers. As an ornamental tree in the British Isles it is very pleasing. It does not grow very fast, and the largest trees in the country are only about 40 ft. high, but well-grown specimens are very graceful in their soft feathery branching. It likes a good moist soil, but will not thrive where there is lime. With age and on poor soils it is apt to get thin, but this can to some extent be remedied by clipping off the ends of the shoots to induce denser branching—a process it bears very well. It is one of the favourite subjects of the Japanese for dwarfing. It is well distinguished from *C. pisifera* and *C. Lawsoniana* by its blunt, round-ended leaves, and the thin glaucous line just beyond the margins beneath.

Numerous varieties are in cultivation, of which the following are the more important :—

Var. AUREA.—Young shoots golden yellow. Perhaps more striking is Var. CRIPPSII, coloured similarly, but of a paler shade ; very pleasing as a small tree of dense, very elegant habit. Var. KETELEERI is of the same colouring.

Var. COMPACTA.—Habit dwarf ; branches very short. Another dwarf form is PYGMÆA (nana), a very low, rounded bush suitable for the rock garden.

Var. FILICOIDES.—Habit dense ; branching very close, the ultimate divisions short, much crowded, and not so flattened as in the type.

Var. LYCOPODIODES.—Habit dwarf ; branching irregular, not strictly in two rows, the ultimate branchlets much thicker, more four-sided, and less compressed than in the type.

Var. TETRAGONA AUREA.—This has the branching of filicoides, but the branchlets are thicker, more four-sided, and scarcely compressed. Young shoots yellow. Dwarf and slow-growing.

C. PISIFERA, Koch. SAWARA CYPRESS.

(*Retinispora pisifera*, Siebold.)

A tree 70 to 100, occasionally 120 to 130 ft. high, with a trunk 3 to 5 ft. in diameter. Branches arranged in two opposite horizontally spreading rows ; branchlets flat, the ultimate divisions about $\frac{1}{16}$ in. wide. Leaves of about equal length, the lateral ones somewhat the larger ($\frac{1}{12}$ in. long), all with sharp, slender, free points ; dark green above, green at the tips beneath, but with a broad patch of glaucous bloom at the base of each. Cones brown, about the size of a pea ; scales ten or twelve, hollowed towards the centre, where is a minute projection.

Native of Japan ; introduced along with vars. filifera, plumosa, and squarrosa by J. G. Veitch in 1861. As a tree for gardens the typical *C. pisifera* is inferior to *C. obtusa*, from which it is readily distinguished by its sharply pointed leaves. It is more likely to be confused with some forms of *C. Lawsoniana*, but the leaves of the American species are rarely so finely pointed, and those of the lateral ranks, as in *C. obtusa*, are conspicuously longer than the upper and lower ones. In habit *C. pisifera* is apt to be thin, especially in poor soils, but this may be improved by an occasional clipping over in spring, more especially when in a small state. An occasional application of manure water is also beneficial.

There are four leading varieties of *C. pisifera* in gardens, the two first adult, the two last juvenile :—

1. Var. AUREA.—A variety of the adult type which originated in Messrs Barron's nursery at Borrowash ; it has the whole of the young shoots golden yellow.

2. Var. FILIFERA (*Retinispora filifera*).—A remarkably distinct form (adult), in which the lateral branching is much reduced, so that the main branchlets become elongated, terete, and cord-like ; the leaves also are larger. Inter-mixed are short branchlets of the type. The tree is low and wide, often a broadly pyramidal shrub only, its whole outer surface furnished with the slender pendulous branchlets. Var. FILIFERA AUREA has the young growths golden.

3. Var. PLUMOSA (*Retinispora plumosa*).—A persistently juvenile form (or rather "state") of *C. pisifera*, not so large-growing, more pyramidal in habit, and not so flatly but more plumosely branched ; the final subdivisions decurved. It is most distinct, however, in the leaves, which are $\frac{1}{8}$ in. or more

long, awl-shaped, arranged in opposite pairs, and stand out from the axis at an angle of about 45° . Var. *PLUMOSA ARGENTEA* has creamy white young shoots; var. *PLUMOSA AUREA* has them yellow; whilst var. *PLUMOSA ALBOPICTA* has them creamy white at the tips only.

4. Var. *SQUARROSA*, *Masters* (*Retinispora squarrosa*, *Siebold*).—This retains permanently an even more juvenile type of foliage and branching than *plumosa*, and one characteristic of seedlings of the species. Normally, seedlings retain it for three or four months, when the *plumosa* type of foliage develops; the following year and the year after the typical adult form begins to appear. Var. *squarrosa* is a very dense-habited bush of uniform silvery, glaucous hue, the branching very bushy, irregular, often lumpy. Leaves about $\frac{1}{4}$ in. long, narrow, flat, and pointed; glaucous on both sides, and standing out at angles of 45° to 90° . They are arranged in pairs or in threes, sometimes spirally, more often decussately. A very pleasing and striking small tree or bush. Var. *SQUARROSA SULPHUREA* has a distinctly yellowish hue, very marked when grown alongside the ordinary form. Both are apt to get thin with age, and are often improved by an occasional clipping.

C. SEMPERVIRENS, *Linnaeus*. ITALIAN CYPRESS.

A tree 80 to 150 ft. high and 4 to 10 ft. in girth of trunk in the Mediterranean region, its branching either horizontal or fastigate, the bark thin; final subdivision of branchlets terete or squarish, $\frac{1}{10}$ to $\frac{3}{10}$ in. wide. Leaves scale-like, dark green, arranged in four rows, closely pressed to the twig or axis, overlapping each other at their bases, the exposed part diamond-shaped, blunt at the apex. Cones globose to oblong, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long; scales eight to fourteen, usually rising to a point in the middle, but sometimes flat or slightly hollowed, with a thin boss in the centre. Seeds smooth.

The horizontal form is distinguished as *HORIZONTALIS*, and is probably the type. The erect-growing one is known as *STRICTA*, but more generally in Italy as "*C. pyramidalis*," sometimes also as "*fastigiata*."

Native of S.E. Europe and Persia, and the "cypress" of the ancients; cultivated in England for at least four centuries. It lives out-of-doors at Kew, but does not thrive there like *C. macrocarpa*, needing a warmer climate. This tenderness is more especially marked in young trees. There are fine examples scattered over the south and west parts of our islands. Wherever planted it likes shelter, and should be put out young. The erect-growing form is the most popular in this country, and is the tree whose tall, dark, columnar shape is so characteristic a feature of Italian gardens and cemeteries. It lives to be many hundreds of years old in S. Europe. In the Boboli Gardens, familiar to visitors to Florence, an avenue of cypresses is 300 years old, yet shows no evidence of decline. At Somma, in Lombardy, there is, perhaps, the most famous tree in Europe. It is of the horizontal-branched type, and grows close to the Simplon road, which Napoleon is said to have diverted in order to save it. The legend that this tree antedates the Christian era is not now accepted as true. The wood of the Italian cypress is remarkably durable, and was much employed for making large chests for clothing, etc., in the Middle Ages, its odour, agreeable to human beings, keeping away moths. According to Loudon, the doors of St Peter's at Rome, made of this wood, stood for over 1100 years, and were found to be perfectly sound on removal.

Among the cypresses, *C. sempervirens* is most closely allied to *C. macrocarpa*, but may usually be distinguished by the finer, more delicate spray and smaller leaves, also by the frequently shallow, pyramidal apex of the scales, and the smooth, not warted, seeds.

C. THYOIDES, *Linnaeus*. WHITE CEDAR.(Chamæcyparis sphæroidea, *Spach*.)

A tree usually 20 to 50, but up to 70 or 80 ft. high in a wild state, with a reddish brown trunk 2 ft. or more in diameter; of slender columnar form in a young state, and shortly branched. The smaller ramifications are flat, two-ranked, and somewhat fan-shaped; the branching as a whole is bushy, spiral, and irregular. The trees shed their effete branchlets in fan-shaped pieces, 1 to 3 ins. long. Leaves in four ranks, the lateral ones usually longer than those above and beneath, which are marked with a conspicuous raised gland; they are $\frac{1}{8}$ to $\frac{1}{2}$ in. long, pointed, the lateral ones spreading at the tips; dull grey-green. Cones $\frac{1}{8}$ to $\frac{1}{4}$ in. in diameter, globose, very glaucous; scales six, each with a triangular boss in the centre.

Native of Eastern N. America, usually found in cold, swampy, often inundated ground; introduced in the eighteenth century. This tree was more frequently cultivated in earlier times, before the Californian and Japanese cypresses were introduced, than it is now. It is not so striking as they are, but is worth growing for its neat columnar habit. Although a swamp tree in its native country it will thrive better here in ordinary, deep, moist soil. In New Jersey immense quantities of trunks of this tree have been found immersed in swamps, many of them, although buried for hundreds of years, perfectly sound and not at all water-logged. It is very distinct in its branching from any other of Chamæcyparis group.

Var. *GLAUCA* (syn. *kewensis*).—Leaves glaucous, especially beneath.

Var. *LEPTOCLADA* (*Retinispora leptoclada*, *Gordon*)—A very distinct form of dwarf, close, pyramidal habit; the main branches erect, the smaller ones very short. Besides the ordinary type of adult foliage it has branches with the juvenile type of leaf, longer and more awl-shaped. It appears to have been raised in a nursery at Andelys, in N.W. France, about 1850.

Var. *VARIEGATA*.—Young branchlets yellow.

C. TORULOSA, *Don*. HIMALAYAN CYPRESS.

A tree up to 150 ft. high in the Himalaya, with horizontal branches, and bark peeling off in long strips. Branchlets arranged in opposite ranks, more or less drooping, the final subdivisions equally four-sided, about $\frac{1}{10}$ in. in diameter. Leaves of equal size, deep green, scale-like; overlapping at the base, the terminal part ovate, bluntish, incurved and thickened at the point, often grooved on the back. Cones purplish when young, globose, very shortly stalked, $\frac{1}{2}$ to $\frac{3}{4}$ in. in diameter; scales eight, rarely ten each, with a small central boss.

Discovered by Buchanan-Hamilton during his famous journey in Nepal, 1802-3; introduced in 1824. It is tender, and only seen to advantage in the southern and western counties. I have specimens from Hewell Grange, Worcester; Ravenhill, Sevenoaks; and Penrhyn, Wales.

Var. *CORNEYANA*, *Carrière*, has the branchlets arranged irregularly rather than in two opposite ranks, and they are more pendulous.

CYDONIA. QUINCE. ROSACEÆ.

A group of five species of trees and shrubs closely allied to *Pyrus*, but differing in the many-seeded cells of the fruit. Leaves alternate, deciduous, simple, with large stipules. Flowers normally in almost stalkless clusters, or solitary. Petals five; stamens numerous; calyx

five-lobed. Fruit large, apple or pear-like, five-celled, with many seeds in each cell. Seeds coated with mucilage. Cydonia was the name given by the ancients to the common quince on account, so it is said, of its growing in great abundance near Cydon, in Crete.

Four of the quinces come from China and Japan, whilst the common quince of our orchards probably originated in S.E. Europe or Asia Minor, but that is uncertain. The fruits of all the species are fragrant and edible when cooked, but excessively harsh and astringent in the raw state. They are used for making jellies and other conserves, also for flavouring ices, etc. Only one species, *C. sinensis*, is of doubtful hardiness. They all like a sunny position, and whilst not particular as to soil, prefer a good well-drained loam. The common quince often thrives well in moist positions.

C. CATHAYENSIS, *Hemsley*.

A deciduous shrub of open habit, sparsely branched and more or less thorny. Branches tortuous, furnished with spiny spurs several inches long. Leaves short-stalked, lanceolate or linear-lanceolate, 3 to 5 ins. long, finely toothed, pointed, tapering at the base; smooth above, reddish downy beneath. On the young growths of the year the stipules are large, broad, and leaflike, oblique, 1 in. long, toothed. On year-old shoots the leaves are in tufts springing from the axil of a spine; stipules small. Flowers two or three together in short clusters; each flower $1\frac{1}{2}$ ins. in diameter; petals white, round, overlapping; calyx ciliate. Stamens numerous, shorter than the petals. Fruit very large and heavy; 4 to 6 ins. long, $2\frac{1}{2}$ to $3\frac{1}{2}$ ins. wide; somewhat egg-shaped, but abruptly contracted near the base. Seed $\frac{3}{8}$ in. long, wedge-shaped, pointed at one end.

Although this quince is probably a native of China, nothing appears to be definitely known of its habitat. Henry collected it in the province of Hupeh, China, but never undoubtedly wild. It has long been grown at Kew, and by Canon Ellacombe at Bitton, but its introduction is unrecorded. It is perfectly hardy and bears fruit freely, but this does not ripen always out-of-doors. Although not in any way showy, its habit is quaint, and the huge fruits stuck close to the branches have a curious and interesting appearance. Increased by seeds.

C. JAPONICA, *Persoon*. JAPANESE QUINCE.

A deciduous shrub of wide-spreading habit, forming a dense tangle of interlacing, more or less spiny branches, ultimately 10 ft. high, and 20 ft. in diameter; branchlets downy. Leaves $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, oval, tapering more gradually towards the base than towards the apex, evenly saw-toothed, dark glossy green above, paler beneath, quite smooth on both surfaces; stipules large and conspicuous on the shoots of the year, as much as $1\frac{1}{2}$ ins. diameter, obliquely kidney-shaped and toothed. Flowers $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. across, produced in clusters on the old wood, usually two to four on each cluster, scarlet to blood-red. Fruit stalkless, green-yellow, specked with small dots, 2 to $2\frac{1}{2}$ ins. long and wide, apple-shaped or pear-shaped, fragrant. Syn. *Pyrus japonica*, *Thunberg*.

Native of China and Japan; introduced by Sir Jos. Banks to Kew in 1796, and for many years now one of the best known and most admired of hardy shrubs. It sometimes commences to flower before Christmas, especially when grown on a wall, and is usually in blossom by February or March, continuing until June, or even later. Sometimes autumn flowers are produced in distinct racemes instead of the stalkless clusters usual to the species; in these cases the flowers are produced alternately on stalks 1 in. or more long,

as many as half a dozen on each raceme. A similar arrangement is occasionally seen in the white variety of *C. Maulei*. *C. japonica* loves the sun, and flowers most freely planted against a south wall. Perhaps it is seen at its best in some sheltered sunny spot as a wide-spreading lawn shrub. It stands pruning well, summer pruning being best. Sometimes it is successfully used as a hedge plant. There is one in Lord Annesley's garden at Castlewellan which flowers admirably, being pruned annually in late summer. A great number of varieties have been sent out by nurserymen, ranging in colour from white and pale yellow to the richest crimson. The following is merely a selection:—

Var. ALBA.—Flowers white tinged with rose; also in a semi-double form (*semi-pleno*).

Var. AURORA.—Flowers rose, suffused with yellow.

Var. CARDINALIS.—Flowers larger than ordinary, rich crimson.

Var. "KNAP HILL SCARLET."—The most brilliant of red kinds.

Var. NIVALIS.—Flowers white.

Var. SINICA.—Flowers double, deep red.

Var. SULPHUREA.—Flowers yellowish white.

Var. VERSICOLOR.—Flowers rose- and salmon-coloured.

All these varieties to be obtained true must be increased by layers, although by sowing seeds, new and perhaps improved kinds may be got.

C. MAULEI, *T. Moore*. DWARF QUINCE.

A low, spreading, deciduous thorny shrub, usually under 3 ft. in height, considerably more in width; branchlets very downy when young. Leaves 1 to 2 ins. long, obovate or oval to almost orbicular, toothed, tapering at the base to a short stalk, quite smooth; stipules large on the young growing shoots, ovate or broadly heart-shaped, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide. Flowers in almost stalkless clusters from the joints of the year-old wood, very abundant, orange-red, scarlet or blood-red, $1\frac{1}{2}$ ins. across. Fruit apple-shaped, $1\frac{1}{2}$ ins. diameter, yellow stained with red on the sunny side, fragrant.

Native of Japan; introduced about 1869 by Messrs Maule of Bristol. This is one of the most charming of red-flowered dwarf shrubs, flowering from April to June, and when at its best, literally wreathing its branches with blossom. It bears fruits freely, and they are pleasantly coloured and scented in early winter; though harsh and acid when raw, they make an excellent conserve. Besides its dwarfer habit, it differs from its near ally, *C. japonica*, in having more obovate or rounded leaves, minutely warted twigs, and more coarsely toothed leaves. Syn. *Pyrus Maulei*, *Masters*.

Var. ALBA.—Flowers white. This form often flowers a second time in autumn, producing its flowers alternately on almost leafless shoots, each flower with a stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, the whole forming a raceme 3 or 4 ins. long.

Var. ALPINA, *Rehder* (*C. Sargentii*).—A more than usually dwarf form, introduced from the mountains of Japan by Prof. Sargent. Under cultivation, like other alpine varieties, it appears to revert to the type.

Var. ATROSANGUINEA.—Flowers rich blood-red. Var. SUPERBA is nearly or quite the same.

C. SINENSIS, *Thouin*. CHINESE QUINCE.

A small deciduous or semi-evergreen, unarmed tree, up to 20 ft. high, with the bark of the trunk and main branches peeling off in flakes like that of a plane. Branchlets extremely hairy when quite young, afterwards smooth and glossy. Leaves obovate, ovate, or oval; $2\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; tapering to a stalk $\frac{1}{2}$ in. long, which is furnished with hairs and gland-tipped teeth; upper surface smooth, lower one covered with pale brown hairs,

becoming nearly smooth by autumn; margin regularly and minutely saw-toothed, teeth gland-tipped. Flowers solitary from the buds of the year-old shoots, or on short spurs, stalkless, soft carmine, 1 to $1\frac{1}{2}$ ins. across, petals oblong. Fruit egg-shaped, pale citron-yellow when ripe, 5 to 7 ins. long.

Native of China; introduced to England in the last decade of the eighteenth century, but afterwards quite lost to cultivation. Reintroduced from Italy in 1898. It succeeds very well on a south wall, and bears fruits which, however, do not ripen or become so large as one sees them on the Italian Riviera, where the tree is much cultivated. In the open it is not quite satisfactory, and suffers in severe winters. This is due no doubt to lack of summer sun, for I saw it a few years ago in the Vienna Botanic Garden 15 ft. or more high in perfect vigour, and the winter cold there is greater than ours. It flowers in April and May. It should be raised from seeds, obtainable from S. Europe.



CYDONIA VULGARIS.

C. VULGARIS, *Persoon*. COMMON QUINCE.

A deciduous, thornless tree, 15 to 20 ft. high, with crowded branches and a low quaint habit; young branchlets covered with greyish wool. Leaves ovate or elliptical, $2\frac{1}{2}$ to 4 ins. long, $1\frac{3}{4}$ to $2\frac{1}{4}$ ins. wide, not toothed, dark green above, pale with a dense felt of grey wool beneath, especially when young; stipules hairy, glandular. Flowers 2 ins. across, pink or white, each one solitary at the end of a short twig, produced during May. Fruit light golden yellow, pear-shaped, very fragrant. Syn. *Pyrus Cydonia*, *Linnaeus*.

Var. *LUSITANICA*. Portuguese Quince.—Naturally a more vigorous variety than the type, this is not quite so hardy in Britain. The fruit is 4 ins. long, $3\frac{1}{2}$ ins. wide at the thickest part, tapering thence to the stalk; skin deep yellow covered with grey down. Flowers large, pale rose, and produced in sufficient abundance to make this variety the best worth growing for ornament.

Var. *MALIFORMIS*. Apple-shaped Quince.—Is the hardiest form; fruits 4 ins. long by $2\frac{1}{2}$ ins. wide, rich golden yellow. (To distinguish this from the type, with its pear-shaped fruits, the latter sometimes called "pyriformis.")

Besides these there are other varieties with vernacular names, the best perhaps of which is the "Vranja" Quince, introduced from and long grown near Vranja, in S. Servia. The fruit is very fragrant, of a clear shining gold, and said to have a softer flesh than most quinces.

The native country of the quince, like that of some other commonly cultivated plants, does not appear to be definitely known. It has been cultivated in S. Britain and S. Europe from time immemorial, and, if not wild, is naturalised in many countries bordering the Mediterranean. The fruit when raw is harsh and astringent, and unfit for food, but it has long been grown in orchards for flavouring apple-pies, ices, and various confections. The pear-shaped form is perhaps the handsomest of all hardy fruits. The quince is largely employed as a stock on which pears are grafted.

CYRILLA RACEMIFLORA, *Linnaeus*. LEATHERWOOD. CYRILLACEÆ.

A deciduous shrub in this country, 4 ft. or more high (a small tree in some parts of its native habitat), of spreading habit, free from down in all its parts; young shoots slender, very leafy. Leaves alternate, oblanceolate or obovate; $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; much tapered at the base, more abruptly so or rounded at the apex, dark lustrous green; stalks $\frac{1}{4}$ in. or less long. Flowers very small, numerous and white, crowded on slender cylindrical racemes, 3 to 6 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide; produced in late summer and autumn; the racemes appearing in a horizontal whorl at the base of the current season's growth. Fruit a roundish capsule $\frac{1}{12}$ in. long.

Native of Eastern N. America from N. Carolina to Virginia; found also in the West Indies. This curious shrub was introduced to Britain in 1765, but had long disappeared until reimported ten or fifteen years ago. Only the form from the northern limits of its distribution, which is shrubby and deciduous, is hardy in the south of England; the more southern forms are evergreen, tree-like, and not hardy. The profusion and curious arrangement of the racemes as well as the season at which they appear, give the species a certain distinction and merit. It thrives in a mixture of peat and loam. The natural order to which it belongs is regarded as being allied to the holly family.

CYTISUS. BROOMS. LEGUMINOSÆ.

A very important place is filled in gardens by the group of shrubs commonly classed together as "brooms." Of this group, which includes *Genista*, *Spartium*, etc., *Cytisus* is the most important genus. Its species are mostly quite deciduous, some are almost always leafless, and all are shrubby, varying in stature from 12 ft. or more high, down to less than as many inches. The leaves are alternate, simple, or trifoliate (sometimes both on the same plant). The flowers have the pea-flower shape characteristic of the order, and, with the exception of one or two species, they are yellow. Fruit a pod. The genus is essentially a European one, but a few species extend eastward to Asia Minor, and others reach across the Mediterranean to N. Africa.

The affinities of the genus are with Laburnum, Ulex, and Genista. Laburnum is distinguished by the thickened or winged sutures (seams) of the pod; Ulex by the coloured calyx; but the distinctions between Genista and Cytisus are not so easily found. The most serviceable one is furnished by the seed. In Cytisus the outer coat of the seed has a wart-like excrescence near the hilum, which is technically known as the "strophiole." In Genista this is absent or rudimentary.

The species of Cytisus are easily cultivated. They like a fairly good, but not rich soil, and abundant sunshine. Whenever possible, they should be raised from seeds, but if these are not available cuttings and grafts can be used. Cuttings should be taken in August when the wood has become firm. Pieces from $1\frac{1}{2}$ to 3 ins. long may be used, always with a slight heel of older wood. They should be dibbled in very sandy soil under cloches, or in a frame, only uncovering to give water. They ought to push roots the following spring, and soon after can be potted in small pots, or, if vigorously rooted, planted out straight away in nursery beds, being careful to water and, if necessary, shade until established. The brooms do not transplant well after they have reached a good size, so it is wise to get them in their permanent places early.

Among the following species are some which stand out by reason of one character alone: thus the purple flowers distinguish *purpureus*, the pure white ones *albus*; the long racemes of *nigricans* and the frequently stalkless leaves of *sessilifolia* render those species unmistakable. *C. leucanthus* is recognised by its nearly white flowers in terminal heads; *supinus* and *Heuffeli* by the yellow ones similarly arranged.

C. ALBUS, *Link.* WHITE SPANISH BROOM.

(*Genista multiflora*, *Spach.*)

A tall broom, sometimes 10 or more ft. high; branchlets very slender, round, slightly ribbed, downy when young; but little branched, and produced abundantly in besom-like masses. Leaves trifoliolate on the lower part of the shoot, simple towards the top; leaflets linear, silky, up to $\frac{1}{2}$ in. long, or so small as to be scarcely noticeable. Flowers white, produced in May at the joints all along the previous summer's wood, singly, or two or three together; each flower $\frac{1}{3}$ in. long on a stalk of equal length. Pods 1 in. long, hairy, with thickened seams, four- to six-seeded.

Native of Spain and Portugal. This beautiful broom, the only really white one that is genuinely hardy, is one of the most useful of hardy shrubs. Easily raised from seed, and reaching its full beauty in three or four years, it is admirably adapted for planting in small groups in shrubberies in association with the sturdier evergreens. It does not rob other plants, although it soon out-tops most of them.

C. ARDOINI, *Fournier.*

A low, decumbent, deciduous shrub, 4 or 5 ins. high, with round, shallowly grooved, hairy branches. Leaves trifoliolate, with a main-stalk $\frac{1}{4}$ in. long; leaflets obovate or oblong, $\frac{1}{3}$ in. long, almost shaggy when young on both sides. Flowers golden yellow, produced in April and May, one to three (occasionally up to six) at each joint, on short hairy stalks, on the terminal part of the previous year's shoots. Each flower is about $\frac{1}{2}$ in. long, with

a short hairy calyx; the standard petal is orbicular and incurved at the edges. Pod $\frac{3}{4}$ to 1 in. long, hairy, containing one or two seeds.

Native of the Maritime Alps, where, according to Moggridge (*Flora of Mentone*, t. 58), it is extremely rare in a wild state owing to the plants being eaten over by grazing animals before the seeds have time to ripen. It was first discovered by Ardoino, after whom it is named, in 1847, but was apparently lost sight of until 1866, when it was found again by the Rev. Wm. Hawker and introduced to cultivation. It is a singularly pretty little shrub, one of the dwarfest of brooms, quite hardy, and flowers freely. Under cultivation it hybridises readily through insect agency if grown near other species. It is the seed parent of *C. kewensis* and *C. Beani*, as well as some other inferior unnamed kinds. It is a delightful rock garden plant, but if associated with other brooms should be raised from cuttings to be sure of coming true.



CYTISUS BEANI.

C. BEANI, *Nicholson*.

A deciduous, semi-prostrate shrub, 6 to 18 ins. high, twice or thrice as wide, with round, slightly grooved, slender branches, hairy when young, afterwards smooth. Leaves simple, linear, about $\frac{1}{2}$ in. long, hairy. Flowers produced singly, in pairs, or in threes at each joint of the previous summer's growth, deep golden yellow, forming charming sprays of blossom up to 1 ft. in length.

A chance hybrid raised at Kew in 1900, and first noticed in a bed of

seedlings of *C. Ardoini*. The pollen parent was evidently *C. purgans*, which it resembles in leaf and stem; its semi-prostrate habit it inherits from *C. Ardoini*. It flowers in May, and is then one of the prettiest of dwarf brooms; it is, however, at its best when two or three years old.

C. DALLIMOREI, Rolfe.

(Bot. Mag., t. 8482.)

A hybrid raised at Kew in 1900 by crossing *C. scoparius* var. *Andreanus* (seed-bearer) with *C. albus*. It is a tall shrub, perhaps 8 or 9 ft. high, of thin, erect habit, suggesting that of *C. scoparius*. Leaves mostly trifoliate, downy, young wood ribbed. Flowers about $\frac{5}{8}$ in. long, the whole of the petals suffused with beautiful shades of rosy pink deepening on the wing-petals to crimson; the almost orbicular standard petal is $\frac{5}{8}$ in. long, darker outside than within, keel almost white. Calyx helmet-shaped, shining brown, slightly downy, $\frac{1}{8}$ in. long; flower-stalk $\frac{1}{4}$ in. long, downy. At each node the flowers are solitary or in pairs.

The beautiful broom is quite distinct from any other in cultivation, and is the first hybrid broom raised by artificial cross-fertilisation, all its predecessors having originated as chance crosses made by insects. It is propagated by grafting on *Laburnum*. As it flowers regularly and in great profusion in May, it ought in time to become a popular garden shrub.

C. DECUMBENS, Spach.

(Bot. Mag., t. 8230.)

A prostrate shrub, 4 to 6 ins. high, with five-angled, sparsely hairy branches. Leaves simple, stalkless, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, oblong or obovate, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; hairy, especially beneath. Flowers bright yellow, $\frac{1}{2}$ to $\frac{5}{8}$ in. long, produced singly, in pairs, or in threes from the joints of the preceding summer's shoots; the flower-stalks are $\frac{1}{3}$ to $\frac{1}{2}$ in. long, and the calyx $\frac{1}{8}$ in. long, both hairy. Pod $\frac{3}{4}$ to 1 in. long, hairy, three- or four-seeded.

Native of S. Europe from France to Albania and Montenegro. This species is, perhaps, the most prostrate of all brooms in cultivation, lying as it does flat on the ground and only increasing in height by additional growths laid on the older ones. In May and June it is very gay with the bright but rich yellow flowers. It may be strongly recommended for the rock garden, especially for positions where it is in full sunlight. Said by Aiton to have been introduced in 1775, but now rare in gardens.

C. HEUFFELI, Wiersbicki.

(*C. supinus* var. *Heuffeli, Briquet.*)

A low, deciduous shrub with slender, erect, or arching branches covered with greyish appressed hairs. Leaves trifoliate, with stalks $\frac{1}{3}$ in. long; leaflets $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. or less wide; linear oblong or linear obovate, covered with flattened hairs beneath; ultimately smooth above. Flowers borne on the shoots of the year in a close terminal head, each $\frac{3}{4}$ in. long, with narrow, yellow petals, and a very hairy calyx which extends two-thirds the length of the flower. Pod 1 in. long, $\frac{3}{16}$ in. wide, covered with silky greyish hairs, and containing four to eight seeds.

Native of Hungary and the Transylvanian Alps. It belongs to the *C. supinus* group, characterised by the terminal inflorescence, the long hairy

calyx, and the hairy pods. *C. Heuffeli* is, perhaps, nearest to *C. austriacus*, the hairs, as in that species, being appressed; but it is distinguished by its slender stems and narrower leaves.

C. HIRSUTUS, Linnæus.

(Bot. Mag., t. 6819.)

A dwarf, more or less decumbent, deciduous shrub, 1 to 2 ft. high, with round slender stems covered when young with outstanding (not appressed) hairs. Leaves trifoliolate; leaflets oval, or broadly obovate, up to $\frac{3}{4}$ in. long, half as much wide, under-surface shaggy. Flowers yellow, 1 in. or more long, produced in axillary clusters of two to four blossoms; standard petal stained with brown in the centre, roundish, and as much as $\frac{3}{4}$ in. across; calyx tubular, very hairy, $\frac{1}{2}$ in. long. Pod 1 to $1\frac{1}{2}$ ins. long, flattened, shaggy.

Native of S. Europe; introduced nearly two hundred years ago, but not often seen. It has been much confused with *supinus* and *ratisbonensis*; the former is, of course, quite distinct in its terminal inflorescence; the latter, which is the more closely allied, is of taller, sturdier habit, and has the hairs on the various parts appressed.

Var. *HIRSUTISSIMUS, Boissier*, is sometimes seen in gardens. It is a sturdier, more erect form found further east than the type, occurring in Asia Minor; the leaves, calyx, and pods are even more hirsute. Up to 3 or 4 ft. high.

C. CILIATUS, Wahlenberg, is a native of the south-eastern part of the Austrian Empire and Turkey. It is sometimes made a variety of *hirsutus*, from which it differs chiefly in the pods being hairy only on the seams, or even almost smooth. Habit and flower as in ordinary *C. hirsutus*.

C. KEWENSIS, Bean.

A low, deciduous, perfectly procumbent shrub, less than 1 ft. high, but sometimes 6 ft. across. Leaves sometimes simple, but usually trifoliolate, downy. Flowers produced in May singly, or two or three together, at each joint of the previous year's wood; they are each about $\frac{1}{2}$ in. long, creamy white or pale sulphur-yellow, with a fine standard petal $\frac{1}{2}$ in. across.

A hybrid between *C. Ardoini* (seed-bearer) and *C. albus*, raised at Kew in 1891. For growing on shelves of the rock garden few dwarf shrubs are more beautiful. The flowers are rather larger than those of *C. præcox*, but otherwise very similar.

C. LEUCANTHUS, Waldstein.

(Bot. Mag., t. 1438; *C. albus, Hacquet*, not *Link*; *C. schipkaensis, Dieck.*)

A dwarf shrub of spreading habit, 4 to 10 ins. high, deciduous, with round, hairy branchlets. Leaves trifoliolate, with a hairy main-stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long; leaflets about $\frac{1}{2}$ in. long, obovate or narrow elliptic, almost smooth above, clothed beneath with appressed hairs. Flowers closely packed in a terminal cluster, yellowish white, six to ten in each cluster. The flower is $\frac{3}{4}$ in. long, but the petals do not expand fully through being clasped by the large hairy calyx $\frac{1}{2}$ in. long. Pod $\frac{3}{4}$ in. long, compressed, shaggy, containing two to five seeds.

Native of S.E. Europe. This species was originally introduced to England about 1806, but was afterwards completely lost sight of in gardens; about 1890 it was again introduced from the Balkan Mountains, and having been found on the Shipka Pass, it was distributed from nurseries under the name of *C. schipkaensis*, without its identity with the old *leucanthus* being noticed. It flowers best in June and July, but continues until October to produce odd

clusters. It is not one of the prettiest of dwarf brooms, but flowers later than most of them. It may be used as a carpeting beneath thinly planted, taller shrubs, or in small patches in the rock garden. It belongs to the supinus group.



CYTISUS NIGRICANS.

C. MONSPESSULANUS, *Linnaeus*.
MONTPELIER BROOM.

(*C. candicans*, *De Candolle*; *Genista candicans*, *Linnaeus*.)

A shrub 6 ft. or more high, with erect, very leafy branches; evergreen in mild winters. Branchlets conspicuously ridged, hairy when young. Leaves trifoliate, short-stalked; leaflets obovate with a short, abrupt tip, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, smooth above, hairy beneath. Flowers produced in early May in short racemes or short-stalked umbels, three to nine in each umbel, from the axils of the leaves; $\frac{1}{2}$ in. long, bright yellow. Calyx $\frac{1}{8}$ to $\frac{1}{4}$ in. long, bell-shaped, with unequal triangular teeth. Pod $\frac{1}{2}$ to $\frac{3}{4}$ in. long, shaggy, three- to four-seeded.

Native of S. Europe from France and Portugal to Dalmatia and Greece, also in N. Africa and Syria; introduced in 1735, but never common on account of its tenderness. Although at Kew it survives winters of moderate severity it succumbs to 15° or 20° of frost, and is therefore really adapted for the mildest parts of our islands only. It has been introduced from N. India, being apparently naturalised in some parts there.

C. NIGRICANS, *Linnaeus*.

(*Bot. Mag.*, t. 8479; *C. longispicatus*, *Hort.*)

A deciduous shrub, 3 to 5 ft. high, with erect, round branches covered with appressed down. Leaves trifoliate, with main-stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long; leaflets $\frac{1}{2}$ to 1 in. long, obovate or oval, with scattered hairs beneath. Flowers yellow, in erect slender racemes, terminating the shoots of the year, and

sometimes more than 1 ft. long. Whilst the racemes are themselves leafless, they frequently extend into leafy growth above the flowers. Flowers crowded on the raceme, each one $\frac{1}{3}$ to $\frac{1}{2}$ in. long, and borne on a slender, rather shorter, hairy stalk. Calyx somewhat helmet-shaped, hairy. Pod 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. wide, hairy.

Native of Central and S.E. Europe; introduced in 1730. This broom is

very distinct among its kind, because of its long terminal racemes, which commence to open flowers in July, and continue until the end of August. Flowering as it does on the shoots of the current year, it should be pruned in spring before growth commences. It is wise also to remove the racemes when the flowers are over, so as to prevent excessive seed formation. A group of this broom in the front of a shrubbery is very effective. The flowers turn black when dried, a peculiarity (not confined to this species) on which Linnæus based the specific name.

C. PRÆCOX, *Wheeler*. WARMINSTER BROOM.

A hybrid broom with the habit of *C. albus*, but with denser and heavier masses of young branches. Leaves mostly simple, about $\frac{1}{2}$ in. long, silky like the young shoots; soon falling. Flowers sulphur-yellow, produced in remarkable abundance in early May, and very beautiful then; but they have a heavy, rather unpleasant odour which renders the plant unsuitable for growing in large masses near the house. It ripens good seed, but the plants do not come true, reverting more or less to one or other parent. It can be increased easily from cuttings placed in sandy soil under cloches in a cold frame during August. This fine broom first appeared among some seedlings of *C. purgans* in the nursery of Messrs Wheeler of Warminster about 1867. From its appearance it was surmised that it was a hybrid between that species and *C. albus*, made through insect agency. The reversion of its seedlings to the white broom have since proved this.

C. PURGANS, *Boissier*.

A deciduous shrub, often nearly leafless, 3 or 4 ft. high, of sturdy habit, forming a low, wide mass of rather rigid, erect, grooved branches. Leaves stalkless, narrowly obovate, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, clothed with appressed silvery hairs, and soon falling. Flowers produced in April and May, singly or in pairs from the joints of the preceding year's wood, deep golden yellow, each flower $\frac{1}{2}$ in. long, on a somewhat shorter stalk. Pod $\frac{3}{4}$ to 1 in. long, hairy, three- or four-seeded.

Native of France from the Loire southwards to Central Spain; long cultivated in English gardens (Philip Miller grew it in the Chelsea Botanic Garden in the mid-eighteenth century). The exceptionally rich golden colour of its flowers makes this species well worth cultivation; it should have the sunniest possible position. Its foliage is a negligible quantity, but the numerous dark green branchlets give the effect of an evergreen. It can be increased in the usual way (see under *præcox*), but plants so raised are not so long-lived as seedlings. It is said to have purgative and emetic properties, but is poisonous in large quantity, and not used in medicine.

C. PURPUREUS, *Scopoli*. PURPLE BROOM.

A low, deciduous shrub, from 1 to 1½ ft. high; branchlets smooth or nearly so, well furnished with trifoliolate leaves. Leaflets obovate, $\frac{1}{4}$ to 1 in. long, stalkless themselves, but with a common stalk $\frac{1}{4}$ to 1 in. long; usually quite smooth, dark green. Flowers purple, produced in May on the shoots of the preceding summer, one to three of them at each joint. Each flower is $\frac{3}{4}$ in. long; the calyx $\frac{1}{3}$ to $\frac{1}{2}$ in. long. Pod quite smooth, 1 to 1½ ins. long, containing three or four seeds.

Native of Central and S.E. Europe; introduced in 1792. From the colour of its flowers it is one of the most distinct of brooms, and one of the most charming of dwarf shrubs. It makes an admirable cover for the ground

beneath a group of taller thinly planted shrubs. A good system of cultivating it is to cut out the flowering shoots as soon as the flowers have faded, leaving the young growths that always spring up from near the ground to form the flowering shoots for the following year. Seeds provide the best means of propagation, and a sufficient quantity of them should, of course, be left to ripen for the purpose. There is a white-flowered variety (FLORE ALBO), and one with more rosy flowers (CARNEUS or ROSEUS).



CYTISUS PURPUREUS.

C. RATISBONENSIS, Schæffer.

(*C. biflorus*, L'Heritier; Bot. Reg., t. 308.)

A deciduous shrub, ultimately 4 to 6 ft. high, the erect, round branches covered with short, greyish, appressed down. Leaves trifoliate, on stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long; leaflets $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; covered beneath with appressed hairs, the margins ciliate; upper surface smooth except when young. Flowers produced during May, two to four together at each joint of the previous summer's wood; they are bright yellow, 1 in. or more long, the standard petal roundish and $\frac{1}{2}$ in. across; calyx tubular, $\frac{1}{2}$ in. long; pod 1 in. long, $\frac{3}{8}$ in. wide, both with appressed hairs.

Native of Europe from Germany to the Caucasus, abundant in Hungary and the Balkan States. It is very hardy, and easily increased by the numerous seeds it bears; altogether a handsome and useful broom. It comes from the Continent under a variety of names and in slightly differing forms, varying in stature and in the character of the down. *C. ELONGATUS*, Waldstein, for instance, is a robust form with down of a more felted character mixed with outstanding hairs. Then such names as *ruthenicus*, *uralensis*, and *serotinus* indicate plants scarcely differing from the type. Mr Briquet makes it a variety of *C. hirsutus*, but that is well distinguished by its dwarfer, more spreading habit, and especially by the hairs not being appressed.

C. SCOPARIUS, Link. COMMON BROOM.

(*Sarothamnus scoparius*, Koch.)

A deciduous shrub, up to 5 or 6 ft. high in the open; twice as high when drawn up in shrubberies. Although the leaves fall in autumn, the plant, by the greenness of its branches, retains an evergreen aspect through the winter. Branchlets erect, straight, prominently angled, hairy when young. Leaves at the base of the shoot trifoliate and stalked, those near the end stalk-

less and often reduced to one leaflet. Leaflets obovate, sometimes narrowly so, $\frac{1}{4}$ to $\frac{5}{8}$ in. long, smooth except beneath when quite young. Flowers a rich



PURPLE BROOM, *Cytisus purpureus*.

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glowing yellow, 1 in. long, produced singly or in pairs from the joints of the year-old shoots in May; standard petal round, $\frac{1}{2}$ in. across; calyx smooth. Pod $1\frac{1}{2}$ to 2 ins. long, hairy, especially on the margins.

Native of W. Europe, and the only *Cytisus* native of the British Isles, over which it is widely spread.

Var. *ANDREANUS*, *Dippel*.—Similar to the type in habit, foliage, and shape of flower, but with the wing-petals of a rich brownish crimson, and the standard petal, though mainly yellow, stained and lined with the same colour. This beautiful and striking variety was discovered by the late Mr Edouard André growing wild in Normandy, about 1884. It succeeds best grafted on Laburnum. It comes only partly true from seed, many of its progeny having flowers very poorly coloured as compared with the parent; but some distinct and improved forms have been obtained, especially by Mr T. Smith of Newry; one of the best he has named "Firefly," more highly coloured than *Andreanus* itself.

Var. *FLORE PLENO*.—Flowers double.

Var. *FOLIIS VARIEGATIS*.—Leaves variegated with white, the whole plant having a not unpleasing grey effect.

Var. *PENDULUS* (*C. grandiflorus* of nurseries).—This variety is not only distinct because of its low prostrate habit (pendulous only when grafted on standards of Laburnum), it is particularly showy, because of the large size of its flowers.

Var. *SULPHUREUS*. Moonlight Broom.—A dwarfer, flatter-growing, more compact shrub than the type, with pretty pale sulphur-yellow flowers.

Whilst the ordinary broom, in spite of its great beauty, may be considered too common a shrub to deserve a place in the garden proper, it is admirable for semi-wild spots, dry banks, and such-like places. All the varieties are worth growing, especially *Andreanus*, *pendulus*, and *sulphureus*. The common broom is best propagated by seed; but seed is too uncertain

to be employed for the varieties. Perhaps the best way to increase them is to graft them low on seedlings or on roots of either of the common Laburnums. This should be done in spring, using sprays with wood two seasons old. Cuttings of the current season's wood put under cloches in August take root fairly well, but plants so raised are apt to die off suddenly when a year or two old through decay at what was the base of the cutting, due to the callus not completely covering the pithy part of the base. Young brooms, however raised, should be cropp'd over several times when young, to induce a bushy form.



CYTISUS SESSILIFOLIUS.

C. SESSILIFOLIUS, *Linnaeus*.

(Bot. Mag., t. 255.)

A deciduous, bushy shrub, 5 or 6 ft. high, with ribbed, not downy branchlets. Leaves smooth, trifoliate, usually without stalks on the short flowering shoots,

but with stalks up to $\frac{3}{4}$ in. long on the stronger, non-flowering ones. Leaflets very variable in shape, often obovate, but also oval, roundish, or oblate, from $\frac{1}{4}$ to $\frac{3}{4}$ in. long, pointed. Flowers four to ten, in short racemes terminating short side twigs of the year, bright yellow, $\frac{1}{2}$ in. long, expanding in June. Pod $1\frac{1}{4}$ ins. long, $\frac{1}{2}$ in. wide, smooth.

Native of S. Europe and N. Africa; introduced about three hundred years ago, and one of the most attractive of the later-flowering brooms. It is more appreciated on the Continent than with us, and gives some of the brightest effects seen in German gardens in June.

C. SUPINUS, *Linnaeus*.

(*C. capitatus*, *Scopoli*.)

A deciduous shrub, 2 to 4 ft. high, with round, erect, hairy branches. Leaves trifoliate, with a main-stalk about $\frac{1}{2}$ in. long; leaflets obovate or elliptical, very hairy beneath, ultimately smooth above, $\frac{1}{2}$ to 1 in. long. Flowers in a terminal cluster or umbel 2 ins. across, each flower nearly 1 in. long, with bright yellow petals; calyx tubular, $\frac{1}{2}$ in. long, very hairy. Pod $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ in. wide, covered with shaggy hairs.

The shrub here described must be taken to represent a considerable group of brooms found in a wild state over an area reaching from Spain in the west through the south of Europe to Turkey in the east, all characterised by a terminal umbel of flowers and hairy stems, leaves, calyx, and pods. It is a group which in its largest sense includes *C. Heuffeli* and *C. leucanthus*, but these being distinct enough to be readily recognised are here described separately. In a restricted sense it must include *C. AUSTRIACUS*, *Linnaeus*, which differs in having the hairs on the shoots, calyx, and pods appressed. All the members of this group flower on the shoots of the year in July and August, and intermittently until the frosts come. Whatever pruning, therefore, is necessary, should be done in spring before growth recommences, when the last made shoots may, if desired, be cut back almost to the old wood.

C. SUPRANUBIUS, *O. Kuntze*. TENERIFFE BROOM.

(*Bot. Mag.*, t. 8509; *C. nubigenus*, *Link*; *Spartium nubigenum*, *Linnaeus*.)

A shrub 8 to 10 ft. high, of broom-like habit; twigs stiff, stout, ribbed, clothed with white hairs at first, soon smooth. Leaves of three leaflets, each $\frac{1}{6}$ to $\frac{1}{3}$ in. long, $\frac{1}{12}$ to $\frac{1}{6}$ in. wide, with a main-stalk of about the same length; inconspicuous or absent. Flowers borne in May in axillary clusters on the previous season's shoots; they are milky white with a tinge of rose, $\frac{1}{2}$ in. long; standard petal roundish obovate, $\frac{1}{3}$ in. long; calyx and flower-stalk hairy. Seed-pod brown, 1 to $1\frac{1}{4}$ ins. long.

Native of the Canaries, and very abundant on the Peak of Teneriffe. It was cultivated at Kew seventy years ago, but is too tender to withstand hard winters there. It is, however, so beautiful and so distinct that it is much to be recommended for the milder parts of the kingdom. At Glasnevin, Dublin, it is 8 ft. high in the open, producing the effect of an evergreen through the dark green of its numerous branchlets which resemble those of *Spartium junceum*. They are, therefore, very much stouter than those of the common white broom—*C. albus*.

C. VERSICOLOR, *Hort*.

A hybrid, of which *C. purpureus* is one parent and either *ratisbonensis* or *elongatus* the other. It has inherited the characters and general aspect of *C. purpureus*, having smooth stems and similar foliage, but is a sturdier, taller,

and more rounded bush, 2 ft. or more high. It differs from *C. purpureus* in having the flowers a distinct compromise between yellow and purple, and in having a quite hairy calyx. It has been known for about fifty years, and is a very desirable broom.

DABŒCIA POLIFOLIA, *Don.* ST DABEOC'S HEATH.

ERICACEÆ.

(*D. cantabrica*, *Koch*; *Boretta cantabrica*, *O. Kuntze.*)

An evergreen shrub up to 2 ft. high, with slender, erect stems, furnished with glandular hairs. Leaves alternate, ovate oblong, $\frac{1}{4}$ to $\frac{5}{8}$ in. long, $\frac{1}{10}$ to $\frac{1}{4}$ in. wide, tapering at both ends, very dark glossy green and with a few scattered hairs above, covered beneath with a close white wool; stalk scarcely evident. During the summer a cluster of two or three small leaves comes in the axil of each leaf. Flowers produced from June to November in erect, terminal, glandular racemes, ultimately 3 to 5 ins. long. Corolla broadly egg-shaped, $\frac{3}{8}$ to $\frac{1}{2}$ in. long; contracted at the mouth, where are four tiny reflexed lobes; rosy purple. Calyx with four glandular, hairy divisions, which are $\frac{1}{8}$ in. long. Seed-vessel four-celled, hairy; flowers-stalk $\frac{1}{4}$ in. long.

Var. ALBA.—Flowers pure white, and the whole plant of a paler cast than the type; discovered in Connemara in 1820.

Var. ATROPURPUREA has richer red-purple flowers than the type.

Var. BICOLOR (syn. versicolor) has some of its flowers white, others purple, whilst others are partly white and partly purple; all on the same plant.

Native of W. Europe, including Ireland, where it is found in Connemara. This beautiful little shrub is one of the most valuable we possess, flowering as it does from late June until after the autumn frosts come. It make a charming picture planted in large patches, either of one sort, or more mixed. It may be propagated by seed, and its varieties by cuttings. Closely allied to *Erica*, it differs in the corolla not being persistent. The plants are better if pruned over in early spring, so as to remove the old flower-spikes and part of the previous year's shoots. This tends to keep them closer in habit and more effective in blossom. It likes a peaty soil or a light, sandy loam, free from lime, with which leaf-mould has been mixed.

DANAË LAURUS, *Medicus.* ALEXANDRIAN LAUREL.

LILIACEÆ.

(*D. racemosa*, *Moench*; *Ruscus racemosus*, *Linnaeus.*)

An elegant evergreen shrub, 2 to 4 ft. high, with green, slender, erect or spreading, semi-woody stems, once-branched and quite smooth. "Leaves" alternate, oblong-lanceolate, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{4}$ to $1\frac{1}{2}$ ins. wide; bright green on both surfaces, taper-pointed, abruptly narrowed at the base but scarcely stalked. Flowers greenish yellow, small, bisexual,

produced four to six together at the end of the branches each on a stalk, $\frac{1}{8}$ in. long. Fruit a berry, $\frac{1}{4}$ in. across, red, with a pale, saucer-shaped disk at the base.

Native of S. Europe and Asia Minor; introduced in 1713. This pretty evergreen with a rather bamboo-like habit, is closely allied to the butcher's broom (*Ruscus*), and was once placed in the same genus. It is, however, quite distinct in its terminal inflorescence, bisexual flowers, and unarmed "leaves." The so-called "leaves," as in *Ruscus*, are really flattened branches (cladodes), but perfectly resemble leaves, and perform the same functions. The sprays are valuable for winter cutting, and placed in vases in association with flowers, remained fresh a long time, and very pleasing in their cheerful, polished green. The plant thrives well in semi-shaded spots in moist soil. Its fruits are not borne regularly with us, but seeds can be purchased from seedsmen. Failing them, it is easily increased by division in spring.

DAPHNE. THYMELÆACEÆ.

A genus of small, beautiful, mostly fragrant-flowered shrubs, both evergreen and deciduous; with tough, flexible bark and young wood. Leaves alternate, except in *D. Genkwa*, never toothed or divided, and with little or no stalk. Flowers very like those of a lilac, in having a tubular base, expanding at the mouth into four spreading lobes. (There is only one floral envelope, and it is usually called the "calyx" or "perianth.") They are produced in terminal heads or axillary clusters. Stamens eight, in two rows of four. Fruit berry-like, one-seeded. The outside of the flower is frequently hairy, the inside frosted or glistening. Most of the cultivated *Daphnes* are European, and are found on a limestone formation, but a few are Asiatic. None is found in N. America, but *D. palustris* of the eastern United States is a near ally.

Whilst some of the *Daphnes* are easy to cultivate, others are found by many growers and in many places to be difficult to establish. Most of the European species prefer to grow where lime is present; they also like good drainage combined with abundant moisture. *D. Laureola* and *pontica* grow well in semi-shaded spots, and lime is not a necessity for them. Nor is it necessary for *D. odora*, *Dauphinii*, or *retusa*. I have not observed that a wholly peaty soil, recommended by many writers, is good for *Daphnes*. A soil of good sandy loam with lime rubble mixed is more likely to suit the majority. In places like the Thames Valley, where there are frequently hot dry spells during the summer, small boulders of limestone are useful laid over the roots to conserve moisture. The majority like abundant sunshine, whilst they abhor dryness at the root. The rock garden affords an admirable site for all the dwarfier species. All or nearly all transplant badly, and should be given permanent places early.

The *odora* group can be increased most readily by cuttings; *D. Blagayana* and *D. Cneorum* by layering; *D. Mezereum*, *D. pontica*, *D. Laureola*, and *D. alpina* come freely from seed. For the rest grafting

is usually resorted to, and generally seedlings of *Mezereum* for the deciduous ones and seedlings of *Laureola* for the evergreen ones are employed. It has, however, to be admitted that many of the *Daphnes* are still untamed wildings. In some places a few species find the conditions so suitable that they thrive without any special care. But I know of no place where the cultivation of all the *Daphnes*, or even the hardier ones, has been satisfactorily achieved. It is quite possible also that, like many shrubs that flower with the same profusion, they are naturally short-lived.

D. ALPINA, Linnæus.

A dwarf, deciduous shrub, 6 to 18 ins. high, with short, erect, downy twigs. Leaves oblanceolate, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; often crowded towards the end of the shoot, grey-green, downy on both sides. Flowers white, fragrant, produced during May and June in terminal clusters of six to ten, the cylindrical, slender tube $\frac{1}{2}$ in. long, downy outside; the four lobes lanceolate, pointed; fruit yellowish red.

Native of the European Alps; introduced in 1759. Suitable for the rock garden, especially in association with limestone, on which formation it is always found. A neat plant of no great beauty, but pleasing for its fragrance.

D. ALTAICA, Pallas

(Bot. Mag., t. 1875.)

A low, deciduous shrub with smooth shoots and leaves, the latter oblanceolate or narrowly oblong, pointed, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide, smooth. Flowers only slightly scented, usually about five or six in a terminal cluster; white, $\frac{1}{2}$ in. diameter, downy outside; perianth segments reflexed; ovary smooth; fruit red.

Native of the Altai Mountains; discovered about 1780. It is closely allied to *D. caucasica*, but is considered to differ in having a looser, less silky down on the corolla-tube. As represented in cultivation, *D. altaica* has larger, more pointed leaves, fewer flowers on an average in the cluster, and does not produce a crowd of short flowering twigs from the previous year's shoot, as does *D. caucasica*. The two, however, are probably geographical forms of the one species, to which the shrub grown as *D. SOPHIA* also belongs. Distinguished from *D. alpina* by its smooth leaves.

D. BLAGAYANA, Freyer.

(Bot. Mag., t. 7579; Garden, 1878, t. 143.)

A dwarf, evergreen shrub of spreading habit, rarely more than 1 ft. high. Leaves stalkless, aggregated in a tuft at the end of the twig, narrowly obovate, tapered towards the base, rounded at the apex; 1 to $1\frac{3}{4}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; smooth on both surfaces. Flowers creamy white, very fragrant, produced in March and April, crowded in a head of twenty to thirty blossoms at the end of the twig and about 2 ins. across, consisting of several umbels, subtended by thin, greenish, silky bracts. Flowers $\frac{1}{2}$ in. diameter; the lobes broadly ovate, $\frac{1}{4}$ in. long; the tube $\frac{5}{8}$ to $\frac{3}{4}$ in. long, slenderly cylindrical, slightly silky. Fruit pinkish white, rarely seen in cultivation.

Native of the mountains of E. Europe, discovered by Count Blagay in 1837; introduced about 1875. This beautiful and sweet-scented *Daphne* has perhaps nowhere been so successfully cultivated as in the Glasnevin Botanic

Gardens. It is there planted on low mounds composed of stones and loam from a granite district. The secret of success appears to be in the continuous layering of the shoots. As soon as the young growths are an inch or so long, the previous summer's branches are weighed down to the ground by placing stones on them. A little soil may come between. By this system the whole plant is always renewing its root system at the younger parts. At Glasnevin I have seen a patch 8 ft. across, in the rudest health. This system is, no doubt, helped by the moist, equable climate of Dublin. As this shrub is found on calcareous rock, stones of the same character would appear to be preferable for layering, but Sir F. Moore tells me he does not consider this *Daphne* needs lime. He recommends good loam or peat and leaf-soil, and partial shade.

D. CAUCASICA, *Pallas.*

(Bot. Mag., t. 7388; *D. salicifolia*, *Lamarck.*)

A deciduous shrub, up to 4 ft. high, with flowering twigs downy; barren young twigs less so, or smooth. Leaves produced along the entire shoot, oblanceolate, tapered at the base and oftener rounded than tapered at the apex; 1 to $1\frac{1}{4}$ ins. long, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide; smooth, pale green above, somewhat glaucous beneath. Flowers glistening white, fragrant, produced during May and June in terminal heads of usually four to twelve blossoms; the perianth $\frac{1}{3}$ in. across, with ovate lobes; tubes $\frac{1}{3}$ in. long, cylindrical, silky outside; ovary slightly downy.

Native of the Caucasus; many times introduced and lost. It has no great merit, but is pleasing in its fragrance and for its abundant flower clusters borne at the end of crowded, short, leafy shoots springing from the previous year's growth. It thrives exceedingly well at Warley Place, where there are rounded bushes 4 ft. high. It differs from *D. alpina* in its smooth leaves.

D. CNEORUM, *Linnaeus.* GARLAND FLOWER.

(Bot. Mag., t. 313.)

An evergreen trailing shrub, producing a great number of long, slender, minutely downy branches, densely clothed with leaves, and forming a low, spreading mass under 1 ft. high. Leaves oblanceolate, with a tapering base and broadly wedge-shaped apex, ending in a minute bristle-like tip; $\frac{3}{4}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide; dark green above, greyish beneath, smooth. Flowers crowded in a dense terminal cluster, numerous, scarcely stalked; they are fragrant and rich rosy pink, the tube $\frac{3}{8}$ in. long, very downy outside, the expanded part $\frac{3}{8}$ in. across, with ovate-oblong lobes. Blossoms in May.

Native of Central and S. Europe; introduced in 1752. This *Daphne* is the best and most useful of the evergreen species, from all the rest of which grown in gardens it is distinguished by its lax, prostrate habit. It flowers with remarkable freedom, the leaves being almost entirely hidden by bloom. It likes a permanently moist bottom, and apparently thrives well in calcareous soil. Some of the healthiest plants I have seen in the London district were (some years ago) in one of the plots under the control of the London County Council on Plumstead Common, Kent. This place is on a limestone formation, and is perhaps 200 ft. above the Thames. The plants had, apparently, treatment similar to that meted out to privets and such-like, but were in rude health. At the same time it succeeds splendidly in the R.H.S. gardens at Wisley, where the soil is a sandy peat. It is a good plan to layer the outer shoots by placing stones on them, as recommended for *D. Blagayana*.

Var. *VERLOTI*, *Meissner* (*D. Verloti*, *Grenier*).—A distinct variety. Leaves up to 1 in. long, but rarely more than $\frac{1}{2}$ in. wide; the flowers less numerous

and less densely packed in the head ; the perianth tube as much as $\frac{5}{8}$ in. long. Native of the Dauphiny and Bavarian Alps.

A variety with white flowers has been found in the Jura Mountains. The so-called "var. major" appears to have no standing.

Nearly allied to, and sometimes confused in gardens with, *D. Cneorum* is *D. STRIATA*, *Trattinick*, a native of the European Alps. It is, however, easily recognised by the striated, smooth tube of the flower (that of *Cneorum* being very downy), and by the smooth young shoots. The leaves, arrangement of flowers, etc., are about the same as in *D. Cneorum*. Flowers deep rose. *D. striata* is very rare in gardens.

D. COLLINA, *Smith*.

An evergreen bush, 2 to 3 ft. high, of bushy habit ; young shoots silky hairy. Leaves obovate, tapered at the base, mostly rounded or blunt at the apex ; $\frac{3}{4}$ to $1\frac{3}{4}$ ins. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide ; dark glossy green above, pale and very hairy beneath. Flowers fragrant, purplish rose, produced in a terminal head of ten to fifteen blossoms ; they are $\frac{1}{2}$ in. across, and felted with silky hairs outside ; lobes roundish ovate.

Native of Italy, Crete, Asia Minor ; introduced in 1752. It is not very often seen in cultivation, and usually under the name of *D. sericea*, which is a very closely allied species with tapering pointed leaves, and young shoots soon becoming smooth. Neither of the two is very hardy.

D. DAUPHINII, *Hort*.

(*D. hybrida*, *Lindley*, *Bot. Reg.*, t. 1177.)

This is an evergreen shrub with very much the aspect of *D. odora*, between which and *D. collina* it is supposed to be a hybrid. Its leaves are narrowly oval, 1 to 3 ins. long, glossy green above, quite smooth. Flowers in a terminal cluster, very fragrant, about the size of those of *odora* and of a similar colour (reddish purple), but readily distinguished from those of that species by the hairiness of the tube outside, also of the lobes. This character it inherits from *D. collina*. This hybrid *Daphne* is somewhat hardier than *D. odora*, but is not really happy out-of-doors near London, needing at least winter shelter there. It is essentially a south and west country evergreen. Propagated by cuttings.

D. GENKWA, *Siebold*.

A deciduous shrub, probably 3 or 4 ft. high, the erect, slender, sparsely branched shoots covered with silky hairs when young. Leaves oval-lanceolate, from 1 to 2 ins. long, $\frac{1}{3}$ to $\frac{5}{8}$ in. wide ; pointed, silky hairy beneath, short-stalked ; mostly opposite, occasionally alternate. Flowers lilac-coloured, produced during May at the joints of the naked wood of the previous year in stalked clusters, the stalks up to $\frac{1}{2}$ in. long, silky. There are from three to seven flowers in each cluster, the tube $\frac{1}{3}$ to $\frac{1}{2}$ in. long, slender, silky hairy outside, the expanded portion $\frac{1}{2}$ in. across.

Introduced from China by Fortune in 1843, and later from Japan, where it has long been cultivated but is not native. Unfortunately it is too tender for all but the mildest parts, and is short-lived in cultivation. The flower is very like that of a common lilac in form and colour, and when the shoots are well furnished with them the plant is a beautiful object. Shoots $1\frac{1}{2}$ ft. long are sometimes made in a season, the upper two-thirds of which will be covered with blossom. These long, slender wands of blossom, the

comparatively long-stalked clusters, and especially the opposite leaves, make this *Daphne* very distinct. It is said to require a soil devoid of chalky substances, but its treatment is little understood.

D. HOUTTEANA, *Lindley*. PURPLE-LEAVED DAPHNE.

(*D. Laureola* var. *purpurea*, *Hort.*; *D. Mezereum atropurpurea*, *Dippel*.)

There seems to be little doubt that this is a hybrid between *D. Mezereum* and *D. Laureola*. It was first described and figured by Louis Van Houtte, in the *Flore des Serres*, t. 592, in 1851, but he did not know its origin or even venture to give it a name. He alludes to it as "*D. Mezereum foliis atropurpureis* of several gardens." It has since been mostly called *D. Laureola* var. *purpurea*, but is distinct from both species.

A partially evergreen shrub, 2 to 4 ft. high, with stiff, erect branches. Leaves usually crowded towards the tip of the shoot, and resembling those of *D. Laureola* in size, shape, and texture, but of a dark purplish tinge. Flowers pale lilac, produced two to five together in short-stalked clusters. At the time of flowering (April) there usually remain a few purple leaves of the preceding summer's growth. It is from the axils of these and the buds beneath them that the flowers are borne:

D. JAPONICA, *Siebold*.

(*D. Mazeli*, *Carrière*; *D. odora* var. *Mazeli*, *Hemsley*.)

An evergreen shrub nearly allied to *D. odora*, and of the same size and aspect. The foliage, too, is similar, and the flowers of the same shape, size, and fragrance, but instead of being borne exclusively in terminal clusters, the flowers are also produced on short-stalked clusters from the leaf-axils along the branches; they are pink outside, whitish within. This *Daphne* is somewhat harder than *D. odora*, but requires winter protection near London. It commences to bloom in November and lasts through the winter.

Native of Japan, whence it was introduced about 1866. Now very rare in gardens. It was figured in the *Garden* for Nov. 16, 1878.

D. LAUREOLA, *Linnaeus*. SPURGE LAUREL.

An evergreen shrub of bushy habit, 2 to 4 ft. high, devoid of down in all its parts. Leaves oblanceolate, tapered gradually to the base, more abruptly to the point; from $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; dark lustrous green, and of thick, firm texture. Flowers yellowish green, with no odour, produced during February and March; they are borne in clusters of three to eight blossoms, each cluster on a common stalk about $\frac{1}{2}$ in. long, springing from the axils of the uppermost leaves of the preceding year's growth. Flowers $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. diameter. Fruit ovoid, bluish black when ripe.

Native of S. and W. Europe, including England. Like *D. pontica*, it prefers a moist soil and semi-shade, and is useful in association with woodland, chiefly for its shining evergreen foliage, for the flowers have neither fragrance nor bright colour to recommend them. *D. pontica* differs in having larger, mostly twin flowers produced at the base of the new shoots six or eight weeks later, and thinner leaves.

Var. *PHILIPPI*, *Grenier*.—A dwarf, densely bushy shrub with sturdy, short shoots. Leaves closer and more densely arranged on the shoot than in the type; obovate, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{3}$ to $\frac{3}{4}$ in. wide, dark glossy green. Flowers smaller than in the type. Native of the Pyrenees.

D. MEZEREUM. *Linnaeus*. MEZEREON.

A deciduous, erect-branched shrub, ultimately 3 to 5 ft. high and as much through, usually tapering to a naked base; young shoots covered with small flattened hairs. Leaves oblanceolate, tapering at the base to a short stalk, rounded or pointed at the apex; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; dull rather grey green, especially beneath; smooth. Flowers purplish red, very fragrant, produced from the buds of the leafless twigs in February and March; clustered closely on the branches in twos and threes. Each flower is $\frac{1}{2}$ in. across, the four segments of the perianth ovate; the tube $\frac{1}{4}$ in. long, slender, downy. Berries globose, $\frac{1}{8}$ in. diameter, red.

Native of Europe and Siberia; found apparently wild, though sparsely so in Britain. This is one of the earliest and most attractive of our spring-flowering shrubs, and a healthy specimen with its erect, cylindrical masses of blossom is precious for both its rich colour and its exquisite fragrance. It is also beautiful with fruit in autumn. In many places it is not easy to grow, and is apt to die off suddenly without any apparent cause. I think it loves cool, moist conditions, and is liable to exhaustion through excessive seed-bearing. In the summer of 1910 I saw it naturalised in a wood just above the Falls of Niagara, on the Canadian side, very damp, and traversed by a multitude of streams making their way to the river.



DAPHNE NEAPOLITANA.

Var. ALBA, *Aiton*.—Flowers dullish white; fruits bright yellow. This variety comes true from seed, and is somewhat more robust than the red-flowered type. A form with purer white blossoms is known as "Paul's white." There is also a form with double white flowers.—var. FLORE ALBO PLENO.

Var. GRANDIFLORA, *Dippel* (*D. autumnalis*, *Hort.*).—Commences to flower in October and lasts until February. The flowers are rather larger than in the type, and equally richly coloured and fragrant. As it does not bear fruit usually, it is grafted on the type, which is readily propagated by seeds.

D. NEAPOLITANA, *Loddiges*.

(*D. Fioniana*, *Hort.*; *D. Delahayana*, *Hort.*)

A dense, erect-branched shrub, 2 to 3 ft. high, of bushy habit, and evergreen; shoots dark brown, with minute forward-pointing hairs. Leaves short-

stalked, scattered along the branches, oblanceolate or narrowly obovate, rounded or obtusely angled at the apex; $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; dark glossy green and smooth above, glaucous and more or less hairy towards the base beneath. Flowers in one or more leafy clusters at the apex of the branches, from ten to fourteen flowers in a cluster, opening successively from March to May, and even later; at first they are rosy purple, but turn pale with age, sweetly scented, $\frac{1}{8}$ in. long and wide, covered outside with minute whitish down. Fruit not seen.

This *Daphne*, which is one of the most robust and easiest to cultivate of a difficult class of plants, would appear to be a hybrid of natural origin. Lindley, who gave an excellent figure of it in *Bot. Reg.*, t. 820, called it *D. collina* var. *neapolitana*. The general opinion now held is that it is a hybrid; its parentage is usually given as *collina* $\times$ *Cneorum*, but I should rather judge it to be *oleoides* $\times$ *Cneorum*. It is grown in gardens under a variety of names, often as *D. oleoides*. One of the most useful of *Daphnes*, and fond of lime in the soil.

D. ODORA, *Thunberg.*

(*D. japonica*, *Paxton* not *Siebold.*)

An evergreen shrub, 4 to 6 ft. high, with smooth, round, dark branches. Leaves narrowly oval, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide; pointed and tapered about equally at both ends, dark green, quite smooth on both surfaces. Flowers red-purple, very fragrant, produced densely in a terminal head; each flower $\frac{1}{2}$ in. long, $\frac{3}{8}$ in. across; the tube not downy, rich purple; the four lobes paler, spreading, ovate. Flower-stalks very short, hairy.

Native of China and Japan; introduced from the latter country in 1771; hardy in the southern and western counties, but surviving mild winters only near London. In Devon, Cornwall, and Isle of Wight there are beautiful bushes of this *Daphne* in the open air, which commence to flower in mid-winter and remain so until spring. It is one of the most deliciously fragrant of evergreens.

Var. *ALBA* has white flowers.

Var. *VARIEGATA* has the leaves margined with yellow.

This species does not need a calcareous soil, and can be increased by layers or cuttings, the latter made of moderately ripened shoots in July. On its own roots this *Daphne* is not difficult to cultivate, but in the greater part of Britain it must be regarded as a greenhouse plant. Often wrongly called *D. indica* in gardens.

D. OLEOIDES, *Schreber.*

An evergreen shrub, 2 to 3 ft. high; branches leafy, erect, covered when young with close, dark grey down. Leaves somewhat leathery, stalkless, oblanceolate, tapering at the base, pointed at the apex; $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, about $\frac{1}{4}$ in. wide, dull green above; silky beneath when young, becoming nearly smooth with age, rather glaucous; midrib prominent, terminating in a bristle-like tip. Flowers in a terminal cluster of three to eight blossoms, which are about $\frac{1}{2}$ in. long, stalkless, silky hairy outside, varying in colour from purplish rose to tinted white. Fruit red.

Native of S. Europe, reaching from Spain to Asia Minor and N. Africa. It is allied to *D. collina*, but is scarcely so ornamental; it differs in the more distinctly and uniformly pointed leaves, which are not so markedly downy beneath. In gardens the plant grown as *D. oleoides* is usually *D. neapolitana* (*g.v.*). The true thing is rare, and not so pretty or good a garden plant.

D. PETRÆA, Leybold.(D. rupestris, *Facchini*.)

A tiny evergreen shrub, 3 to 5 ins. high, forming a low tuft of gnarled twigs. Leaves crowded, hard and leathery, narrowly obovate or oblong, tapered towards the base, obtusely pointed or rounded at the tip, thickened at the margins, and triangular in section; $\frac{1}{4}$ to $\frac{1}{2}$ in. long, $\frac{1}{8}$ to $\frac{1}{12}$ in. wide; not stalked, dark green. Flowers rich glowing pink, fragrant, produced in June in terminal clusters of about four blossoms, the tube of the flower is slenderly cylindrical and covered with fine down; across the spreading oval lobes the flower is $\frac{1}{4}$ to $\frac{1}{3}$ in. in diameter.

Native of the Southern Tyrol, and one of the most delightful of all Alpine shrubs. It grows naturally in positions fully exposed to the sun's rays, often in crevices of perpendicular rock. The most successful cultivator of this *Daphne* is Mr Reginald Farrer, who used to show little bushes grown in pots at the Temple Show in London almost covered with blossom. It is said to prefer a chalky soil, well drained and permanently moist, but in full sunshine.

D. PONTICA, Linnæus.

(Bot. Mag., t. 1282.)

An evergreen shrub about 3 ft. high, naked and tapering to a single stem at the base, spreading at the top; branchlets and leaves smooth. Leaves obovate, 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; stalkless, tapered to the base, more abruptly so to the pointed apex, glossy green. Flowers yellowish green, fragrant, borne during April

in pairs from the axils of bracts at the base of the new shoots, the whole forming a dense mass of blossom crowned by the tips of the pushing young



DAPHNE PONTICA.

twigs. Perianth tube $\frac{1}{2}$ in. long, slender; lobes narrow, pointed, recurved, Flower-stalk about $\frac{1}{2}$ in. long, forking near the top.

Native of Asia Minor; introduced in 1752. Although the flowers of this *Daphne* have no bright colour, they are fragrant and profuse, and the shrub is a cheerful evergreen. It likes a moist, loamy, or peaty soil in a sheltered, partially shaded spot. Useful for grouping near woodland walks.

D. RETUSA, *Hemsl.*

(Bot. Mag., t. 8430; *D. tangutica*, *Maximowicz.*)

A low, densely branched, evergreen shrub, of close, neat, sturdy habit; young shoots hairy. Leaves leathery, thick, densely arranged towards the



DAPHNE RETUSA.

end of the twig; oval inclined to obovate; 1 to 2 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide; stalkless, the base tapered, the apex rounded and notched, margin revolute; dark glossy green, smooth. Flowers produced during early May in a crowded cluster 3 ins. across terminating the branch, each flower borne on a short, conspicuously brown-felted stalk; perianth tube smooth, $\frac{5}{8}$ in. long; rosy purple outside; glistening white, tinged with purple inside; lobes ovate, $\frac{1}{2}$ in. long. Fruit bright red.

Native of W. China; discovered by Mr A. E. Pratt near Tachien-lu, at 13,500 ft. elevation. Introduced from the same spot by Wilson in 1901. I saw this delightful little bush flowering in the Coombe Wood nursery in April 1909, and it was exquisitely fragrant, like lilac. The plant is of compact habit, and will probably not grow much more than 1 to 2 ft. high. It is apparently very hardy, and if it can be propagated in sufficient

quantity will make a valuable addition to cultivated *Daphnes*. It has some affinity with *D. odora*, but is easily distinguished by its thick, much smaller notched leaves, and the shaggy young shoots and flower-stalks.

DAPHNIPHYLLUM. EUPHORBIACEÆ.

The two shrubs cultivated in gardens belonging to this genus are handsome, robust evergreens, with alternate, stout-textured rhodo-

dendron-like leaves. Flowers unisexual, with the sexes on separate plants, of no beauty. The males have no petals, very small sepals, but curious, large, stout anthers. Fruit a roundish or oval drupe. The two following shrubs will grow in any good soil, and are useful for moist, shady positions. Propagated by cuttings made of moderately ripened wood in July, and placed in gentle bottom heat.

D. HUMILE, Maximowicz.

(*D. jezoënsis, Hort.*)

A low, much branched, evergreen bush, apparently $1\frac{1}{2}$ to 2 ft. high, but much more in width; quite smooth in all its parts. Leaves oval or slightly obovate; 2 to 5 ins. long, $\frac{3}{4}$ to 2 ins. wide; tapered at both ends; dark shining green above, with a glaucous bloom beneath; stalk $\frac{3}{8}$ to $\frac{5}{8}$ in. long. Flowers not seen. Fruit blue-black, according to wild specimens.

Native of Yezo, Japan, where, according to Sargent, it is a common under-shrub in the deciduous forests; introduced by Maries for Messrs Veitch about 1879. It is very distinct, in habit from *D. macropodum*; plants at Kew twenty years old are still less than 2 ft. high, but 4 or 5 ft. in diameter. It does not dislike moderate shade, and would make a useful, low, evergreen cover where such is required without the annual cropping that shrubs like laurels and rhododendrons need. It has been known in gardens, as *D. jezoënsis*, and also considered a variety of *D. macropodum*, but I am unable to distinguish it from Maximowicz's specimen of *D. humile* preserved at Kew; and that is the only species recorded from the Island of Yezo.

D. MACROPODUM, Miquel.

An evergreen shrub of bushy, rounded form, at present 8 to 12 ft. high in this country, and as much or more in diameter; young shoots smooth, glaucous, often reddish. Leaves rhododendron-like, 3 to 8 ins. long, 1 to $3\frac{1}{2}$ ins. wide; oblong or narrowly oval, taper-pointed at the apex, wedge-shaped at the base, quite smooth; dark green above, glaucous beneath; stalk 1 to $1\frac{1}{2}$ ins. long, stout, often red like the midrib. Flowers small and inconspicuous, pale green, with a strong pungent odour; produced during late spring from the leaf-axils of the previous year's growth in racemes 1 in. long; bracts and stamens pink. Fruit blue-black, pea-shaped.

Native of Japan; introduced by Maries for Messrs Veitch in 1879. A handsome and vigorous evergreen, becoming in Japan, and perhaps in this country, eventually a small tree. It is quite hardy, having withstood 30° of frost at Kew, but nevertheless likes shelter. The red colouring of the leaf-stalks, midribs, and young wood adds to its beauty, but is not always present.

Var. *VARIEGATA*.—Leaves with a broad, irregular margin (sometimes reaching to the midrib) of creamy white; not so hardy as the type.

DAVIDIA INVOLUCRATA, *Baillon.* CORNACEÆ.

(*Bot. Mag., t. 8432.*)

A deciduous tree reaching a height of 40 to 65 ft. in a wild state, in habit resembling a lime tree (*Tilia*); young branches covered more or less with a glaucous bloom, afterwards turning very dark. Leaves vivid green, broadly ovate or roundish, 3 to 6 ins. long, and about three-fourths

as wide, heart-shaped at the base, the apex drawn out into a long fine point; margins set with coarse triangular teeth; upper surface furnished with silky hairs, the lower one felted with a thick grey down; stalks slender, $1\frac{1}{2}$ to 3 ins. long. About eight pairs of nearly parallel veins proceed from the midrib at an angle of 45° . Flowers produced in May with the strongly scented young leaves from the buds of the previous year's shoots; they are crowded in a rounded head about $\frac{3}{4}$ in. diameter, borne at the end of a drooping stalk about 3 ins. long; their only conspicuous features are the long red or white stamens forming a brush-like mass, and an egg-shaped ovary, with a short six-rayed style and a ring of abortive stamens at the top. It is not, however, in the flowers themselves where the remarkable beauty of the *Davidia* lies, but in two (rarely three) enormous bracts by which each flower-head is subtended. These bracts are white or creamy white, hooded, oblong, long-pointed, and of unequal size, the lower one being the larger, and sometimes nearly



DAVIDIA INVOLUCRATA.

6 ins. long and half as wide; the upper bract is about half the size, and stands above the flower-head like a canopy. Fruit solitary, pear-shaped, about $1\frac{1}{2}$ ins. long and 1 in. wide, green with a purplish bloom, containing one hard, ridged nut.

Native of Central and W. China; first discovered near Moupin in 1869, by the Abbé David, after whom the genus is named, but not introduced to Europe until 1897, when a parcel of thirty-seven seeds was sent to Mr Maurice de Vilmorin by Père Farges. Of this sending only one seed germinated, and that not until June 1899. The plant grew and flourished, flowering for the first time at Les Barres in May 1906. This plant and a few cuttings from it were the only representatives of *Davidia* in Europe until Wilson's first journey in China for Messrs Veitch, 1899-1902, during which several thousands of seeds were sent home. These germinated well, and the abundant representation of *Davidia* in European gardens became assured. So far as can at present be judged, the *Davidia* is absolutely hardy. It starts into growth late, and ripens its shoots in autumn up to the tip—two valuable attributes in regard to hardiness

The winter of 1908-9, which was the severest since its introduction, and injured many reputedly hardy plants, did not affect the *Davidia* to the extent of a single bud. It appears to thrive best in a loamy soil, and loves abundant moisture. It can be propagated by cuttings made of short side twigs when the wood is becoming firm.

As a garden tree the *Davidia* is one of great promise. It stands quite apart in its distinct beauty from all other trees that can be grown in this country. Mr Wilson has many times told me of the wonderful aspect of the tree as seen in its native wilds, laden from top to bottom with enormous white bracts. It flowered at Coombe Wood in May 1911, and from a spray of the tree the accompanying figure was made. The leaves were farther advanced than is usual with the tree when in bloom at home. *Davidia* stands much apart in the vegetable kingdom; its nearest ally is considered to be *Nyssa*.

There remains to be considered the question as to whether there be one or more species of *Davidia*. The original tree discovered by David had leaves as described above, viz., white-felted beneath. But the trees introduced by Farges, and later by Wilson, have leaves almost or quite smooth, and they differ from each other in one having leaves glaucous beneath, the other yellowish green beneath. On the strength of these differences Mr L. A. Dode of Paris has founded two additional species:—

1. *D. involucrata*, *Baillon*.—Leaves whitish, felted beneath (the original type discovered by David).
2. *D. Vilmoriniana*, *Dode*.—Leaves smooth and glaucous beneath (this is the single tree raised by Mr de Vilmorin from Farges' seed).
3. *D. læta*, *Dode*.—Leaves smooth and yellowish green beneath. (To this belongs the great number of plants raised by Messrs Veitch from Wilson's first seeds; as stated above, it flowered at Coombe Wood in May 1911—the stamens white, with black anthers.)

Whether the distinctions on which Mr Dode's species are founded will prove to be permanent or not remains to be seen. I do not think that the differences between Nos. 2 and 3 are sufficient to constitute a species; but those between that pair and the original *D. involucrata* of David's finding are certainly very marked. Mr Wilson believes the hairy- and the smooth-leaved trees to be separate and distinct, and he considers the former to be the more handsome. He tells me he found them growing commingled—so they are not geographical varieties. During his second journey for Messrs Veitch in China (1903-5), he sent home seeds from the hairy-leaved tree (the true *D. involucrata*) gathered by his own hand, but it is a curious fact that the young trees raised from them at Coombe Wood at first showed very little of the hairy character of their parent, but they are becoming conspicuously hairy now. If they should prove eventually to be distinct, then:—

D. involucrata (true) will have been first introduced by Wilson in 1905; and

D. Vilmoriniana by Farges in 1897. *D. læta* need not be considered of much importance as apart from *Vilmoriniana*, but it was introduced by Wilson in 1901.

DECAISNEA FARGESII, *Franchet.* BERBERIDACEÆ.

(Bot. Mag., t., 7848.)

Two remarkable Asiatic shrubs constitute the genus *Decaisnea*, which is allied to *Lardizabala*, and is dedicated to Joseph Decaisne. *D. Fargesii* is deciduous, 7 to 10 ft. high, consisting of a cluster of erect stems containing abundant pith and distinct in winter for their large, pointed buds; young shoots smooth, thick. Leaves pinnate, from 2 to 3 ft. long; consisting of from $6\frac{1}{2}$ to $12\frac{1}{2}$ pairs of leaflets. Leaflets ovate, slender-pointed, entire, 3 to 6 ins. long, glaucous beneath, smooth or nearly so; main-stalk often purplish brown. Flowers produced in a loose drooping panicle 12 to 18 ins. long terminating the young growths. Each flower is borne on a slender stalk $\frac{3}{4}$ in. long, the six sepals (petals absent) being erect, narrow lanceolate, finely pointed, 1 to $1\frac{1}{4}$ ins. long; yellowish green, the upper half curving outwards. Fruit dull blue, cylindrical, 3 to 4 ins. long, $\frac{3}{4}$ in. wide, with numerous tiny warts on the surface.

This interesting and striking shrub is a native of the mountains of W. China, where it was collected and sent to France by the missionary, Père Farges, in 1895. Two years later it was sent by Mr Maurice de Vilmorin to Kew, where it has proved quite hardy, and where it flowers and produces fruit regularly, but is subject to injury by late spring frosts. It is a handsome foliage plant. It likes a rich loamy soil, and is propagated by seeds. From *D. insignis*, a native of the Himalaya and probably not hardy, it is quite distinct in its blue fruits, those of *D. insignis* being golden yellow. In foliage and flower they are much alike.

DECUMARIA BARBARA, *Linnæus.* SAXIFRAGACEÆ.

(Gardeners' Chronicle, Oct. 9, 1909—supplement.)

A climbing, deciduous shrub ascending the trunks of trees in a wild state; stems round, slightly downy when young, forming aerial roots like an ivy; buds hairy. Leaves opposite, oval or ovate, tapering at both ends, short-pointed; 3 to 5 ins. long, $1\frac{1}{2}$ to 3 ins. wide; quite smooth on both surfaces, or slightly hairy beneath when young, shallowly toothed towards the apex, often entire; stalk 1 to 2 ins. long. Flowers white, produced in June and July in an erect terminal corymb 2 to 3 ins. long and wide. The individual flower is small, $\frac{1}{4}$ in. across, with seven to ten narrow oblong petals, alternating with a similar number of calyx teeth; stamens twenty to thirty. Fruit urn-shaped, $\frac{1}{3}$ in. long, the lower part prettily striped with numerous whitish ridges, upper part smooth, tapering.

Native of the south-eastern United States; introduced in 1785, but an uncommon plant in gardens owing to its tenderness. It thrives in the south-western counties of England and Ireland, but elsewhere should be grown on a sheltered wall. It can be increased by cuttings of firm shoots. Its nearest allies are the climbing *Hydrangeas* and *Schizophragmas*, from

which it is quite distinct in the always perfect flowers, and more numerous petals and stamens.

D. SINENSIS, *Oliver*, discovered by Henry on the cliffs of the Yangtze-Kiang gorge, near Ichang, China, has smaller obovate leaves and waxy white fragrant flowers. Recently brought into cultivation, but may not be hardy.

DENDROMECON RIGIDUM, *Bentham*. PAPAVERACEÆ.

(Bot. Mag., t. 5134.)

A shrub from 2 to 10 ft. high in a wild state; the branchlets half-woody, slender, smooth, glaucous. Leaves thickish, ovate or narrow lanceolate, pointed, 1 to 3 ins. long, glaucous, nearly or quite stalkless. Flowers poppy-like, bright yellow, 2 to 3 ins. diameter, borne singly on stalks $1\frac{1}{2}$ to 3 ins. long, fragrant. Petals four; calyx of two sepals; stamens numerous.

Native of California, where it was discovered by David Douglas on dry rocky hills. First introduced by W. Lobb about 1854, this beautiful plant has from time to time disappeared and been reintroduced. It is undoubtedly tender, but thrives at Kew at the foot of a sunny wall until a winter like that of 1908-9 kills it. It is allied to *Romneya*, but differs in the entire leaves and yellow flowers. It needs the sunniest position available, and the soil should be of a loamy character, lightened by the addition of sand, and especially mortar rubble, well drained. Propagated by cuttings made of well-ripened, firm summer shoots; the cuttings should consist of three joints, and be placed singly in small "thumb" pots in moderate heat in very sandy soil. A plant in the garden of Capt. Riall at Old Conna Hill, near Bray, in Ireland, covers a wall to the height of 12 ft. Its main stem is 6 ins. thick, and the plant is always more or less in bloom.

DESFONTAINEA SPINOSA, *Ruiz and Pavon*. LOGANIACEÆ.

(Bot. Mag., t. 4781.)

An evergreen shrub, 10 ft. or more high in favourable localities, branches covered with pale, smooth, shining bark. Leaves very like those of a holly, but opposite; 1 to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; oval or ovate in the main, but armed at the edges with sharp triangular spines $\frac{1}{8}$ to $\frac{1}{3}$ in. long; shining dark green, smooth; stalk $\frac{1}{3}$ in. long. Flowers solitary on stalks $\frac{1}{3}$ to $\frac{1}{2}$ in. long, produced from July until late autumn. Corolla funnel-shaped, $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. wide at the mouth, crimson scarlet, with five rounded, yellow, shallow lobes; calyx green, with five oblong lobes $\frac{1}{3}$ in. long, edged with hairs; anthers five, with scarcely any stalk, attached at the base of the corolla lobes.

Native of Chili, Peru, etc.; introduced by W. Lobb about 1843. It is not hardy near London, but appears to find its most congenial conditions in the west of Scotland, thriving also in other places on our western seaboard, and in Ireland. It bears fruit about the size of a cherry, containing numerous small black seeds, which afford the best

means of increase. Few shrubs produce a more gorgeous display than this when laden with scarlet and yellow flowers.

DESMODIUM TILIÆFOLIUM, *Don.* LEGUMINOSÆ.

A semi-woody plant, which sends up annually from a woody root-stock a number of erect stems 2 to 4 ft. high, more or less downy. Leaves trifoliolate, with a main-stalk 2 to 3 ins. long. Leaflets nearly smooth on both sides, or very downy beneath, the end one larger than the others, broadly obovate; 2 to 4 ins. long, $1\frac{1}{2}$ to 3 ins. wide; the side leaflets half to two-thirds as large, and broadly ovate. Panicles terminal, 8 to 12 ins. high, the lower sections borne in the uppermost leaf-axils. Flowers $\frac{1}{2}$ in. long, varying from pale lilac to dark pink, borne on a slender stalk not quite so long as itself. Calyx $\frac{1}{10}$ in. wide, hairy, with broad shallow teeth. Pod 2 to 3 ins. long, $\frac{1}{8}$ in. wide; six- to nine-jointed, with the scalloping on the upper side characteristic of the genus.

Native of the Himalaya at 9000 ft.; the specimens now at Kew were raised from seed obtained from Kashmir in 1879. It flowers from August to October, but needs a hot summer to bring out its best qualities. In cold, wet seasons the flowers do not open at all. Propagated by division of the root-stock in spring. The late Sir Henry Collett called this a "protean plant"; the form in cultivation is one whose leaves are not very downy.

Desmodium is a genus of well over one hundred species, many of which are tropical, others herbaceous. Not one cultivated species that is hardy can be termed a pure shrub, as the stems die back to ground-level every year. The genus is allied to, and has some similarity to, *Lespedeza*, but the rounded, one-seeded pods of the latter clearly distinguish it from *Desmodium*.

DEUTZIA. SAXIFRAGACEÆ.

An Asiatic group of deciduous shrubs allied to *Philadelphus*, but very distinct from that genus in having ten stamens with winged stalks, often toothed or forked at the top; in the starry hairs or scurf with which most parts of the plants are furnished; and in five (instead of four) petals and calyx-lobes. Leaves opposite. Flowers either in racemes, as in *gracilis* and *scabra*, or in corymbose panicles.

The *Deutzias* are some of the most beautiful shrubs flowering in June. Nearly all the species mentioned in the following descriptive notes are quite winter-hardy; but, unfortunately, they are easily excited into growth by unseasonable warmth in the early spring months, and are often, especially in low-lying districts, injured and their crop of flowers ruined by late frosts. In elevated gardens they usually escape. They like a good loamy soil and plenty of moisture. The only pruning required is an occasional (say biennial) thinning out of the old worn-out branches. As they flower on the shoots made the previous year, no shortening back can be done except at the loss of bloom. They are very easily propagated by cuttings of half-ripened wood placed in gentle bottom heat about the end of June or later.

D. COMPACTA, Craib.

A deciduous shrub whose young shoots are at first clothed with close stellate down, becoming smooth and brown the second year. Leaves lanceolate to oval-lanceolate, mostly rounded at the base, the apex long and tapered; minutely toothed; up to $2\frac{1}{2}$ ins. long by 1 in. wide on the sterile shoots, much smaller on the short flowering ones; the upper surface dull dark green, furnished with appressed, stellate, mostly four- or five-rayed hairs; grey-green beneath, with more minute and more numerous stellate hairs (only visible with a lens); veins in five to seven pairs; leaf-stalks $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers borne during July at the end of leafy twigs about 3 ins. long numerous, in compact corymbose panicles 2 ins. across. Flowers white, $\frac{1}{2}$ in. wide, closely packed; petals roundish; calyx bell-shaped at the base, the lobes broadly ovate; flower-stalks stellately hairy.

Native of China; introduced by Mr Maurice de Vilmorin, and distributed by him under the number 4277. It flowered for the first time at Kew and Glasnevin in July 1913. It is distinct in its small, densely clustered blossoms.

D. CORYMBOSA, R. Brown.

A deciduous shrub up to 9 ft. high, of vigorous habit; bark bright brown, peeling off in rolls; young shoots sprinkled when quite young with tiny stellate hairs, becoming smooth. Leaves ovate, with a long tapered point and a rounded or broadly tapered base, finely toothed, 2 to 5 ins. long, 1 to $2\frac{1}{4}$ ins. wide, green on both sides. To all appearance smooth, they are, especially when young, really furnished with minute starry scales, only visible under the lens. Flowers crowded in a corymb or broad panicle, 2 to 3 ins. across; each flower $\frac{3}{8}$ in. in diameter. Petals pure white, roundish ovate, overlapping; styles rather longer than the stamens; anthers large and conspicuously yellow, wings of the stamens toothed. Calyx-lobes broadly triangular, smooth except for embedded starry scales.

Introduced from the Himalaya in 1830. The flowers have a charming hawthorn-like scent, and form compact, full clusters. The anthers, through their size and colour, give a yellowish tinge to the inflorescence. A distinct and fine species, the year-old branches forming large pyramidal panicles in June.

D. DISCOLOR, Hemsley.

A shrub 5 or 6 ft. high, young shoots scurfy, ultimately pale greyish brown, smooth, and with peeling bark. Leaves of thinnish texture, narrowly ovate-oblong; $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; dull green, with starlike hairs above, grey beneath, and furnished with very minute, stellate scurf; rounded or broadly tapered at the base, slender-pointed or sometimes acute. Flowers in corymbs 3 ins. across; each flower $\frac{1}{2}$ to 1 in. wide, the best forms very showy, varying in colour from white to pink. Calyx and flower-stalks scurfy.

Native of Central and W. China. The best form of this species is var. MAJOR, which has white or faintly rose-tinted flowers 1 in. across, produced in long arching sprays. It was introduced by Wilson for Messrs Veitch in 1901. (Fig., p. 482.) The distinctions between this species and *D. longifolia* are pointed out under the latter.

D. GRACILIS, Siebold.

A deciduous, erect-growing shrub up to 4 ft. high; young shoots soon quite smooth. Leaves lanceolate, tapered or rounded at the base, long and

slenderly pointed, rather coarsely and unequally toothed; 1 to 3 ins. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide; deep green. Seen under the lens the upper surface shows numerous star-shaped depressions in which are embedded minute, star-shaped hairs. Flowers pure white, $\frac{5}{8}$ to $\frac{3}{4}$ in. across, produced in erect racemes or panicles $1\frac{1}{2}$ to 3 ins. long. Petals obovate, rounded at the apex; styles distinctly longer than the stamens; calyx slightly scaly, with small, triangular, greenish white lobes. Flower-stalks smooth.

Native of Japan; introduced about 1840. Well known for forcing early into blossom for conservatory decoration, this species is also very handsome



DEUTZIA DISCOLOR VAR. MAJOR.

out-of-doors where the climate suits it. It is quite hardy, but in low-lying districts is very frequently injured by late frosts.

Var. AUREA has yellow leaves; var. MARMORATA has mottled ones. Mr Lemoine of Nancy has raised some beautiful hybrids by crossing this with purpurascens and other species. Some of the best are:—

CAMPANULATA.—Flowers large, white, open bell-shaped; the stalks almost black.

CARMINEA, EXIMIA, ROSEA, all have flowers white inside, soft rose outside, the buds rich carmine; VENUSTA has large white flowers, with the petals frilled at the edges.

All these forms are exceedingly beautiful at their best, and quite hardy. Provided they escape late frosts, they produce slender columnar masses of blossom 1 to 2 ft. long, composed of racemes terminating short side twigs from the previous year's growths. Half in flower, half in bud, they are exquisite.

D. LEMOINEI, *Hort.*

A hybrid between *D. gracilis* and *D. parviflora*, raised by Mr Lemoine of Nancy. It is an erect shrub up to 7 or 8 ft. high, with smooth young shoots, and lanceolate leaves, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide, sharply toothed, long-pointed; the upper surface has minute star-like hairs, beneath it is almost smooth. Flowers pure white, $\frac{5}{8}$ in. across, produced in erect corymbs. For forcing into flower early this is a very valuable shrub, more beautiful and effective than *gracilis*, and in that state is very popular at spring flower shows. Out-of-doors, at least in low-lying localities, it rarely has a chance to do itself justice, owing to the destruction of its flower-buds by unseasonable frosts. Its natural flowering time is May and June.

D. LONGIFOLIA, *Franchet.*

(Bot. Mag., t. 8493.)

A deciduous shrub 4 to 6 ft. high; young shoots sparsely scurfy; afterwards smooth, bright brown, peeling. Leaves narrowly oval-lanceolate, rounded or tapered at the base, slender-pointed, finely toothed; $1\frac{1}{2}$ to 5 ins. long, $\frac{1}{2}$ to $\frac{1}{4}$ in. wide; upper surface dull greyish green, sprinkled with pale, flat, usually five- or six-rayed, stellate hairs; under-surface greyish white, covered with a close felt-like layer of many-rayed stellate scales, the midrib and chief veins furnished on each side with few to many white simple hairs. Flowers in corymbose panicles, 2 to 3 ins. long and wide, produced in June at the end of short two- to six-leaved twigs; each flower is about 1 in. across, rich purplish rose, paling at the margins of the petals. The wings of the inner stamens are deeply bilobed at the top, the anthers set in the notch; calyx-lobes linear-oblong, persistent, covered like the calyx-tube and flower-stalks with pale starry scurf. Fruit $\frac{1}{4}$ in. across.

Native of W. China; introduced by Wilson in 1905. This is one of the finest of the Chinese *Deutzias*, both in size of flower and richness of tint. It is closely allied to *D. discolor*, but is distinguished by the longer, narrower leaves, more distinctly veined beneath, and especially, by the simple hairs along the midrib—absent in *discolor*; the wings of the inner stamens are deeply bilobed in *discolor*, but the lobes do not reach up to or above the anther as in *longifolia*.

Var. *VEITCHII* is a form with larger and more striking flowers.

D. MOLLIS, *Duthie.*

A deciduous shrub, 5 or 6 ft. high, with reddish brown, hairy young shoots. Leaves lanceolate, oval, or broadly ovate; 2 to $4\frac{1}{2}$ ins. long, $\frac{5}{8}$ to $2\frac{1}{4}$ ins. wide, shortly or slenderly pointed, rounded or tapered at the base; finely toothed, dull green and rough with stellate hairs above, grey and thickly felted with soft down beneath. Flowers white, $\frac{1}{2}$ in. across, produced during June in dense corymbs 2 to 3 ins. in diameter. Petals rounded; wings of stamens tapered from the base to the top, and quite entire; calyx-lobes very short, broad, and reflexed. Flower-stalks and calyx densely covered with short hairs and starry scales.

Native of Hupch, China ; discovered by Wilson, and introduced by him in 1901. It is very distinct from the older Deutzias in the thick down beneath the leaves, and in the tapering filaments. It flowers in June, but has not yet made a great display.



DEUTZIA MOLLIS.

D. PARVIFLORA, Bunge.

A shrub of erect habit up to 6 ft. high ; young wood smooth, pale brown ; bark peeling the second year. Leaves ovate-lanceolate or ovate, with a usually short, slender point, tapered at the base, sharply toothed ; $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide ; dull green and sprinkled over with minute starry down above ; paler, glossy green, and almost smooth beneath. Flowers white, $\frac{1}{2}$ in. across, produced in corymbs 2 or 3 ins. across. Wings of stamens variable, sometimes none, sometimes a proportion toothed.

Native of China, Manchuria, and Corea, where it may be said to represent *D. corymbosa*, to which species it is most nearly allied in botanical characters, but distinct in its smaller leaves with more open teeth and fewer-rayed (four to nine) hairs. In low-lying districts it is of little value owing to its susceptibility to injury by late frosts, but pretty in continental gardens, where it is not excited so early into growth as with us.

D. PURPURASCENS, Rehder.(D. discolor var. purpurascens, *Franchet*; Bot. Mag., t. 7708.)

A shrub 6 or 7 ft. high; shoots pale brown, rather scurfy when quite young. Leaves ovate or ovate-lanceolate, 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide, broadly tapered or rounded at the base, slender-pointed, toothed, scurfy, with starry minute scales on both surfaces, especially above; stalk $\frac{1}{2}$ to $\frac{3}{8}$ in. long. Corymbs rounded, $1\frac{1}{2}$ to 2 ins. across, expanding in early June; flowers $\frac{3}{4}$ in. across, white suffused with purple on the outside; petals roundish ovate, scurfy outside except at the margins. The five longer stamens have the apex of the wings forked so that each fork stands above the anther, the five smaller ones have the apex undivided and the anther attached below it on the inner side; calyx with linear-lanceolate lobes, and, like the flower-stalk, covered with starry scurf.

Native of Yunnan; discovered by the Abbé Delavay, and sent by him to Mr de Vilmorin in 1888. It is allied to discolor, but as indicated by Mr Rehder is distinguished by the scales on the leaves being only five-to seven-rayed (half as many as in *D. discolor*), and by the wings of the filaments being extended above the anthers. A very handsome shrub and a parent of several beautiful hybrids, among which is *D. KALMÆFLORA* (whose pollen parent is *D. parviflora*); this was raised by Lemoine and distributed in 1900; its flowers are pale rose inside, deeper outside.

D. REFLEXA, Duthie.

A shrub 3 ft. or more high; young shoots smooth. Leaves oval-lanceolate, tapered at the base, slenderly pointed; 2 to 4 ins. long, $\frac{1}{2}$ to 1 in. wide; upper surface beset with rather scattered starry scales, the lower one grey, densely clothed with much smaller scales, and furnished with simple hairs along the chief veins. Flowers pure white, produced in May and early June in dense, rounded, corymbose panicles about 2 ins. across. Petals $\frac{1}{2}$ in. long, reflexed at the margins; wings of the stamens distinctly bilobed at the top; calyx-lobes narrow-oblong, persistent; calyx and flower-stalks scaly.

Native of Central China; discovered and introduced by Wilson in 1901. I have only seen it in flower at Coombe Wood, where it is very pretty about the beginning of June, the previous year's stems being then loaded with the numerous flower clusters. It is allied to *D. Vilmorinæ*, and has the same fringe of simple hairs along the midrib and veins, but the flower-stalks are shorter, the inflorescence more crowded, the flowers smaller; the reflexed margins of the petals are also very distinctive.

D. SCABRA, Thunberg.(D. crenata, *Siebold*.)

A deciduous shrub up to 10 ft. high; branches erect, covered with brown peeling bark; young shoots smooth or slightly rough. Leaves ovate to ovate-lanceolate, the larger ones of the barren shoots rounded or heart-shaped at the base, slender-pointed, up to 4 ins. long by nearly 2 ins. wide; the smaller ones and those of the flowering twigs tapered at the base, all stellately scurfy on both sides; the marginal teeth are small and fine, standing upwards rather than outwards from the margin. Panicles erect, cylindrical, 3 to 6 ins. long, terminating short leafy lateral twigs. Flowers pure white or tinged with pink outside, $\frac{1}{2}$ to $\frac{3}{4}$ in. long and wide; petals

nearly erect, oblong, pointed; style about as long as the petals, calyx-lobes deciduous, covered with starlike scales; the lobes triangular; wings of stamens with two distinct shoulders below the anthers. Flowers in late June.

Var. FLORE PLENO includes several forms with double flowers 1 in. across, composed of numerous petals narrower than in the type. One of the best is distinguished as FL. PL. ROSEO, the outer petals being suffused with rosy purple. "Pride of Rochester" is very similar. Var. CANDIDISSIMA has pure white flowers, and so has var. WELLSII, but they are rather smaller.

Var. PUNCTATA has single pure white flowers, but the leaves are strikingly marbled with white and two or three shades of green. It is a rather pretty variegated shrub, but apt to revert to the ordinary green state.

Var. WATERERI.—Flowers 1 in. across, single; petals rosy outside.

Native of Japan and China; introduced in 1822. This is undoubtedly the best and most reliable of Deutzias in this country. It usually escapes damage by late frosts, and produces its showy erect panicles in great profusion. Strong branches will, in their second year, become transformed into pyramidal masses of bloom 2 ft. long. The double-flowered and rosy forms are excellent shrubs. The species is confused with *D. Sieboldiana* (q.v.)

D. SETCHUENENSIS, *Franchet.*

(Bot. Mag., t. 8255.)

A shrub up to 6 ft. high, of graceful habit; young shoots scurfy, rather rough, glossy the first year, brown the second year, finally peeling. Leaves oval-lanceolate, rounded at the base, taper-pointed, finely toothed; $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{3}{8}$ to $1\frac{1}{2}$ ins. wide; dull green and rough, with minute starry hairs above, grey and more densely covered with similar down beneath; stalk $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Flowers white, about $\frac{5}{8}$ in. across, produced in May and June in corymbs 3 or 4 ins. across. Petals ovate, clothed with minute starry down outside; calyx-lobes triangular, persistent, they and the flower-stalks grey-felted. The wings of the longer stamens terminate at the top in two prominent teeth; the smaller stamens have several smaller teeth.

Native of China, in Szechuen and Hupeh; introduced to France in 1895. The plant described above was subsequently put in commerce by Lemoine as corymbiflora (see *Gardeners' Chronicle*, 1898, ii., p. 295). According to Rehder, who distinguishes it as *D. setchuenensis* var. corymbiflora, it differs slightly from the type in the character of the pubescence, and in length of flower-stalk. It is a beautiful shrub, but unfortunately spring-tender in our climate.

D. MYRIANTHA, *Lemoine*, is a beautiful hybrid between the above and *D. parviflora*. Flowers pure white, very numerous in large corymbs, hardier than *D. setchuenensis*.

D. SIEBOLDIANA, *Maximowicz.*

(*D. scabra*, *Siebold and Zuccarini*, not of *Thunberg.*)

A deciduous shrub of bushy, rather lax habit, 3 or 4 ft. high; young shoots covered with scurfy stellate down. Leaves ovate or oval; $1\frac{1}{2}$ to 3 ins. long on the barren shoots, $\frac{3}{8}$ to $1\frac{1}{4}$ ins. wide; rounded, heart-shaped, or tapered at the base, pointed, sharply and irregularly toothed; dull green, stellately hairy on both surfaces, the hairs with three to five rays; veins prominent beneath; stalk $\frac{1}{4}$ in. or less long. Leaves of the flowering twigs smaller and comparatively broader; often scarcely stalked. Flowers pure white, $\frac{1}{2}$ in. diameter, produced during early June in corymbose-paniculate clusters 1 to 2 ins. long, terminating short lateral twigs which carry one or two pairs of leaves. Petals

ovate ; style rather longer than the stamens, whose wings taper towards the anthers ; calyx felted, the lobes broadly triangular, persistent. Flower-stalks rough with bristles and stellate down.

Native of Japan ; and an elegant although not showy shrub. In regard to nomenclature, it is much confused with *D. scabra*, *Thunberg*, and has even been called "*scabra vera*." The confusion appears to have originated with Siebold and Zuccarini in 1835. It is a much smaller shrub than *D. scabra* (the common *Deutzia* of gardens), differing in the shape of the inflorescence, in having persistent calyx-lobes, and in the tapered wings of the stamens.



DEUTZIA SIEBOLDIANA.

D. STAMINEA, *R. Brown*.

A deciduous shrub, 4 to 5 ft. high ; shoots rough when young with starlike scales. Leaves ovate, with long slender points, and a rounded or tapered base, unequally toothed ; dull green and rough above, grey beneath, and thickly covered with minute starry scales ; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide. Flowers in short racemes or corymbs 2 ins. wide ; petals $\frac{3}{8}$ to $\frac{1}{2}$ in. long, downy ; wings of stamens toothed ; calyx grey with stellate scales, its lobes narrow, pointed.

Native of the Himalaya ; tender in this country. At Kew it is cut down to the ground almost every year, and its flowers consequently are not often seen. The form in cultivation, sometimes grown as *canescens* or *Brunoniana*, has more broadly ovate, longer-pointed leaves than are typical.

D. VILMORINÆ, *Lemoine*.

A vigorous shrub of erect habit, up to 8 ft. or perhaps more high ; young shoots slightly rough with scurfy stellate hairs at first, becoming brown and shining. Leaves oblong-lanceolate, rounded or broadly tapered at the base, slenderly pointed, sharply toothed, 2 to 5½ ins. long, $\frac{3}{8}$ to 2 ins. wide ; dark dull green and rough with stellate hairs above, grey and covered with a close felt of starry down beneath ; also with simple hairs at the sides of the midrib and veins ; stalk $\frac{1}{8}$ to $\frac{1}{2}$ in. long. Flowers in broad corymbose panicles up to 3 ins. long, white, 1 in. across. Petals ovate with the edges upturned ; wings of stamens dilating upwards to about midway, then narrowing, awl-like, to the anthers. Calyx-lobes linear-lanceolate, reflexed, covered like the flower-stalk with grey scurf, persistent. Fruits hemispherical, $\frac{1}{2}$ in. across.

Native of Szechuen, China ; sent to Mr Maurice de Vilmorin at Les Barres by the Abbé Farge in 1897 ; introduced to England in 1905. Next to *D. scabra* this species, I think, promises to be the most valuable of *Deutzias*. It is a rapid grower, and its fine flowers escape damage by late frosts better than those of most *Deutzias* do, and usually make a good display. It was named after the late Madame de Vilmorin of Les Barres. Allied to *D. discolor*.

D. WILSONI, *Duthie*.

(Bot. Mag., t. 8083.)

A shrub 4 to 6 ft. high, whose young branches are slightly scurfy at first, soon becoming dark reddish brown ; the bark peeling. Leaves 2 to 5 ins. long, $\frac{3}{8}$ to 1½ ins. wide ; ovate-oblong to oblong-lanceolate, tapered or rounded at the base, acute or acuminate ; rough, with four- or five-rayed stellate hairs above, dark dull green ; grey beneath, and covered with minute stellate scurf, and furnished also with pale bristle-like simple hairs, especially along the midrib and veins. Flowers in corymbose panicles ; each flower nearly 1 in. across, white ; longer stamens with tapered wings, shorter ones toothed.

Native of W. and Central China ; discovered and introduced by Wilson about 1901. It is a handsome shrub of the *discolor* group, but distinct in the hairiness of the lower surface of the leaves, suggesting *D. mollis* when young.

DIERVILLA. CAPRIFOLIACEÆ.

A genus of deciduous shrubs, closely allied to the honeysuckles, but distinguished by having dry, cylindrical seed-vessels (capsules). Leaves opposite, either shortly or not at all stalked. Flowers often three on a stalk, the corolla funnel- or bell-shaped at the base, five-lobed at the mouth. Calyx five-lobed, persistent. Seeds numerous.

The *Diervillas* are found in Eastern N. America and in N. Asia, especially in Japan and China. The Asiatic species were at one time kept apart as *WEIGELA*, and they are not only much more beautiful than the American ones (or true *Diervillas*), but are well distinguished in various ways. The shoots of the current year are barren, the flowers being borne on short lateral twigs on the year-old branches, whilst in the American species they come at the end of the current season's shoots ; the corolla of the Asiatic species is regular or nearly so ; in the American ones it is two-lipped. There are few more beautiful summer-flowering

shrubs than the Asiatic Diervillas. The first of them, *D. florida* (or *Wiegela rosea*), was introduced in 1845. Afterwards other species were introduced and hybridising was commenced, with the result that a very fine race of garden varieties has been produced showing great variety of colour, from white and yellowish white to deep rose and blood-red. These now surpass the original species in effectiveness, and the latter are becoming scarce. The separation and identification of some of the Asiatic species is not easy. *D. Middendorffiana*, however, is readily distinguished by its yellow flowers and two-lipped calyx; *D. floribunda*, by its crimson or blood-red flowers; *D. præcox*, by its early flowering. The three others may be differentiated as follows:—

- D. florida*.—Lobes of calyx lanceolate, penetrating only half or about half its length; stigma bilobed; seeds not winged.
- D. japonica*.—Lobes of calyx narrow linear, extending to the base; seeds winged; leaves very downy; calyx and corolla more or less so.
- D. grandiflora*.—Lobes of calyx as in *japonica*; leaves downy chiefly on the midrib and veins beneath; corolla smooth; calyx fringed on the margin.

The Diervillas are easily cultivated, and there are only two, *D. Middendorffiana* and *D. japonica hortensis*, that show any indication of tenderness. Being gross feeders they need a rich, moist, loamy soil. They are very easily increased by cuttings of half-ripened growths. The Asiatic species should be pruned as soon as the flowers are past, by entirely removing the old shoots that have flowered—a process of thinning—leaving the young shoots of the year untouched, to produce their crop the following year. The American species, *D. Lonicera*, *sessilifolia*, and *rivularis*, may be pruned back in spring before growth commences.

The garden varieties are too numerous to mention, but besides those alluded to under their respective species, the following may be recommended:—

Abel Carrière.—Flowers rose-carmine, changing to red; yellow in the throat. A very vigorous and ornamental shrub.

Conquête.—Flowers large, deep pink.

E. André.—Flowers very dark brownish crimson. One of the *floribunda* group.

Grænewegeni.—Flowers deep rose outside, pale within, with yellowish lines.

Madame Lemoine.—Flowers white, changing to deep blush.

In several Diervillas the flowers open pale and deepen in colour later, so that various shades are seen on the same plant simultaneously.

D. FLORIBUNDA, Siebold.

A shrub 4 to 8 ft. high, with slender, supple branches clothed with soft hairs. Leaves ovate or oval with long, tapering points, wedge-shaped at the base; 3 or 4 ins. long, and about half as wide on the long, barren, first-year shoots, considerably smaller on the lateral flowering twigs; toothed, downy on both surfaces, especially beneath. Flowers produced during June in corymbs terminating, and in the leaf-axils of, the short side twigs. Corolla

funnel-shaped, 1 in. long, with five spreading lobes at the mouth, where it is $\frac{5}{8}$ in. across, downy outside; of a dark, almost blood-red. Calyx $\frac{1}{2}$ in. long, consisting of a tube and five narrow linear lobes, hairy. Seed-vessel cylindrical, narrow, downy.



DIERVILLA FLORIBUNDA.

Native of the mountains of Japan; introduced to Europe about 1860. The typical *D. floribunda* is now very rare in cultivation, but it is the species whose characteristics and colour of flower are dominant in the dark crimson-flowered garden varieties like *LAVALLEI*, *LOWEI*, and *EVA RATHKE*. Although the flowers are smaller than in other Asiatic species, their splendid colouring makes this species and its group of varieties inferior to none.

Var. *VERSICOLOR* is figured by Siebold and Zuccarini in the *Flora Japonica*, t. 33. It is said to have flowers at first whitish, reddening with age.

D. FLORIDA, Siebold.

(*Weigela rosea*, Lindley, Bot. Mag., t. 4396; *W. amabilis* of gardens.)

A shrub 6 or 7 ft. high, of spreading habit and arching branches; young shoots with two lines of short hairs. Leaves oval or oval-lanceolate, long-pointed, toothed except at the base, felted on the midrib beneath; 2 to 4½ ins. long, $\frac{3}{4}$ to 1½ ins. wide; very shortly stalked. Flowers often in terminal threes or fours on short lateral twigs. Corolla funnel-shaped, 1¼ ins. long, with five spreading rounded lobes at the mouth, where it is as much in diameter; deep rose on the outside, paler and becoming almost white within; stigma bilobed. Calyx with five slender, erect lobes $\frac{1}{3}$ to $\frac{1}{2}$ in. long, awl-shaped, nearly smooth; ovary downy.

Native of China; introduced for the Horticultural Society by Fortune in 1845. It is perhaps the commonest of *Diervillas*, being usually known by Lindley's name of *Weigela rosea*; it is one of the parents of many of the fine garden varieties. Blossoms in May and June.

Var. *CANDIDA*.—Flowers pure white. A hardier white variety and more serviceable in gardens than *D. japonica hortensis*.

Var. *LOOYMANSI AUREA*.—Leaves yellow; perhaps of hybrid origin.

Var. *VARIEGATA*.—A good variegated shrub; leaves edged with pale yellow; flowers deep rose. A form of this, *NANA*, is dwarf and has the leaves edged with creamy white. Flowers very pale rose.

D. GRANDIFLORA, Siebold.(D. coræensis, *De Candolle.*)

A deciduous shrub, 6 to 10 ft. high; young branchlets smooth. Leaves 3 to 5 ins. long, 2 to 3 ins. wide; oval or obovate, with a long, abrupt point. nearly or quite smooth above, hairy on the midrib and chief veins below; stalks $\frac{1}{4}$ to $\frac{3}{4}$ in. long, bristly. Flowers produced during June in corymbs usually of threes, terminating short lateral twigs. Corolla bell-shaped, abruptly narrowed near the base; 1 to $1\frac{1}{4}$ ins. long, $\frac{3}{4}$ in. across at the five-lobed mouth, not downy; pale rose at first, changing to carmine. Calyx with five narrow, linear lobes $\frac{1}{8}$ in. long; ovary smooth.

Native of Japan, but not, according to Siebold, of Corea, as the name coræensis implies. The distinguishing characters from *D. florida* are the linear calyx-lobes reaching to the base, the longer-stalked leaves, and the smooth ovary. It is a very free-flowering, handsome shrub.



DIERVILLA FLORIDA VARIEGATA.

D. JAPONICA, De Candolle.(Weigela japonica, *Thunberg.*)

A deciduous shrub, 6 to 8 ft. high; young shoots nearly smooth. Leaves oval or ovate, 2 to 4 ins. long, about half as wide; toothed, long and taper-pointed, densely felted with pale down beneath; slightly hairy above; stalk $\frac{1}{4}$ in. or less long, bristly on the edges. Flowers mostly in threes, terminal and in the leaf-axils of short side twigs, forming a leafy panicle 3 to 5 ins. long. Corolla between funnel- and bell-shaped, 1 to $1\frac{1}{4}$ ins. long, less in width, rather downy outside; pale rose at first, changing to carmine. Calyx-lobes linear, more or less downy.

Native of Japan and China. It is allied in botanical characters to *D. floribunda*, having the corolla downy outside; and the calyx-lobes slender and downy; but the corolla is much larger and differs in colour very much from the almost blood-red one of *D. floribunda*. The garden varieties with leaves more or less felted beneath, derive that character from this species.

Var. *HORTENSIS*, *Rehder* (*D. hortensis, Siebold.*)—Flowers white; leaves nearly white with down beneath. Not so hardy and vigorous as the type. Var. *NIVEA* has purer white flowers.

D. LONICERA, *Miller*.(D. canadensis, *Willdenow* ; D. humilis, *Persoon* ; Bot. Mag., t. 1796.)

A spreading, suckering shrub, 2 to 4 ft. high ; young wood smooth. Leaves oval or ovate-oblong, taper-pointed, usually heart-shaped at the base on strong shoots, tapering on weak shoots ; 2 to 5 ins. long, 1 to $2\frac{1}{2}$ ins. wide, evenly toothed, quite smooth on both surfaces, hairy on the margin when quite young ; stalk $\frac{1}{4}$ in. or less long. Cymes few-flowered, axillary and terminal, produced in June and July on the current season's shoots, the terminal ones three- or five-flowered ; axillary flowers often solitary. Corolla yellow, becoming deeper with age, funnel-shaped, the tube $\frac{1}{2}$ in. long, wider across the five narrow lobes. Calyx smooth, with five erect, awl-shaped lobes. Style and stamens hairy below.

Native of Eastern N. America, from Newfoundland to the S. United States. First brought to Europe by Dr Dierville, a French surgeon, after whom the genus is named ; introduced to England in 1739. It is the least ornamental of cultivated Diervillas, and rarely seen outside botanic gardens.

D. MIDDENDORFIANA, *Carrière*.

(Bot. Mag., t. 7876.)

A shrub 3 or 4 ft. high ; young shoots smooth except for two downy ridges. Leaves 2 or 3 ins. long, 1 to $1\frac{1}{2}$ ins. wide ; ovate-lanceolate, toothed, wrinkled, slightly hairy on the margins and on the chief veins when young only ; stalk $\frac{1}{8}$ in. or less long. Flowers in a terminal cymose cluster. Corolla bell-shaped, sulphur-yellow, stained with orange on the lower lobes ; $1\frac{1}{4}$ ins. long, 1 in. wide across the mouth, where are five spreading lobes. Calyx two-lipped ; the upper lip with three narrow lobes, the lower one with two broader, deeper ones ; all fringed with short bristles. Flowers in April and May.

Native of N. China, Manchuria, and Japan ; introduced to Europe in 1850. A beautiful shrub, very distinct in its yellow blossoms and curious two-lipped calyx. It does not thrive well generally in cultivation, suffering very much from late spring frosts.

D. PRÆCOX, *Lemoine*.

This Diervilla was put in cultivation by Mr Lemoine of Nancy in 1894. He had previously obtained it from Japan, and if not a true species it may be a hybrid or variety raised in that country. It flowers in the first week of May—three or four weeks in advance of its nearest allies. It is a vigorous grower, the leaves of the young shoots 5 ins. long and nearly half as wide, hairy, especially beneath. Flowers large, $1\frac{1}{2}$ ins. long, rose-coloured, yellow in the throat, produced in cymes of three or five. The calyx resembles that of D. florida in lobing, but is very hairy. The young stems, on the other hand, are quite smooth. Except that the flowers are rather subject to damage by late frost, this shrub is quite a desirable one.

D. SESSILIFOLIA, *Buckley*.

A deciduous shrub of somewhat tufted habit, 2 to 3 ft. high, with four-angled young branches which are downy only on the corners. Leaves ovate-lanceolate, $2\frac{1}{2}$ to 7 ins. long, half as wide ; sharp-toothed, rounded, or heart-shaped at the base, taper-pointed, smooth except on the midrib above, stalkless. Flowers much crowded in terminal cymose clusters up to 3 ins. across, or in smaller axillary ones, produced from June to August. Corolla

sulphur-yellow, $\frac{1}{2}$ in. long, a narrow tube with five narrow-oblong, blunt lobes. Calyx with five narrow, awl-shaped lobes. Seed-vessel $\frac{1}{2}$ in. long.

Native of the south-eastern United States. This is much superior to its ally *D. Lonicera*, producing large clusters of flowers on the current season's shoots. It should be pruned back in spring before growth commences, when it will send up a dense mass of shoots that will blossom during the summer.

D. SPLENDENS, *Carrière* (*D. sessilifolia splendens*, *Hort.*), is thought to be a hybrid between the above and *D. Lonicera*.

D. RIVULARIS, *Gattinger*, is closely allied to and very similar to *D. sessilifolia*, but the leaves are downy on both sides, especially beneath; the young shoots are downy all over; and the seed-vessel is only $\frac{1}{4}$ in. long. Flowers lemon-yellow. Native of the south-eastern United States; introduced in 1902 to Kew.

DIOSPYROS. EBENACEÆ.

Of this large and important genus (to which the ebony tree belongs) only three species are known to be really hardy in this country, although a fourth—*D. Kaki*—will succeed in the warmer counties in the open, and in many places elsewhere against a wall. They are trees with alternate, entire leaves, and the shoots do not form terminal buds. The male and female flowers are on separate trees, and both are small and without beauty. The fruits are large, and beset at the base by the calyx, which continues to grow after the rest of the flower has fallen. These trees like a good loamy soil, and should be raised from seed, except the named varieties of *D. Kaki*, which are grafted on seedlings.

D. ARMATA, *Hemsley*.

A semi-evergreen tree of sturdy, rounded habit, 20 ft. high, much branched; the branchlets clothed with a thick minute down, and occasionally terminated by a stout thorn. Leaves $\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; entire, the smaller ones roundish, the larger ones oval, tapered about equally at both ends, blunt or rounded at the apex, dark shining green, the midrib minutely downy above, minutely hairy beneath; the blade is specked with minute transparent dots; stalk $\frac{1}{8}$ in. or less long. Flowers not seen. Fruit yellow, roundish, $\frac{3}{4}$ in. diameter, furnished with appressed bristles; borne on a stalk about $\frac{1}{2}$ in. long and set in a persistent calyx, the four lobes of which are ovate, $\frac{1}{2}$ in. long.

Native of Central China; discovered by Henry, introduced by Wilson in 1904, and now growing in the open air at Kew apparently quite hardy, and forming a sturdy bush. In the original description the leaves are described as persistent, but cultivated plants would, apparently, be deciduous in hard winters.

D. KAKI, *Linnaeus*. KAKEE, or CHINESE PERSIMMON.

(*Bot. Mag.*, t. 8127.)

A deciduous tree, ultimately 20 to 40 ft. high, with more or less downy young shoots and winter buds. Leaves oval, 3 to 8 ins. long, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. wide; tapering at both ends; strongly veined; soon smooth glossy green

above, more or less downy beneath. Fruit 3 ins. wide, yellow, and of the shape of an average tomato, supported by the persistent calyx, 2 ins. across.

Native of China ; long cultivated in Japan, where several scores of varieties have been raised, remarkably diverse in size of fruit. Kakees are now being extensively cultivated in the south of Europe, and the fruits sent from there are becoming well-known in London shops as "persimmons." As regards the British Isles, it, or some of its forms, for it is difficult now to distinguish the type, ought to be hardy in the mildest parts. Canon Ellacombe has obtained fine crops in his garden at Bitton, from trees trained against a wall. At Kew, splendid crops are obtained in a cool greenhouse, and a tree has lived in the open for five or six years. Its real hardiness must as yet, however, be regarded as very doubtful. This species is well distinguished from the others by its large leaves and fruit.

D. LOTUS, *Linnaeus*. DATE PLUM.

A deciduous tree, usually under 30 ft. high in this country, but probably twice as high in warmer climates ; young shoots more or less downy, often becoming quite smooth. Leaves oval, 2 to 5 ins. long, 1 to 2 ins. wide ; tapered at both ends, entire, dark polished green above, and smooth except on the midrib ; pale, somewhat glaucous, and with small scattered hairs beneath ; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, downy. Trees unisexual ; male flowers produced on very short, downy stalks one to three together, in the leaf-axils of the shoots of the year in July ; female flowers solitary. Calyx large in both sexes, remaining attached to the base of the fruit, and growing larger with it ; corolla pitcher-shaped, green suffused with red, $\frac{1}{4}$ in. long. Fruit orange-shaped, ultimately $\frac{1}{2}$ to $\frac{3}{4}$ in. across, purplish or yellowish.

Native of China, whence it has several times been introduced ; of the Himalaya, possibly also of Asia Minor. It was cultivated early in the seventeenth century in England, but has never become very common in gardens, although perfectly hardy. Fruits develop freely, but remain very astringent, and unfit for food. The trees emit a curious heavy odour, especially on damp days in autumn. It is due apparently to some exhalation from the leaves.

D. VIRGINIANA, *Linnaeus*. PERSIMMON.

A deciduous tree, 40 to 65 ft. high in this country ; but occasionally over 100 ft. high in a wild state, with a trunk 2 ft. in diameter ; young shoots more or less downy. Leaves oval to ovate, tapering or more or less heart-shaped at the base, pointed at the apex ; $1\frac{1}{2}$ to 5 ins. long, $\frac{3}{4}$ to 2 ins. wide ; glossy green above, pale beneath ; smooth except for a little down on both sides of the midrib ; stalk downy, $\frac{1}{2}$ to 1 in. long. Male flowers produced one to three together in the leaf-axils, on very short downy stalks. Corolla pitcher-shaped, $\frac{1}{2}$ in. long, with four short recurved lobes. Female flowers solitary, larger, yellowish white. The fruit I have not seen in this country, but it is described as more or less orange-shaped, 1 to $1\frac{1}{2}$ ins. across ; pale yellow with a red cheek.

Native of the eastern United States as far north as Connecticut, but most abundant in the Southern and Central States, where the fruit is eaten in large quantities. The tree is somewhat tender when very young, but perfectly hardy after a few years. The finest tree in the British Isles is growing near the Sun Temple at Kew. It is a male tree now 65 ft. high, with a trunk 5 ft. 6 ins. in girth. The trunk is singularly picturesque because of the rugged bark, which is deeply cut into square or rectangular blocks. This tree was planted where it now stands in 1762, being one of a large collection transferred from the Duke of Argyll's garden at Whitton to the then newly formed

arboretum at Kew. In a young state the persimmon is rather like the date plum, but the leaves are longer-stalked, not of so polished a green, broader and more rounded at the base.

DIOSTEA JUNCEA, *Miers.* VERBENACEÆ.

(Bot. Mag., t. 7695 ; *Lippia juncea*, *Schauer* ; *Verbena juncea*, *Hooker*.)

A slender, tall, deciduous shrub of thin, erect habit, eventually a small tree, 15 to 20 ft. high ; young branches long, slender, rush-like ; with scattered down at first, then smooth. Leaves opposite, few, the pairs often about 2 ins. apart ; stalkless, usually $\frac{1}{3}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide ;



DIOSTEA JUNCEA.

ovate-oblong, triangular-toothed, thick, slightly downy. Flowers pale lilac, produced during June, crowded on spikes about 1 in. long, which terminate short lateral twigs. Corolla $\frac{1}{3}$ in. long, tubular, narrowed towards the base, with five small rounded lobes. Calyx cylindrical, downy.

Native of the Andes of Chile and the Argentine ; introduced to Kew about 1890. This shrub or small tree, which is perfectly hardy in the open, has somewhat the aspect of *Spartium junceum*, but is, of course, quite dissimilar in flower ; and even without flowers the opposite leaves show the absence of relationship. It is an interesting plant, pretty without being showy, and worth a place in a shrubbery where its naked base is hidden and its slender top can stand up above the other shrubs. It is quite well able to take care of itself in such a position. Increased by cuttings in July and August.

DIPELTA. CAPRIFOLIACEÆ.

Four species belonging to this genus are known, two of which are in cultivation. They are deciduous shrubs, exclusively Chinese, and are allied to *Diervilla*, which they resemble in shape of corolla. The most distinctive feature of the *Dipeltas* is the number of bracts at the base of the ovary, which persist, grow, and ultimately form dry disk-like wings to the fruit, similar in texture to the wings on elm seed. Two of them are much larger than the others, and being attached by their centres to the fruit have the shield-like appearance to which the generic name refers. Leaves opposite. Both the following species are promising garden shrubs, more especially *D. floribunda*. They like an open, moist, loamy soil, and can be increased by cuttings.



DIPELTA FLORIBUNDA.

D. FLORIBUNDA, *Maximowicz*.

(Bot. Mag., t. 8310.)

A deciduous shrub, with peeling bark, ultimately (according to travellers) 10 to 15 ft. high; young twigs downy (partially glandular-downy). Leaves ovate to oval-lanceolate, tapering at the base, long-pointed, not toothed; 2 to 4 ins. long, $\frac{3}{8}$ to $1\frac{1}{2}$ ins. wide; downy on both sides and at the margin, at least when young; stalks $\frac{1}{4}$ in. or less long. Flowers fragrant, produced in the axils of the leaves and at the end of short twigs, from one to six on a stalk. Corolla 1 to $1\frac{1}{4}$ ins. long, funnel-shaped, 1 in. wide, with five rounded, spreading lobes, pale pink with yellow in the throat. Calyx persistent, with five linear, downy lobes scarcely $\frac{1}{4}$ in. long. Flower-stalk hairy, $\frac{1}{2}$ in. long, with four unequal-sized bracts below the ovary, which continue to grow as the fruit ripens and hide it. The two largest bracts are $\frac{3}{4}$ in. long and $\frac{3}{8}$ in. wide.

Native of Central and W. China ; discovered in 1875, but not introduced until 1902, when Wilson sent home living plants to Messrs Veitch. Seeds were sent two years later. The first flowers opened in the Coombe Wood nursery in 1907. This shrub bears its fragrant blossoms abundantly, the year-old shoots developing short side twigs on which they appear in May and June, thus forming sprays with the flowers in a double row of clusters.

D. VENTRICOSA, *Hemsley*.

(Bot. Mag., t. 8294.)

A deciduous shrub, 6 to 15 ft. high ; young shoots downy. Leaves oval or ovate-lanceolate, rounded at the base, the apex long and taper-pointed, edged with a few gland-tipped teeth, sometimes quite entire ; 2 to 6 ins. long,



DIPELTA VENTRICOSA.

$\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide ; downy on the margins and slightly so on both surfaces ; stalks $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers produced at the end and in the leaf-axils of short side shoots ; usually they are solitary in the leaf-axil and in a terminal corymb of three. Corolla between tubular and pitcher-shaped ; 1 to $1\frac{1}{4}$ ins. long, and $\frac{3}{4}$ in. wide at the mouth ; the tube protruded on one side near the base ; five-lobed, the lobes rounded, and the two upper ones the smaller ; deep rose outside, paler within, except in the throat, which is orange-coloured. Calyx with five awl-shaped lobes, $\frac{1}{2}$ in. long, fringed with short hairs. Flower-stalk slender, and furnished with several bracts at the base of each flower. These bracts (the largest $\frac{2}{3}$ in. long, $\frac{1}{2}$ in. wide), are

persistent and become attached to the fruit, which is also covered by the persistent calyx. Distinct from *D. floribunda* in the smaller, bellied corolla.

Native of W. China; discovered and introduced by Wilson in 1904, flowered in the Coombe Wood nursery in May, 1908. It thrives very well, and promises to be an ornamental as well as interesting shrub.

DIPTERONIA SINENSIS, *Oliver*. ACERACEÆ.

A deciduous, small tree up to 25 ft. high, with a trunk 6 ins. or more in diameter, or sometimes merely a big bush. Leaves opposite, pinnate, 9 to 12 ins. long, consisting usually of from seven to eleven leaflets, which are opposite, ovate or lanceolate, short-stalked; $1\frac{1}{2}$ to 4 ins. long, one-third as much wide; sharply, coarsely, and irregularly toothed; covered like the twigs when very young with scattered hairs which soon fall away. Panicles glabrous, erect, pyramidal, 6 to 12 ins. long. Flowers polygamous, very small, greenish white; stamens white, six to eight, $\frac{1}{8}$ in. long. Fruits produced in large clusters, each one composed of two flat, winged carpels (like the fruits of Wych-elm or *Ptelea*), obovate, $\frac{3}{4}$ to 1 in. long.

Native of Central China, at from 3500 to 5000 ft. elevation. This interesting and handsome species was introduced by Wilson for Messrs Veitch about 1900. It is beautiful in foliage, and its fruits are very interesting; it flowered at Kew in June 1912, but the blossoms were in no way effective. It is evidently quite hardy, thriving well in good loam, and can be propagated by cuttings taken in July and put in gentle bottom heat; it also roots readily from layers. Although an ally of the maples (*Acer*), it is very distinct from them in fruit, and the leaflets are more numerous than in any of the pinnate maples.

D. DYERIANA, *Henry*, the only other species known, also a native of China, is not introduced.

DIRCA PALUSTRIS, *Linnaeus*. LEATHERWOOD.

THYMELÆACEÆ.

(Bot. Reg., t. 292.)

A deciduous shrub, 3 to 6 ft. high, with flexible, jointed branches, and very tough, smooth bark; buds downy. Leaves alternate, oval or obovate; $1\frac{1}{2}$ to 3 ins. long, about half as wide; tapered at both ends, not toothed, smooth and pale green above, somewhat glaucous beneath; stalk $\frac{1}{8}$ in. or less long. Flowers appearing in March at the joints of the naked wood, usually three together on very short stalks. There is no corolla; calyx $\frac{1}{8}$ in. long, funnel-shaped, toothed, pale yellow; stamens eight, protruded. Fruit a pale, oval drupe, $\frac{1}{3}$ in. long, rarely seen in Britain.

Native of Eastern N. America; introduced in 1750. This is not a showy plant, and its yellow flowers are often injured by spring frost, but it is an interesting one. It is closely allied to the *Daphnes*, which differ from *Dirca* in having spreading calyx (or perianth) lobes and stamens

not protruded. *Dirca* is a moisture-loving plant, and likes a deep soil to which some peat is added. A specimen in the Cambridge Botanic Garden has attained a diameter of 9 ft. The remarkable toughness and flexibility of the shoots have been taken advantage of in several ways. In early times the American Indians used the bark for making ropes, and the twigs are still used in rural districts as tying material and for basket-making.

DISANTHUS CERCIDIFOLIA, *Maximowicz*. HAMAMELIDACEÆ.

(Sargent's Forest Flora of Japan, t. 15.)

A deciduous shrub up to 8 or 10 ft. high, with slender, spreading branches; young shoots perfectly smooth and round, and marked with small whitish lenticels. Leaves alternate, firm, very broadly ovate to roundish, heart-shaped or truncate at the base, blunt and rounded at the apex; 2 to 4½ ins. long, and almost or quite as broad; perfectly smooth, glaucous green and entire; stalk 1 to 2 ins. long. Flowers dark purple, two of them set back to back at the end of a stalk ¼ in. long, produced from the leaf-axils. Each flower is ½ in. across, with five narrow tapering petals, arranged starwise; calyx with five short recurved lobes; stamens five. Seed-vessel a woody, nut-like capsule.

Native of Japan; introduced about 1893, not yet well known in gardens. It has not yet flowered in Britain to my knowledge, and the appearance of the blooms is chiefly known from Sargent's figure above cited. We know it, however, to possess one excellent quality: its foliage—handsome and Judas-tree like in form, turns in autumn to one of the loveliest of claret-reds suffused with orange. No new shrub, indeed, is more beautiful in this respect. It is rather tender when young, but appears quite hardy after a few years. A plant at Kew, 3 ft. high, growing in peaty soil in a bed of heaths, is in excellent condition, and was not injured in the least in the winter of 1908-9. *Disanthus* (the name refers to the paired flowers) is only known by this species. It belongs to that group of the Witch-hazel family with many seeds in each fruit. In Japan it flowers in October when the previous year's seeds are ripening, resembling in this respect its ally the Virginian witch-hazel.

DISCARIA. RHAMNACEÆ.

A genus of small trees or shrubs closely allied to *Colletia*, and found chiefly in S. America. One almost hardy species is found in New Zealand, and the same or a nearly allied one in Tasmania and S. Australia. The leading characteristics of these plants are their large opposite spines, which are really reduced branches; their opposite or clustered leaves, and their numerous small, clustered, axillary flowers, of which a bell-shaped calyx is the most conspicuous part, the petals being often absent. Fruit a dry, three-lobed capsule. Besides the two species described below, a third is sometimes cultivated, viz., *D. LONGISPINA*, *Miers*, a native of

Uruguay. It has small obovate leaves, $\frac{1}{2}$ in. or less long, slender spines 2 ins. or more long, and crowded clusters of small yellowish white flowers. It requires the protection of a wall.

The Discarias like a sheltered, sunny position, ordinary garden soil, and they can be multiplied by means of cuttings taken in July and placed in a close frame.

D. SERRATIFOLIA, *Bentham*.

(Gardeners' Chronicle, 1876, ii., f. 65;
Colletia serratifolia, *Ventenat*.)

A deciduous shrub, 10 to 14 ft. high, with long, slender, pendulous, spiny branches. Leaves opposite, $\frac{1}{2}$ to 1 in. long, ovate-oblong, with shallow, rounded teeth; both surfaces smooth and lustrous green, especially the upper one, which has an almost varnished appearance. The spines, stiff, sharp, and $\frac{3}{4}$ in. or more long, are produced in pairs at each joint. Flowers crowded in clusters on short twigs from the year-old shoots, each flower about $\frac{1}{8}$ in. across, with no petals, but a greenish white calyx tubular at the base, divided at the top into five triangular lobes.

Native of Chile and Patagonia; cultivated at Kew since 1842, and quite hardy. Although it has no colour-beauty to recommend it, its flowers are borne so abundantly in June as to render it quite pretty, and they are, besides, charmingly fragrant. It is well worth cultivating for these, as well as for its distinct and graceful appearance and glossy dark foliage.

D. TOUMATOU, *Raoul*. WILD
IRISHMAN.

A deciduous shrub, varying in New Zealand from a low, scrubby bush 2 ft. high, to a small tree 25 ft. high, with long, slender, flexuous and exceedingly spiny branches. Spines 1 to 1 $\frac{1}{2}$ ins. or even more long, opposite, sharply pointed, stiff, standing out from the branchlets at almost right angles. Leaves opposite on the shoots of the year, or in clusters beneath the spines on the year-old shoots,



DISCARIA TOUMATOU.

from $\frac{1}{2}$ to $\frac{3}{4}$ in. long, varying in shape from narrow oblong to obovate. Flowers

greenish white, $\frac{1}{8}$ in. across, produced very numerous in clusters along with the leaves; calyx with four or five lobes, petals absent. Fruit a round, three-valved capsule, $\frac{1}{8}$ in. wide.

Native of New Zealand. This remarkable shrub is unfortunately too tender to thrive in the open at Kew, but succeeds very well against a south wall, where it flowers in great profusion every May. It is worth growing for its extraordinary spines, which are green and terete, and as thick as the shoot from which they spring. The leaves are sometimes absent on old plants.

DISTYLIUM RACEMOSUM, *Siebold*. HAMAMELIDACEÆ.

(Gardeners' Chronicle, 1906, ii., fig. 120.)

An evergreen shrub with rigid, short branches (a small tree in nature); young shoots minutely warted. Leaves alternate, leathery, entire, narrow-oblong or obovate, tapering at the base to a short stalk, often blunt at the apex; $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; shining deep green, smooth on both sides except when very young. Flowers sometimes unisexual, in small erect racemes, about 1 in. long. There are no petals, but a five-parted, reddish, downy calyx, and several lurid purple stamens; flower-stalks covered with rusty-coloured scurf. Fruit semi-woody, downy, surmounted by the two styles which remain attached at the top, and to which the generic name refers.

Native of Japan, where, according to Sargent, it is an evergreen tree, with an exceedingly hard, dark-coloured, valuable wood. It has never promised to be more than a dwarf, somewhat stiff shrub in this country. It is not very hardy at Kew, but grows well and flowers out-of-doors at Edinburgh, at Haslemere in Surrey, and will do so, of course, in other mild localities. It belongs to the curious rather than to the beautiful class of shrubs. Propagated by cuttings. Its nearest ally is *Sycopsis*.

Var. *VARIEGATUM*.—Leaves narrow, often deformed; blotched and margined irregularly with creamy white; often grown in cool greenhouses, and better known in gardens than the green type.

DORYCNIUM. LEGUMINOSÆ.

Of the half-dozen or so species that make up this genus, none is genuinely shrubby, for much of the growth they make during summer dies the following winter after bearing flowers and seeds. But the two here described (especially *D. suffruticosum*) form woody permanent bases. They belong to the pea-flowered section of Leguminosæ, and are distinguished by the capitate inflorescence, the thick, short seed-pods, and the quinquefoliolate leaves. Very easily cultivated in an open position in a light, loamy soil.

D. HIRSUTUM, *Seringe*.

(*Cytisus Lotus*, *Hort.*)

A semi-herbaceous plant, with erect, branching, annual stems, round, slightly ribbed and hairy, springing from a woody base. Leaves of five

leaflets with scarcely any stalk. Leaflets obovate, $\frac{3}{4}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; hairy, especially beneath. Flower-heads $1\frac{1}{2}$ ins. across, produced on hairy stalks 1 to 2 ins. long, from the leaf-axils and at the ends of the shoots. Flowers $\frac{3}{4}$ in. long, six to ten in a head, white; calyx $\frac{1}{8}$ in. long, five-lobed, very hairy. Pod $\frac{1}{3}$ in. long, smooth, oblong, containing about four seeds, the calyx persisting at the base.

Native of S. Europe; cultivated in England in 1683. It has recently reappeared and spread in gardens as "*Cytisus Lotus*." When in bloom it has a resemblance to some brooms of the *Cytisus supinus* group, but is, of course, very distinct in the smooth pods and axillary inflorescence. It flowers from June to September, and produces seed abundantly; these afford the best means of increase.

D. SUFFRUTICOSUM, *Villars*.

(*Lotus Dorycnium*, *Linnaeus*.)

A deciduous shrub, 2 to 3 ft. high, of thin, elegant habit. Stems very slender, much-branched, slightly ribbed, furnished when quite young with grey appressed down. Leaves of five leaflets, stalkless; leaflets linear-obovate, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, greyish, with silky hairs. Flowers produced in numerous rounded heads, $\frac{1}{2}$ in. or so across, from the leaf-axils near the top of the branch, each head being borne on a slender stalk 1 to $2\frac{1}{2}$ ins. long. Flowers pinkish white, $\frac{1}{4}$ in. long, ten to twelve in a head; calyx $\frac{1}{8}$ in. long, with five narrow, pointed lobes, silky grey. Pod rounded, about $\frac{1}{8}$ in. long, containing one seed.

Native of S. Europe, known in gardens since the middle of the seventeenth century, but not much grown now. The base only of the plant is shrubby, the upper part being semi-herbaceous, and dying back in winter. It is a graceful but not showy plant, flowering from June to September. Occasionally it ripens a good crop of seed, by which, and by soft wood-cuttings placed in bottom heat, it can be propagated.

DRIMYS. MAGNOLIACEÆ.

A small genus of fragrant aromatic shrubs, two of which are grown out-of-doors in the mildest parts of the British Isles. Leaves alternate, entire, glabrous. They thrive in a warm, loamy soil, and can be propagated by cuttings or layers. *D. Winteri* is the hardier shrub; the other, *D. AROMATICA*, *F. Mueller*, is a tender evergreen suitable only for Cornwall and similar places; there it is already 15 ft. high. Leaves $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, oblanceolate, obtuse; both the leaf-stalks and the young shoots suffused with rich red. Flowers numerous produced during April and May in fascicles from the leaf-axils and at the ends of the branchlets; unisexual, white, $\frac{1}{2}$ in. across; petals linear; flower-stalk slender, $\frac{1}{2}$ in. long. The leaves have a pungent, peppery taste, and the dried fruit has been used as a substitute for pepper. Native of Tasmania, where it is very abundant, and of Victoria.

D. WINTERI, *Forster*. WINTER'S BARK.

(*Bot. Mag.*, t. 4806; *Wintera aromatica*, *Murray*.)

A handsome evergreen shrub, rather tender, and really satisfactory only in the milder parts of the kingdom; young shoots smooth, often tinged with red. Leaves lanceolate, 5 to 10 ins. long, smooth, bright rather pale green, very

aromatic when crushed. Flowers borne in a cluster of loose umbels, from four to seven in each umbel; they are ivory white, fragrant, and about $1\frac{1}{4}$ ins. across; petals linear, pointed, spreading.

Native of S. America from Tierra del Fuego to north of the equator; introduced as a living plant in 1827, but known since 1578, in which year its bitter aromatic bark was brought home by Capt. Winter (after whom it is named) in one of Drake's ships from the Magellan Straits. In the south-west of England it is a free-growing shrub 12 to 25 ft. high; but, wild in S. America, it is described as over 40 ft. high. At Gravetye Manor, near East Grinstead, a group of plants 4 ft. high came through the trying winter of 1908-9 with little injury. At Kilmacurragh, Co. Wicklow, a specimen is 30 ft. high.

ECCREMOCARPUS SCABER, *Ruiz and Pavon.* BIGNONIACEÆ.

(Bot. Reg., t. 939.)

A semi-woody climber with herbaceous shoots and the habit of a Clematis; stems ribbed, not downy. Leaves opposite, doubly pinnate; leaflets three, five, or seven on each subdivision, ovate, oblique, irregularly and unequally lobed; $\frac{1}{4}$ to $1\frac{1}{4}$ ins. long, often heart-shaped at the base, smooth; the main-stalks end in a much-branched tendril which supports the plant by twisting round any available object. Flowers nodding, produced from June onwards in racemes 4 to 6 ins. long, of usually seven to twelve blossoms. Corolla nearly 1 in. long, bright orange-red, tubular, bellied on one side, contracted at the mouth to a narrow orifice, where are five small, rounded lobes. Calyx minutely glandular. Seeds flat, winged, numerous, in inflated pods $1\frac{1}{2}$ ins. long, $\frac{5}{8}$ in. wide.

Native of Chile; introduced in 1824. This handsome climber rarely survives the winter in the open, except against a wall, but ripening seed in abundance it may, if necessary, be treated as an annual. The seeds should be sown in February in heat, and the seedlings planted out, after being once potted, in May. Usually classed with woody plants, it scarcely has a right to be considered as such out-of-doors, although in greenhouses it lives an indefinite time, and forms a stout woody base.

EHRETIA ACUMINATA, *R. Brown.* BORAGINACEÆ.

A small deciduous tree, 15 to 20 ft. high in this country, of open, spreading habit; young shoots soon smooth, marked with pale spots. Leaves alternate, oval, ovate, or slightly obovate; 3 to 7 ins. long, $1\frac{1}{2}$ to 3 ins. wide; smaller on the flowering shoots; tapered or rounded at the base, short-pointed, toothed; furnished above when young with small appressed hairs which soon fall away, tufted in the vein-axils beneath; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers fragrant, white, produced in August in terminal pyramidal panicles 3 or 4 ins. long; the corolla is $\frac{1}{4}$ in. across, deeply five-lobed; calyx with five rounded lobes. Fruit a drupe, at first orange, finally black; rarely seen in this country.

Native of China and Japan; rare in cultivation. A nearly allied, or the same, plant was introduced in 1795 from the Himalaya, and grown in

the early part of last century as *E. serrata*, *Roxburgh*. Although tender when young, and liable to have its shoots winter-killed, *E. acuminata* is perfectly hardy in the adult state at Kew, where there is a tree 18 ft. high, which has grown on its present site for at least thirty years, its trunk being now 1 ft. 9 ins. in girth. It is growing along with other trees and shrubs, but has a full north-east exposure. The species is interesting botanically as a hardy tree belonging to the borage family, and in flowering so late, but it is not showy. A second species is—

E. MACROPHYLLA, *Wallich*.—A handsome foliaged plant, not getting beyond the dimensions of a shrub with us, and more tender than *E. acuminata*. It is frequently killed to the ground at Kew, but sends up stout, erect shoots several feet high during the ensuing summer. Leaves roundish; 4 to 6 ins. long, two-thirds to nearly as much wide; rough with small bristles on both surfaces, especially above; young shoots similar. Native of the Himalaya, whence it was first introduced; also of China, whence a form introduced by Wilson is proving hardier. The genus was named after Ehret, a German botanical artist.

ELÆAGNUS. OLEASTER. ELÆAGNACEÆ.

Of the three genera which form the natural order of scaly shrubs called Elæagnaceæ, Elæagnus itself is distinguished from the other two—*Shepherdia* and *Hippophaë*—by its perfect (not one-sexed), flowers, and from *Shepherdia* further by its alternate leaves. It consists of fifteen to twenty species of evergreen or deciduous trees and shrubs, all the younger parts of which are covered with silvery or brownish scales. The flowers are in axillary clusters, and mostly fragrant; the perianth (there are no petals) has a cylindrical or bell-shaped tube expanding at the mouth into four lobes, resembling a miniature fuchsia. Stamens four, very shortly stalked, and attached at the top of the tube. Fruit a one-seeded drupe. Some of the scales as seen under the lens are beautifully fringed with silvery hairs; in fact, the whole aspect of the young parts of Elæagnus under a sufficient magnifying power is remarkably beautiful.

The Oleasters need a soil of only moderate quality, for the silvery leaved deciduous ones develop a better colour on a light, sandy loam than on a rich one. The evergreen species are best increased by cuttings, the deciduous ones by seed. Grafting is sometimes recommended for the evergreen ones, but as the stocks have to be raised from deciduous species, plants so raised are not so healthy and long-lived as those on their own roots. The deciduous species need exposure to full sunlight.

E. ANGUSTIFOLIA, *Linnaeus*.

(*Bot. Reg.*, t. 1156; *E. hortensis*, *Bieberstein*.)

A deciduous shrub or small tree, 15 to 20 ft. high, with spiny branches; young shoots covered with glistening silvery scales, becoming smooth and dark the second year. Leaves narrow-oblong or lanceolate; 1 to 3½ ins. long, ⅔ to ⅝ ins. wide; dull green and scaly above, silvery scaly beneath; Flowers ⅔ in. long, fragrant, produced in early June, one to three in each leaf-axil of the young shoots. Each flower has a bell-shaped tube and four

spreading lobes about as long as the tube; silvery outside like the under-surface of the leaves, yellow inside; stalk $\frac{1}{2}$ in. long. Fruit oval, $\frac{1}{2}$ in. long, yellowish, silvery scaly; flesh mealy, sweet.

Native of S. Europe and W. Asia; cultivated in England, according to Aiton, since the sixteenth century. It is a striking tree, especially when associated with dark-leaved evergreens, because of the whiteness of the twigs and under-surface of the leaves. In this respect, however, it is not so remarkable as *E. argentea*, whose leaves are silvery on both sides, but it is a larger, better-shaped tree. A kind of sherbet is made from the fruit in the Orient. In



ELEAGNUS ARGENTEA.

Central Europe, especially in the parks and gardens of Germany and Austria, it is much planted, and as the foliage is much whiter under the continental sun than it is in Britain, it often makes a very telling feature in the landscape.

E. ARGENTEA, *Pursh*. SILVER BERRY.

(Bot. Mag., t. 8369.)

A deciduous shrub, 6 to 12 ft. high, of thin, erect habit, with rather slender branches; spreading by underground suckers; young shoots covered with

reddish glistening scales. Leaves oval to narrowly ovate, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; wedge-shaped at the base, rounded or pointed at the apex; both surfaces white and lustrous with silvery scales; stalk $\frac{1}{8}$ in. long. Flowers produced during May in great profusion in the leaf-axils of the young twigs, often three in each axil; they are drooping, $\frac{1}{2}$ in. long, with a stalk $\frac{1}{8}$ in. long; narrow tubular, shining and silvery outside, yellow on the inside of the four pointed lobes; very fragrant. Fruit roundish, egg-shaped, silvery, $\frac{1}{3}$ in. long, with a dry, mealy flesh, said to be edible.

The only species native of N. America, reaching from the Hudson Bay Territory and British Columbia to the Central United States; introduced in 1813. This shrub is one of the most striking of those with silvery foliage, and when laden with its yellow, delightfully fragrant flowers, few others are more pleasing. It is increased by taking off the sucker growths by which it spreads. There is a great confusion in gardens and nurseries between this plant and *Shepherdia argentea*, which seems to have existed in Loudon's time. Loudon does not seem to have known the true plant. There is one simple distinction between them: the *Elæagnus* has alternate leaves, the *Shepherdia* opposite ones. The latter, moreover, is far from being as fine a shrub.

E. GLABRA, *Thunberg.*

There is much confusion in gardens between this species and *E. pungens*; but *E. glabra* differs from *E. pungens* in the following respects. It is not thorny, its longer-pointed leaves are of thinner texture, their lower surface brown and shining with a metallic lustre (*E. pungens* is whitish and dull beneath); and it is of more rambling, even climbing habit. For the rest, *E. glabra* is a vigorous evergreen shrub, with us 15 to 20 ft. high, but twice as much on trees and houses in the south of Europe. The flowers appear in October and November, and are funnel-shaped, white, clothed with brownish scales, fragrant. Young shoots slender, covered with brown, glossy scales.

Native of Japan and China. There appears to be no variegated form of *E. glabra* in cultivation.

E. MACROPHYLLA, *Thunberg.*

(Bot. Mag., t. 7638.)

A robust evergreen shrub of rounded, spreading habit, reaching at present 8 to 12 ft. in height in this country; usually wider than high; young shoots silvery white, with a dense coat of scales. Leaves ovate to broadly oval, rounded at the base, pointed; 2 to $4\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{3}{4}$ ins. wide, silvery all over when young, but afterwards dark lustrous green and slightly scaly above, always of a beautiful silvery metallic lustre beneath; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers produced during October and November, usually in clusters of four to six in the leaf-axils; they are about $\frac{1}{2}$ in. long and wide, each on a stalk $\frac{1}{4}$ in. long; silvery scaly, shaped like a fuchsia, nodding, very fragrant, the four segments triangular. Fruit oval, $\frac{3}{8}$ in. long, red, scaly, the perianth persisting at the top.

Native of the Corean Archipelago and Japan, described by Thunberg in 1784; introduced by Mariés for Messrs Veitch in 1879. It is perfectly hardy, and flowers annually at a time of year when few blossoms remain out-of-doors. It is the largest leaved and handsomest of evergreen oleasters, and is very effective in spring before the young silvery leaves lose their sheen. Allied to *pungens* and *glabra*, it is very distinct from them in the broader silvery leaves and broader more bell-shaped flowers.

E. MULTIFLORA, Thunberg.(Bot. Mag., t. 7341 ; *E. longipes*, *A. Gray.*)

A deciduous or semi-evergreen shrub, 6 to 10 ft. high, as much or more across ; young branches covered with red-brown scales. Leaves oval, obovate, or ovate ; $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide ; tapered at both ends, green, and furnished with scattered tufted hairs above, becoming smooth later, silvery beneath, with a dense covering of tiny scales, intermingled with which are larger reddish brown ones ; stalk $\frac{1}{4}$ in. long. Flowers fragrant, produced in April and May along with, and in the leaf-axils of, the new shoots ; often solitary, about $\frac{5}{8}$ in. long, $\frac{3}{8}$ in. wide ; scaly like the under-surface of the leaf. Fruit $\frac{1}{2}$ in. long, oblong, deep orange, scaly, with a very acid but agreeable flavour ; stalk $\frac{3}{4}$ to 1 in. long.

Native of Japan, whence it was introduced about 1862 ; also of China and probably Corea. It is cultivated in Japan for its fruit, and, according to Sargent, becomes a small tree 20 to 25 ft. high, with a trunk 1 ft. in diameter. The fruits are very abundantly borne, and make the bush very handsome when



ELÆAGNUS MULTIFLORA (in fruit).

ripe in July, hanging along the under-side of the branches. Birds are fond of them.

E. multiflora is a variable species, and the form described above with long-stalked fruits is sometimes regarded as a separate species (*E. LONGIPES A. Gray.*). A form with shorter-stalked, smaller fruits and more lanceolate leaves has been called *LONGIPES* var. *CRISPA*, *Maximowicz.*

E. ORIENTALIS, Linnaeus.(*E. sativa*, *Hort.* ; *E. tomentosa*, *Moench.*)

A deciduous tree up to 20 ft. high, not so spiny as *E. angustifolia*, of which it is sometimes considered a variety ; young shoots downy as well as scaly. Leaves oval or ovate, $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{2}$ to 1 in. wide ; rounded at the base, blunt at the apex, dull green above, covered beneath with silvery scales and starry tufts of down ; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers yellow inside, silvery outside ; very fragrant. Fruit roundish oval, yellowish, with silvery scales.

Native of the Orient; introduced in 1739. Very closely allied to *E. angustifolia*, of which it may be an Eastern form, this differs in its broader, shorter leaves, which are not so glistening beneath, and in the presence of stellate down. It does not in my experience flower so freely, and on the whole is not so desirable.

E. PUNGENS, *Thunberg*.

An evergreen shrub up to 15 ft. high, of dense spreading habit, and more or less thorny; young shoots covered with brown scales. Leaves leathery, oval or oblong; $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; often blunt at the apex, rounded at the base, margins wavy; upper surface dark green and glossy, sprinkled with scales when young, afterwards smooth; lower surface dull white dotted with large brownish scales; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, brown like the young wood and midrib. Flowers pendulous, $\frac{1}{2}$ in. long, the tubular portion widening abruptly above the ovary; silvery white, fragrant, clustered often in threes in the leaf-axils, and opening in October and November. Fruit $\frac{1}{2}$ to $\frac{3}{4}$ in. long, at first brown-scaly with the perianth persisting, red when ripe; rarely seen in Britain.

Native of Japan; perfectly hardy near London. It is often grown as *E. glabra*, a distinct species under the note upon which the differences are pointed out. The fragrance of the flower is like that of *Gardenias*.

Var. *AUREA*.—Leaves margined with rich yellow.

Var. *AUREO-Variegata*.—A richly coloured form, whose large leaves are sometimes $4\frac{1}{2}$ ins. long and $2\frac{1}{4}$ ins. wide, variously marked with deep yellow, much richer than the yellow of var. *Frederici*. The coloured patch is always in the centre, but varies in size; often there is only a thin border of dark green, sometimes only one side of midrib is coloured. Between the yellow and the green there are frequently patches of an intermediate yellowish shade. This shrub is probably the most ornamental and striking of all variegated evergreens. Its effect in midwinter is bright and pleasing. Like many variegated shrubs with the colouring in the centre of the leaf, it is liable to revert to the green type; shoots showing this disposition must be cut away.

Var. *FREDERICI* (syn. *aureo-picta*).—Leaves rather small and narrow, the cream-coloured or pale yellow centre bordered with a thin margin of glossy dark green.

Var. *REFLEXA* (*E. reflexa*, *Decaisne*).—Less thorny than the type; leaves very brown-scaly beneath; margins not wavy. Perhaps a hybrid with *E. glabra*.

Var. *SIMONI*.—Leaves very silvery beneath.

Var. *Variegata*.—Leaves with a border of yellow like var. *aurea*, but of a paler shade.

E. UMBELLATA, *Thunberg*.

A large, wide-spreading, deciduous, often thorny shrub, sometimes 20 to 30 ft. across, 12 to 18 ft. high; twigs covered with brownish scales. The shoots sometimes retain a few leaves at the ends throughout the winter. Leaves narrowly oval; 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; tapered at the apex, tapered or rounded at the base; rather bright green above, shining and silvery beneath; stalk about $\frac{1}{3}$ in. long. Flowers produced during May and June, when the young leaves are about one-third grown, in clusters of one to three; each flower $\frac{1}{2}$ in. long, funnel-shaped, silvery outside, creamy white inside. Fruit globose, $\frac{1}{4}$ to $\frac{1}{3}$ in. diameter, at first silvery, finally red; stalk $\frac{1}{4}$ in. long.

Native of the Himalaya, China, and Japan; varying considerably in several respects, one form coming into flower when another is almost past. The habit also varies, some forms being much wider spreading than others.

The largest plant at Kew is 30 ft. across. A handsome species both in flower and fruit.

Var. *PARVIFOLIA* (E. *parvifolia*, *Wallich*).—Shoots at first silvery; leaves covered with distinctly starry hair-tufts on the upper surface when young, becoming smooth later; silvery and scaly beneath.

E. *umbellata* differs from E. *multiflora* in its globose, short-stalked fruits; in the tube of the perianth being more slender; and in the leaves being paler, longer, and proportionately narrower. It also flowers later.

ELLIOTTIA

RACEMOSA, *Muhlenberg*.

ERICACEÆ.

(Bot. Mag., t. 8413.)

A deciduous shrub, 4 to 10 ft. high, or occasionally a small tree twice as large; young shoots downy. Leaves narrowly oval or obovate, tapering towards both ends, 2 to 5 ins. long; $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide, dark dull green and smooth above, paler and sparsely hairy beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long, hairy. Flowers thinly arranged in a terminal raceme or panicle 4 to 10 ins. high, pure white, slightly fragrant; petals four, oblong, rounded at the end, $\frac{5}{8}$ in. long, reflexed, downy at the margins; calyx $\frac{1}{8}$ in. diameter, with four rounded lobes; stamens eight, shorter than the petals, and with broad, flattened stalks; style as long as the petals. Flower-stalk white, slender, usually one- sometimes three-flowered, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, with a pair of tiny bracts midway. Fruit and seed unknown.

Native of Georgia in the southern United States, and only found in a few isolated spots in the Valley of the Savannah River. It was originally discovered early in the nineteenth century by the botanist, Stephen Elliot (1771-1830), after whom the genus is named, but was not introduced to England until 1894, when Mr Berckmans of Augusta, Georgia, sent a plant to Kew. It first flowered in July, 1911. It is not



ELLIOTTIA RACEMOSA.

improbable that this beautiful and interesting plant may entirely disappear, if it has not already done so, in a wild state, for it appears to have lost the faculty of perfecting seed, and only persists by producing root-suckers. Among deciduous members of the hardy Ericaceæ, its four-petalled flowers and elongated racemes distinguish it. It is one of the rarest shrubs in the world, two plants at Kew and some young ones raised from them being probably the only ones in Europe.

ELSHOLTZIA STAUNTONII, *Bentham*. LABIATÆ.

(Bot. Mag., t. 8460.)

A semi-woody plant, about 5 ft. high, scarcely shrubby, the growths dying back considerably during winter, sending up each summer erect leafy growths, bearing the flowers in panicles at the top during September and October. Shoots cylindrical, clothed with a very fine down. Leaves opposite, lanceolate, slenderly tapered at both ends, coarsely triangular-toothed except at the ends, 2 to 6 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; dark green above, pale and covered with minute dots beneath; smooth on both sides, minutely downy on the margins. When crushed the leaf emits an odour like mint. Flower-panicles narrow-cylindrical, grey, woolly, 4 to 8 ins. long, about 1 in. wide, produced at the end of the main and axillary secondary shoots, forming a large branched inflorescence at the top. Flowers small, purplish pink, crowded in short-stalked umbels on the main axis of the panicle.

Native of China; long known to botanists, but only introduced to cultivation in 1909. It is useful for flowering late in the season, but is of a rather weedy character. Propagated very easily by cuttings of youngish growths. Thrives in rich loamy soil and in full sunshine. The spelling of the generic name is sometimes confused with *Eschscholtzia*—a genus of Californian plants allied to poppies.

EMBOTHRIUM COCCINEUM, *Forster*. FIRE BUSH.

PROTEACEÆ.

(Bot. Mag., t. 4856.)

This remarkable evergreen, small tree perhaps hardly comes within the scope of this work, for it is only suitable for the mildest parts of our islands, such as Cornwall, the south-west of Ireland, and similar places. It has dark glossy green, somewhat leathery leaves, ovate-lanceolate or oval, $2\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; blunt-ended, smooth, and entire. Flowers brilliant crimson-scarlet, produced in wonderful profusion in short axillary and terminal racemes. Each flower is borne on a thin stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, and is at first a slender tube 1 to $1\frac{1}{2}$ ins. long; afterwards the four strap-shaped lobes (in the broadest part of which the anthers are enclosed) curl back, exposing the long erect style. Perhaps no tree cultivated in the open air in the British Isles gives so striking and brilliant a display of colour as this does. In some of the

Cornish gardens there are specimens 30 ft. high, and about the same through. Like many of its natural order it is often short-lived, and after twenty to twenty-five years is liable to die suddenly without any assignable reason. A native of Chile; introduced by Wm. Lobb in 1846; flowers in May. A tree 40 ft. high, at Kilmacurragh, has a trunk $1\frac{1}{2}$ ft. in thickness, and produces suckers from the roots.

EMPETRUM NIGRUM, *Linnaeus*. CROWBERRY. EMPETRACEÆ.

A low, evergreen, heath-like shrub, about 1 ft. high in gardens, with spreading, wiry, procumbent stems, minutely downy when young. Leaves narrow-linear, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, sometimes arranged in fours, but usually arranged indiscriminately on the shoot, always crowded, blunt at the apex, dark green with a white line beneath, margins much decurved. Flowers mostly unisexual, with the sexes on different plants, produced during March singly in the leaf-axils near the tips of the previous summer's shoots. They are very small, and the only conspicuous part is the stamens, of which there are three to each male flower; they are pinkish, and have long, very slender stalks holding the anthers slightly beyond the leaves. The fruit is an orange-shaped black berry, $\frac{3}{16}$ in. wide, borne in clusters near the end of the twigs, each containing six to nine seeds.

Native of the high latitudes of the northern hemisphere, including Britain; a form approaching var. *tomentosum* is also found in Chile. The crowberry is not common in gardens, but it thrives very well in the London district and makes a low, dense, neat mass of greenery, easily increased by cuttings. It is a moorland plant, and an associate of the heather, cranberry and whortleberry, and likes a sandy, peaty soil. The fruits are said to be eaten by peasantry, but are not very desirable. The only allied genus in gardens is *Corema*. The affinities of these shrubs are doubtful, but the general opinion now is to regard them as nearest to the box family.

Var. *PURPUREUM*.—Berries reddish purple. Native of N. America.

Var. *SCOTICUM*.—A dwarf form with smaller leaves.

Var. *TOMENTOSUM*.—Young stems thickly covered with grey down.

ENKIANTHUS. ERICACEÆ.

A distinct group of deciduous shrubs and small trees, native of N.E. Asia. In habit they are marked by the branches and leaves being in whorls, which give to some species a peculiar tabulated appearance. The flowers are in pendulous umbels or racemes; the corolla either bell-shaped or pitcher-shaped, with five small lobes. Calyx five-lobed, and persistent on the seed-vessel. Stamens ten, not so long as the corolla.

These shrubs like a moist soil, with which decayed leaves and some peat have been mixed. Probably, like so many of their family, they dislike lime. Their general treatment is the same as for the hardy Azaleas, and they have a similar love of sunshine. In flower they are pretty and interesting, but their great beauty comes in autumn, when the

leaves turn to various brilliant shades of red and yellow. They are best propagated from seed treated in the same way as recommended for rhododendrons. Cuttings may also be rooted.

E. CAMPANULATUS, *Nicholson*.

(*Bot. Mag.*, t. 7059 (var. *Palibinii*); *Andromeda campanulata*, *Miquel*.)

A deciduous shrub usually 4 to 6 ft. high, occasionally a small tree, branches in whorls; young shoots smooth, reddish. Leaves produced in a cluster at the end of the twig, or alternate on strong growths; obovate to oval, tapered more gradually towards the base, finely toothed, 1 to 2½ ins. long, ½ to 1¼ ins. wide, hairy on the veins of both surfaces, dull green; stalk ⅛ to ⅜ in. long. Flowers produced during May from the terminal bud of the previous year's



ENKIANTHUS CAMPANULATUS.

growth in a hairy raceme sometimes almost reduced to an umbel. Corolla bell-shaped, ⅓ in. long, pendulous, with five rounded lobes, pale creamy yellow, veined and tipped with red; calyx with five lanceolate, pointed divisions ⅓ in. long; stamens very short; flower-stalk downy, ½ to 1 in. long. Seed-vessel egg-shaped, ⅓ in. long.

Native of Japan; introduced in 1880, by Maries, for Messrs Veitch. This is the most satisfactory of the species of *Enkianthus* in our gardens, being quite hardy and flowering freely. It is sometimes cut by late frost. In the Arnold Arboretum, Mass., where the frosts are much more severe than ours, it succeeds remarkably well. The leaves turn golden and red in autumn.

Var. *PALIBINII*, *Bean*.—The plant figured in *Bot. Mag.*, t. 7059, is a distinct form, the flowers being almost wholly of a rich deep red, rather smaller than in the ordinary form, and produced in a distinct raceme. There is a conspicuous line of reddish down bordering the base of the midrib of the leaf beneath. In cultivation at Coombe Wood.

E. CERNUUS, *Bentham and Hooker fil.*

A deciduous shrub, 3 to 6 ft. high, with smooth, bifurcating branches. Leaves obovate, ¾ to 1½ ins. long, half to two-thirds as wide; finely round-

toothed, smooth, or with a few hairs at the base of the midrib beneath. Flowers in a nodding raceme of ten or twelve blossoms, produced in May, each on a downy stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Corolla bell-shaped, $\frac{1}{4}$ in. long and broad, white, the margin cut up into numerous slender-pointed, unequal teeth; calyx-lobes ovate-lanceolate, fringed with short hairs; seed-vessel $\frac{1}{2}$ to $\frac{3}{4}$ in. long.

Native of Japan. It is easily distinguished by the almost fringed mouth of the corolla. Var. RUBENS is similar to the type, except that its leaves are usually shorter and broader (roundish obovate), often from $\frac{1}{2}$ to $\frac{3}{4}$ in. long, and the flowers of a rich deep red. Very distinct and beautiful.

E. HIMALAICUS, *Hooker fil.*

(Bot. Mag., t. 6460; *E. deflexus*, *C. K. Schneider.*)

A shrub or small tree, from 6 to over 20 ft. high; young branches bright red, smooth or hairy. Leaves produced in a cluster at the end of the shoot; 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide; oval, obovate or lanceolate, tapering to both ends, with scattered hairs on both sides, but especially on the midrib beneath. Flowers produced in June along with the young shoots in a terminal, umbellate or racemose cluster, each of the eight to twenty blossoms borne on a drooping, downy stalk $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long. Corolla broadly bell-shaped, $\frac{5}{8}$ in. broad, of various shades of yellowish red with darker lines; lobes triangular, deeper-coloured. Calyx-lobes $\frac{1}{12}$ in. long, triangular and long-pointed. Seed-vessel almost globose, downy.

Native of the Himalaya up to 11,000 ft. altitude, and of W. China. The Himalayan plant is not very hardy and is usually wintered indoors, but the Chinese plants introduced for Messrs Veitch by Wilson in 1908 are likely to prove hardier, as he found them at quite as high altitudes. This Chinese form is not quite identical with the Himalayan one figured in the *Botanical Magazine*, having usually more distinctly racemose flowers and smooth young shoots. *E. himalaicus* has the largest flowers in the genus, and Mr Wilson describes it as one of the most strikingly beautiful shrubs of the W. Chinese mountains.

E. chinensis, *Franchet*, is nearly allied to it, but is distinguished by the smooth leaves and flower-stalks. It is represented in cultivation by a very few plants introduced by Wilson during his journey in Hupeh and Yunnan, 1899-1901. Young shoots smooth. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. wide and long, bell-shaped, salmon pink, with deeper lines. Fruit with five sharp ridges.

E. JAPONICUS, *Hooker fil.*

(Bot. Mag., t. 5822; *Andromeda perulata*, *Miquel.*)

A deciduous shrub, 3 to 6 ft. high; branches bifurcated or arranged in tiers; smooth, reddish. Leaves clustered at the ends of the twigs, 1 to $1\frac{1}{2}$ ins. long, scarcely half as much wide, narrowly oval to obovate, fine-pointed, tapering at the base to a short stalk, minutely toothed, downy only at the base of the midrib. Flowers in a terminal cluster of three or more, each one on a perfectly smooth, slender, drooping stalk about $\frac{1}{2}$ in. long. Corolla white, pitcher-shaped, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, much contracted at the mouth where are five shallow, rounded, reflexed lobes, and five swellings at the base. Calyx of five awl-shaped, smooth lobes $\frac{1}{12}$ in. long. Seed-vessel $\frac{1}{2}$ in. long, cylindrical.

Native of Japan; discovered in 1859 in the neighbourhood of Nagasaki by Sir Rutherford Alcock, and introduced some ten years later by Messrs

Standish. But little known in gardens yet, it is easily distinguished by its white flowers on smooth stalks. It blossoms in April, and its leaves turn a beautiful golden yellow in autumn.

E. SUBSESSILIS, Makino.

(*Andromeda nikoënsis, Maximowicz.*)

A deciduous shrub of bushy habit, 3 to 8 ft. high ; branchlets bifurcated or in whorls, smooth. Leaves produced in a rosette at the end of the twig ; oval to obovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, about half as wide ; tapering to a very short stalk ; abruptly pointed, finely toothed ; dark dull green above, with white hairs on the midrib ; paler beneath, and with darker, longer hairs along the midrib. Flowers produced in late May in slender, nodding, downy racemes, $1\frac{1}{2}$ to 2 ins. long, carrying six to twelve blossoms. Corolla pitcher-shaped, white, $\frac{3}{8}$ in. long, much contracted at the mouth, where are five short recurved lobes ; calyx



ENKIANTHUS JAPONICUS.

lobes ovate, pointed, $\frac{1}{8}$ in. long, edged with hairs ; flower-stalks slender, $\frac{3}{4}$ in. long, smooth except at the base ; seed-vessel egg-shaped, $\frac{1}{8}$ in. long.

Native of Japan ; collected in the Central Province by Maries in 1878 ; introduced to cultivation by Prof. Sargent in 1892, from the Nikko Mountains. It is hardy at Kew, but slow-growing. It has not much beauty of flower, but its foliage turns bright red in autumn. To some extent it resembles *E. japonicus*, having the same white pitcher-shaped corolla, but it is smaller and has not the five rounded protuberances at the base as in *japonicus* ; the inflorescence too is racemose instead of fasciculate.

EPHEDRA. SHRUBBY HORSE-TAIL. GNETACEÆ.

A group of curious shrubs, sometimes climbing, with a mode of growth and branching resembling that of horse-tail (*Equisetum*). They have little garden value, and are rarely seen except in scientific collections. The older parts of the plants are truly woody, the younger parts very pithy ; the branchlets slenderly cylindrical, rush-like, dark or greyish

green, minutely ribbed, opposite or borne in whorls, very tough and flexible, but snapping at the joints. The joints (nodes) are clasped by small membranous sheaths which sometimes develop a pair of leaf-like blades, usually $\frac{1}{8}$ to $\frac{1}{4}$ in. long. The flowers are unisexual, the sexes usually on separate plants, the males being borne on short spikes from the joints, each flower consisting of two opposite membranous sepals and two to eight anthers, which are borne at the top of one central stalk formed by the union of their stalks. The female flower is composed of a naked ovule prolonged at the top into a style-like tube and enclosed in a bag-like calyx or bract, which in the fruiting stage becomes fleshy, red and often sweet and edible.

In cultivation out-of-doors, so far as I have seen, they do not flower profusely or regularly in this country; still less frequently do they bear fruit. The best crop of blossom I have seen was in the early summer of 1912, this being due presumably to the ripening influences of the unusually hot summer of 1911. The flowers are yellow, but have little beauty.

The Ephedras, which in the vegetable kingdom make a connecting link between ordinary flowering plants and conifers, usually inhabit dry, inhospitable regions. Under cultivation they need a well-drained, loamy soil and a sunny spot. They are propagated by seeds and layers and by division. Such species as *E. distachya*, *E. Gerardiana*, and *E. nebrodensis* make evergreen patches, interesting in the garden as being absolutely distinct from any other hardy shrubs. The identification of the species is a difficult botanical study, and a brief general description of a few of the commoner species only can be given here.

E. DISTACHYA, *Linnaeus*.—A shrub variable in height up to 3 or 4 ft., the branchlets rather rigid, with the joints $\frac{1}{2}$ to 2 ins. apart. Leaves $\frac{1}{12}$ in. long. Male flower-spike usually solitary; female flowers in pairs. Fruit globose, $\frac{1}{4}$ in. long, red. Native of S. and E. Europe; cultivated in the sixteenth century. Var. *MONOSTACHYA* (*E. monostachya*, *Linnaeus*) has solitary female flowers.

E. GERARDIANA, *Wallich*.—A densely furnished shrub, often very dwarf (2 or 3 ins. high) in a wild state, but up to 2 ft. high in cultivation, forming a spreading close mass. Branchlets slender, erect, with the joints $\frac{3}{4}$ to 1 in. apart. Male flowers yellow, in a globose or ovate spike $\frac{1}{2}$ in. long. Fruit globose, $\frac{1}{4}$ in. long, red. Native of the Himalaya, the Pamirs, Yarkand, Tibet, etc.

E. INTERMEDIA, *Schrenk*.—An erect shrub about 3 ft. high, branchlets roughish, with the joints $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. apart. Flowers of both sexes often on the same plant. Fruit red, globose, $\frac{1}{4}$ in. long. Native of Central Asia. Distinguished from the others here mentioned by the stouter branchlets and longer internodes.

E. NEBRODENSIS, *Tineo*.—A shrub sometimes 3 ft. or more high, the lower branches prostrate; branchlets with the slightly thickened joints $\frac{1}{2}$ to 1 in. apart. Male flower-spikes solitary, or two or three together; female solitary. Fruit red, rarely yellow, globose, $\frac{1}{4}$ in. long. Native of the Mediterranean region, N. Africa, and Canary Islands. It occurs along the coast of Dalmatia, and I have seen it making very charming evergreen patches at Spalato, on the walls of Diocletian's palace, also in the vicinity of Ragusa.

EPIGÆA REPENS, *Linnaeus*. MAY-FLOWER. ERICACEÆ.

A creeping, evergreen shrub reaching only 4 to 6 ins. above the ground, the slender hairy stems rooting at intervals. Leaves leathery, alternate, ovate-oblong, with a heart-shaped base and a round or short-pointed apex; 1 to 3 ins. long, $\frac{3}{4}$ to 2 ins. wide; of a rather dark glossy green, rough and sprinkled with short bristles on both surfaces and at the margin; leaf-stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, hairy. Flowers produced in April, four to six together in a dense terminal head about 1 in. across, furnished at the base with green, hairy, lanceolate bracts. Corolla tubular, $\frac{5}{8}$ in. long, with five spreading, roundish ovate lobes, making it about $\frac{1}{2}$ in. across at the mouth, woolly within; white or rosy tinted; calyx-lobes lanceolate, smooth, half as long as the corolla, green.

Native of Eastern N. America, from Canada to Georgia. It is abundant near Plymouth, in Massachusetts, where the Pilgrim Fathers landed in 1620. By them, tradition says, it was named after their own famous vessel. It is said to have been introduced to Britain in 1736, but, owing to the difficulty experienced in cultivating it, has never become common. Although capable of withstanding any frost experienced in this country, it misses its native covering of snow, and is excited into premature growth by our mild winters only to be cut off by later frost. It likes a peaty soil, and in Mr Waterer's nursery at Knap Hill thrives admirably on the shady side of a clump of rhododendrons. On the other hand, I have seen it equally good in the botanic garden at Dresden in full sun; but there the climate is not dissimilar to that of its native home. The best success in Britain has been attained by giving it the shelter of a handlight in late winter, and during frosty nights in spring. Propagated by layers.

ERCILLA VOLUBILIS, *Jussieu*. PHYTOLACCACEÆ.

(*Bridgesia spicata*, *Hooker*.)

An evergreen climber producing a dense mass of slender, sparsely branched, very leafy stems, ultimately 15 to 20 ft. high, attaching themselves to walls or tree-trunks by means of aerial roots; young wood smooth. Leaves alternate, $\frac{1}{2}$ in. or less apart; ovate or oblong, $\frac{3}{4}$ to 1 $\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide; tapered or rounded at the base, blunt at the apex, wavy at the margin; smooth, stout, fleshy, dark shining green; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers produced in March and April in dense spikes which are 1 to 1 $\frac{1}{2}$ ins. long, $\frac{1}{2}$ in. through, cylindrical. Calyx $\frac{1}{3}$ in. across, with five dull white, ovate sepals; stamens white, about eight, $\frac{1}{4}$ in. long, much protruded. Corolla none.

Native of Chile; introduced in 1840 by Thomas Bridges, a very industrious collector of South American plants. The genus (of which this is the only species) was named after him by Hooker, but the name had to give way to an earlier one. It lives outside at Kew, and flowers regularly, but succeeds better against a wall, where, if the leading shoots

are securely nailed, it will form a heavy tangle. Its natural means of attachment appear to be scarcely efficient enough to enable the plant to bear its own weight on a vertical surface.

ERICA. HEATH. ERICACEÆ.

Of the several hundreds of known species of heath, the vast majority are native of the Cape of Good Hope; the only hardy ones are of European origin. Of the twelve true species described in the following notes, five are natives of the British Isles. These heaths are all evergreen, and are distinct among hardy shrubs for the smallness and the great number of their leaves, which are linear and usually have the margins recurved so as to form a groove at the back; they are arranged in whorls of three or four, sometimes five or six. In stature these hardy heaths range from small trees over 20 ft. high, to dwarf semi-prostrate shrubs 6 ins. high. The corolla varies from globular to cylindrical, and has usually four small teeth at the contracted opening; it does not fall in the ordinary way, but withers and remains long on the stalk encasing the seed-vessel. Calyx four-parted; stamens eight; fruit a many-seeded capsule.

The best way to use heaths in gardens is to plant them in broad masses. Fine colour effects can be produced in that way by both the early- and later-flowering sorts. But near London, or in places with a similar climate, it would not be wise to plant large masses of *E. lusitanica*, *australis*, *arborea*, and the hybrid *Veitchii*, which are tender, nor of *E. scoparia*, which is scarcely worth it. They thrive in almost any soil that is not strongly impregnated with calcareous matter; but *carnea*, *mediterranea*, *darleyensis*, *cinerea*, and possibly others, can be grown even in such soils. The soil may have decayed leaves mixed with it, but it should not be enriched by manure. The ideal soil is one of light sandy peat, but that is by no means essential.

In most gardens the soil is too rich for the dwarf heaths, and, in consequence, they grow too fast and soft and become lanky, very different from the dense sturdy plants one sees wild. To correct this, especially in those that flower late, it is advisable occasionally to prune over the plants in spring before they start growth. This makes them break into growth lower down, and tends to keep them dwarfer and more compact. Whilst this annual pruning is more especially needed by *E. cinerea*, *multiflora*, *vagans*, *ciliaris*, and *Tetralix*, the early-flowering *E. carnea* and *darleyensis* are also improved if treated the same way as soon as the flowers begin to fade; but with them it is not so necessary.

Heaths can be propagated by seeds and by cuttings. The former should be sown in very sandy peat in spring, and kept in a cool frame until germinated; when large enough to handle they should be pricked off into shallow boxes of similar soil, and when 2 or 3 ins. high planted out in nursery beds or even in permanent places. But cuttings perhaps are preferable. They should be made in July and August, of moderately ripened twigs about 1 in. long; side twigs of that length springing direct from older branches are best. The leaves should be carefully removed from the lower half, and for this work a very sharp knife is essential, so

that the leaves are cut cleanly away without tearing the bark of the cuttings. These are then put in pots of very sandy peat, surfaced with silver sand when finished, and placed in slight bottom heat with a bell-glass over them. They will take root in a few weeks, but need not be disturbed until the following spring, when they can be treated as advised for seedlings.

E. ARBOREA, *Linnaeus*. TREE HEATH.

A shrub of bushy habit, or in favourable localities a tree over 20 ft. high, with a distinct trunk; young wood very hairy, the hairs branched. Leaves very densely packed in whorls of threes, $\frac{3}{8}$ to $\frac{1}{4}$ in. long, smooth, linear, grooved beneath. Flowers very fragrant, borne in great profusion in March and April, and usually clustered near the end of short twigs that clothe the shoots of the preceding year, the whole making a slender panicle up to $1\frac{1}{2}$ ft. in length. Corolla globular, $\frac{1}{8}$ in. long, almost white; sepals ovate, not half as long as the corolla; stigma much flattened, white; flower-stalk $\frac{1}{8}$ in. long, smooth.

Native of S. Europe, N. Africa, and the Caucasus; introduced in 1658. This fine heath is not seen at its best near London, although it grows 8 to 10 ft. high there. Ultimately, however, there comes a frost that kills it. In the Isle of Wight there is, or used to be, a tree in the gardens of Steephill Castle, Ventnor, over 20 ft. high, with a trunk $2\frac{1}{2}$ ft. in girth near the ground. There is another about as high at Mt. Stewart, Co. Down. Even on the Dalmatian islands, where I have seen this heath wild, these dimensions are not exceeded. It appears to be able to withstand about 20° of frost with impunity, if it be of only one or two nights' duration. In former times the wood was largely used at Cannes for turning and making into "briar-root" tobacco pipes—a corruption of the French "bruyère." It was once abundant along the coast from Marseilles to Genoa. The flowers, whose odour is like that of honey, remain, after fading, on the plants till June.

Var. *ALPINA*, *Dieck*.—A very distinct and valuable form of tree heath. It was introduced to Kew in 1899, and has proved to be a very hardy and handsome evergreen, and has never suffered in the least by any frost experienced since that date. In the trying winter of 1908-9 even the smallest twigs were uninjured, preserving a peculiarly fresh and vivid green all the time. It is a sturdy bush, stiffer and more erect in its growth than *E. arborea*. The young wood has the same mossy appearance, due to the abundance of branched hairs. The flowers are not freely borne whilst the plant is young, but afterwards they appear crowded in stiff, pyramidal panicles 1 ft. or more long. They are rather dull white, but the beauty of the plant is as much in the rich cheerful green of the plumose branches all through the winter. It is now 6 to 8 ft. high at Kew. A native of the Mountains of Cuenca, in Spain, at over 4500 ft. altitude. Perhaps distinct enough to rank as a species.

E. AUSTRALIS, *Linnaeus*. SPANISH HEATH.

(Bot. Mag., t. 8045.)

A shrub of rather open, ungainly habit, usually 3 or 4 ft. high, occasionally twice as much; young shoots erect, covered with a short thick down. Leaves linear, $\frac{1}{4}$ in. long, glandular on the margins when quite young, arranged in whorls of fours; dark green above, channelled beneath. Flowers borne on the previous year's growth in clusters of four or eight at the end of the shoot. Corolla cylindrical, $\frac{1}{3}$ in. long, bright purplish red, with four rounded lobes at the mouth; calyx less than half as long as the corolla, slightly downy; anthers slightly exposed; flower-stalk $\frac{1}{2}$ in. long.

Native of Spain and Portugal, introduced according to Aiton by the then Earl of Coventry in 1769. In the richness and brightness of its colouring it is the best of the taller heaths, and flowers from April to June. Unfortunately it is not absolutely hardy, and very severe winters almost clear the country of it, for which reason it has always been rare. It has lived in the open at Kew since 1896, although sometimes hard hit by frost. It should thrive permanently in the Isle of Wight, Cornwall, etc. In gardens, *E. mediterranea* is often confused with it and flowers at the same time, but is readily distinguished by its cylindrical clusters of blossom, the individual flowers coming in the leaf-axils along the shoot—not terminal as in *australis*. The flower arrangement of *E. australis* is similar to that of *E. stricta*, but the latter only commences to bloom when *australis* is over, and it does so on the shoots of the current year.

E. CARNEA, *Linnaeus*.

A low shrub of tufted habit, from 6 to 10 ins. high, the branches becoming prostrate and spreading on old plants; young twigs smooth. Leaves linear, $\frac{1}{8}$ to $\frac{1}{2}$ in. long, dark glossy green above, channelled beneath; arranged mostly in whorls of fours, the whorls $\frac{1}{2}$ to $\frac{1}{3}$ in. apart. Flowers borne singly or in pairs in the leaf-axils at the end of the previous summer's growth, making cylindrical racemes 1 to 2 ins. long. Corolla deep rosy red, scarcely $\frac{1}{4}$ in. long, cylindrical; calyx - lobes narrowly oblong, more than half the length of the corolla, anthers protruded, dark red; flower-stalk about as long as the calyx.

Var. *ALBA* (often grown as *E. herbacea*).—Flowers white.

Native of the Alps of Central Europe; introduced by the Earl of Coventry in 1763. One of the most delightful of all dwarf shrubs, this heath is especially valuable for its early flowering. Soon after New Year's Day the blossoms begin to open, and often by February the plants are completely transformed into tufts or masses of rosy red, all the more pleasing because the prevailing tints of the plants then in flower are yellow, white, and blue. In a young state the plants form dainty little tufts, but with age the branches spread over the ground, and one plant will in time cover 2 ft. or more of space,



ERICA AUSTRALIS.

always keeping its surface well clothed with the dark green leafy twigs. Plants can be kept particularly neat, thick, and dwarf, by cutting them over in early April or as soon as the flowers lose colour. This heath is admirable for furnishing the shelves of the rock garden, and for forming broad patches of colour wherever a dwarf evergreen is suitable. By some authors it and *E. mediterranea* are regarded as forms of the same species. In botanical characteristics the two are similar, but *E. carnea* is, of course, absolutely distinct in its dwarf or semi-prostrate habit, in its more conspicuously exposed anthers, and in flowering earlier. It is also much hardier.

E. CILIARIS, *Linnaeus*.

A straggling shrub, 6 to 12 ins. high, with long prostrate stems from which the flowering branches spring erect in dense masses; young stems thickly covered with hairs. Leaves in whorls of threes, ovate, about $\frac{1}{2}$ in. long, green above, whitish beneath, smooth on both surfaces, but the edges furnished with long gland-tipped hairs; stalk scarcely perceptible. Flowers arranged in whorls of threes on erect terminal racemes, 2 to 5 ins. long, and opening from late June to October. Corolla rosy red, pitcher-shaped, $\frac{3}{8}$ in. long, suddenly and obliquely contracted towards the mouth, where are four rounded, shallow teeth. Sepals very similar to the smallest leaves, but more densely hairy on the margin; flower-stalk $\frac{1}{10}$ in. long; seed-vessel quite smooth.

Native of S.W. Europe, also of Cornwall, Dorsetshire, and W. of Ireland. Amongst hardy heaths it is only likely to be confused with *E. Tetralix*, but that species has its leaves in fours, and its flowers are arranged in short terminal umbels—not on an elongated axis as in *E. ciliaris*. The latter is charming for planting in broad masses for late summer and autumnal flowering.

Var. MAWEANA (*E. Maweana*, *Backhouse*), Bot. Mag., t. 8443.—A very distinct and superior form of *E. ciliaris* found in 1872 in Portugal by the late Mr Geo. Maw. It differs from the ordinary *ciliaris* in its stiffer, sturdier habit, and is less inclined to develop long trailing branches. The flower is larger, being $\frac{1}{2}$ in. long, and the foliage stouter and darker green. It flowers from July to November, and is a most attractive plant.

E. WATSONI, *De Candolle*.—A hybrid between *E. ciliaris* and *E. Tetralix*, found first on a heath near Truro by Mr H. C. Watson. The flowers are arranged much after the fashion of *E. ciliaris*, and they have the obliquely pitcher-shaped form of that species, but the raceme is not so elongated. The leaves are mostly in whorls of four, as in *E. Tetralix*, and have the narrower form of that species.

E. CINEREA, *Linnaeus*. SCOTCH or GREY HEATH.

A low shrub, from 6 ins. to 1 $\frac{1}{2}$ ft. high, with rather stiff, much-divided branches; young shoots downy. Leaves normally three in a whorl, linear, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, flat above, convex beneath, pointed, deep green and smooth. Flowers produced from June to September in terminal umbels of four to eight flowers, or in racemes 1 to 3 ins. long; corolla egg-shaped, $\frac{1}{4}$ in. long, bright purple, with four teeth at the opening. Calyx-lobes narrow-lanceolate, one-third the length of the corolla, semi-transparent, smooth; flower-stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long, downy.

Native of W. Europe from Norway to Spain and N. Italy, and very generally distributed over the moors of Britain. It is, perhaps, the most beautiful of the dwarf summer- and autumn-flowering heaths, and produces an enormous profusion of blossom. In cultivated ground in the Thames

Valley it is apt to be short-lived, growing too fast in the early summer and often scorched by excessive heat in July and August. It is improved by cutting over in the early spring before growth starts. It has varied much in the colour of the flowers, and nurserymen offer some half a dozen varieties. The three following are the most distinct :—

Var. ALBA.—Flowers pure white.

Var. ATROPURPUREA.—Flowers deeper purple than in the type.

Var. COCCINEA.—Flowers red, almost scarlet, and not at all purplish. A very striking variety, but not vigorous like the type.

These and the type are worth planting freely for producing broad masses of colour at a season when comparatively few shrubs are in bloom.

E. DARLEYENSIS, *Bean*.

(*E. mediterranea hybrida*, *Hort.*; *E. hybrida*, *Hort.*)

This heath first appeared in the great heath nursery of Messrs James Smith & Son, at Darley Dale, in Derbyshire, and showed characters intermediate between those of *E. carnea* and *E. mediterranea*. They named it "*E. mediterranea hybrida*," but as it shows as much, or more, affinity with *E. carnea*, I have adopted another name for it. The name "*hybrida*" has been given to it, but that is already in use for a Cape heath. In the characters of its leaves, young wood, and flowers it is identical with those two species, which themselves scarcely differ; but planted in groups it eventually forms dense masses 2 ft. high—at least twice as high as *carnea*, yet never showing any disposition to grow erect, and form a single stem like *mediterranea*. Quite young plants are scarcely distinguishable from *E. carnea*, but soon show they are not the same by their stronger growth. A valuable character of *E. darleyensis* is its habit of commencing to flower as early as November—at least a month before *E. carnea*—and continuing until May. It ought to be in every garden.

E. LUSITANICA, *Rudolph*.

(*Bot. Mag.*, t. 8018; *E. codonodes*, *Lindley*.)

An erect, elegant shrub, eventually 10 to 12 ft. high, forming large plumose branches; young shoots clothed with simple hairs. Leaves about $\frac{1}{4}$ in. long, linear, slightly grooved beneath, irregularly arranged. Flowers slightly fragrant, produced in great profusion during March and April, or even in January and February in mild seasons and warm districts; they are borne in clusters towards the end of small lateral twigs. Corolla cylindrical, $\frac{3}{16}$ in. long, white; calyx and flower-stalk smooth, the former with triangular teeth; stamens and style deep pink.

Native of S.W. Europe; introduced early in the nineteenth century. The only other species with which this is likely to be confused is *E. arborea*. From it *E. lusitanica* differs in the paler foliage, in the more plumose erect branching, in the hairs on the young shoots being unbranched, and in the longer, larger, but less fragrant flowers with a small red stigma. Seen together they are quite distinct. *E. lusitanica* is, if anything, more tender than *E. arborea*, but thrives exceedingly well in the south-west counties. At Lytchet Heath, near Poole, the progeny of a single plant have naturalised themselves in thousands, and now cover $1\frac{1}{2}$ acres of ground. Near London, it will not survive any lengthened exposure to much more than 20° of frost. This heath flowers with extraordinary profusion, the whole plant with its pyramidal branches 1 to 2 ft. long, being covered with blossoms which last long in beauty.

E. MACKAYI, *Hooker*. MACKAY'S HEATH.

By most authorities this heath is regarded as a variety of *E. Tetralix*. It is about 1 ft. high, with its leaves in whorls of four, ovate-oblong, the margins less recurved than in *E. Tetralix*, and thus apparently broader; usually smooth above. The flowers are in terminal umbels as in *E. Tetralix*; the corolla of a deeper rosy red, shorter and broader. Seed-vessel comparatively smooth (it is always downy in *E. Tetralix*). The plant thus in some respects shows a relationship with *E. ciliaris*, and may be a hybrid between these two. The only home of this heath in the British Isles appears to be in Connemara, from Clifden south to Roundstone Bay. Here it was discovered by Mr W. M'Calla in 1833. It is also found in Asturias, N.W. Spain. A pretty dwarf heath, useful for planting in broad patches as recommended for its allies.

Var. FLORE PLENO (*E. Crawfordii*).—A double-flowered form found in W. Galway. The urn-shaped corolla is rather wider at the mouth than in the type, and encloses several small, closely packed petals which have replaced the stamens. Superior to the single form in lasting longer in flower.

E. STUARTII, *Linton*, is regarded as a hybrid between *E. Mackayi* and *E. mediterranea*. It was discovered in W. Galway in 1890, in association with *E. Mackayi*. It leans more to that parent than to *E. mediterranea*.

E. MEDITERRANEA, *Linnaeus*.

A shrub 6 to 10 ft. high, of dense bushy form; branches erect and smooth. Leaves linear, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, dark green, produced in whorls of four. Flowers borne singly or in pairs at each of the leaf-axils at the ends of the twigs of the previous year, the buds being formed the previous summer. They make dense leafy racemes 1 to 2 ins. long. Corolla cylindrical, $\frac{1}{4}$ in. long, of a rich rosy red; calyx-lobes narrow-oblong, rather more than half as long as the corolla; anthers dark red, exposed; flower-stalk $\frac{1}{2}$ in. or less long.

Var. ALBA.—Flowers white; plant not so large and robust as the type.

Var. HIBERNICA (syn. *glauca*).—A form found in W. Ireland, growing there 3 or 4 ft. high. It differs chiefly in the foliage being of a more glaucous hue, and appears to be the same as the heath sold in nurseries as var. *glauca*. It does not flower with such profusion as the type.

Var. HYBRIDA (see *E. darleyensis*).

Var. NANA.—A dwarf plant forming a rounded tuft 1 to 1½ ft. high; not so free-flowering as the type.

Native of S. France, Spain, and of Co. Galway in Ireland, but not of the Mediterranean region, in spite of its name. It is really of Biscayan origin; introduced, according to Aiton, in 1648. Of the spring-flowering heaths it is the finest and best for a climate like that of London. It is quite hardy at Kew except in the severest of all winters, and planted there in large masses provides a continuous feast of colour and fragrance from March to May. Its fragrance is like that of honey. Of the several forms mentioned, the typical one and var. *alba* are, in my experience, the best.

E. MULTIFLORA, *Linnaeus*.

A low shrub, 1 to 2 ft. high; young shoots smooth. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ in. long, linear, almost cylindrical, slightly downy at the base, arranged in fours or fives. Flowers clustered in the leaf-axils as in *E. vagans*, forming an erect, cylindrical, terminal raceme, 2 or 3 ins. long. Corolla pale rose, pitcher-shaped, $\frac{3}{8}$ in. long; anthers oblong, protruding, each anther with its two cells (loculi) separated only slightly at the top; sepals lance-shaped, not quite half as long as the corolla; flower-stalk $\frac{1}{2}$ in. long, holding the flower clear of the leaves.

Native of S. Europe; introduced in 1731. This heath is very rare in

gardens, a form of *E. vagans* being usually made to do duty for it. The two have been much confused by botanists, but *E. multiflora* is easily distinguished by the anthers being only slightly notched at the top, whereas in *E. vagans* they are slit to the base; the sepals also are longer and narrower than in *E. vagans*.

E. SCOPARIA,
Linnaeus. BESOM
HEATH.

A shrub of loose, uneven habit, as much as 9 or 10 ft. high, its branches erect and, like the leaves, free from down. Leaves in whorls of threes (sometimes fours), $\frac{1}{4}$ in. long, linear, pointed, glossy dark green. Flowers produced in May and June, in clusters of two to five, in the leaf-axils, over almost the whole of the preceding year's growth. Corolla greenish, $\frac{1}{2}$ in. long, globular. Calyx and flower-stalk quite smooth.

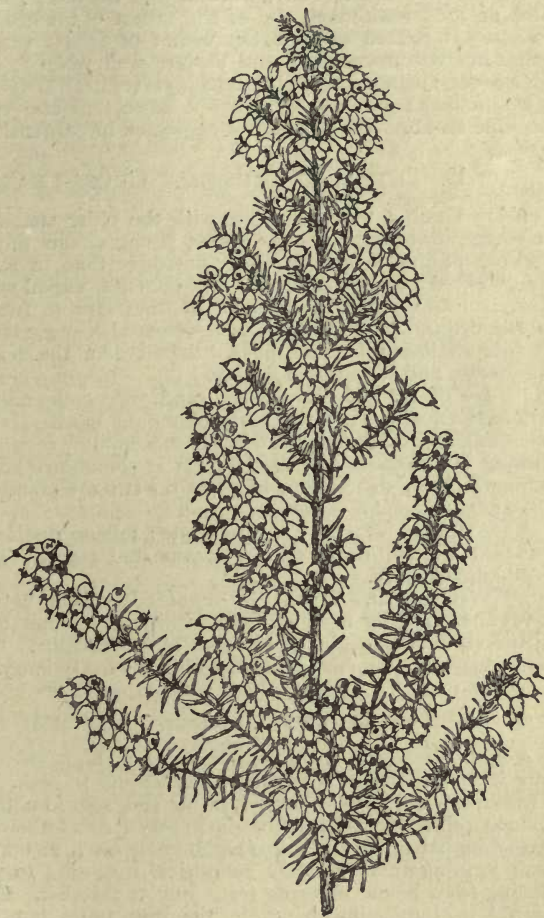
Native of Central and W. France, and much used there for making besoms. It is perfectly hardy, and is the tallest of the heaths as they are found in gardens near London; whilst its habit is loose and irregular, it is decidedly elegant. It blossoms with great freedom, but the blossoms are small and of no great beauty, and it is only for its beauty of habit that it is desirable.

Var. *PUMILA* (syn. var. *nana*) is a dwarf variety which I have not seen over 2 ft. high.

E. STRICTA, *Andrews*.

(*E. ramulosa*, *Viviani*; *E. terminalis*, *Salisbury*, Bot. Mag., t. 8063;
E. corsica, *De Candolle*.)

An erect shrub up to 8 or 9 ft. high, the branches covered with scarcely perceptible down. Leaves arranged in whorls usually of fours, sometimes fives



ERICA MEDITERRANEA.

or sixes ; linear, $\frac{1}{4}$ to $\frac{1}{3}$ in. long, dark glossy green. Flowers in terminal umbels carrying four to eight blossoms, and in beauty from June to September. Corolla cylindrical, narrowing towards the mouth, where are four recurved teeth ; pale rose, $\frac{1}{4}$ in. long ; calyx with four lanceolate lobes, smooth.

Native of S. Spain, Italy, Corsica and Sardinia ; introduced, according to Aiton, in 1765. Although one of the tallest of the heaths, it is perfectly hardy at Kew. It passed through the winter of 1894-5 without serious injury. It strikes freely from cuttings, and flowers well when 12 ins. high. Its pleasing habit, erect, clustered twigs, and deep green, healthy-looking foliage ; its bright rosy blossoms ; and the fact that it flowers in late summer, make it a most desirable shrub. Yet it is almost neglected in gardens.

E. TETRALIX, *Linnaeus*. CROSS-LEAVED HEATH.

A low shrub, 6 to 18 ins. high, with the older stems spreading or prostrate. the young flower-bearing ones erect ; young shoots downy. Leaves arranged in whorls of four, forming a cross, narrower than in *E. ciliaris*, and averaging $\frac{1}{8}$ in. long ; dark green above, white beneath, edged with glandular hairs, and downy. Flowers in a dense head of from four to twelve or more blossoms. Corolla cylindrical, $\frac{1}{4}$ in. long, rose-coloured, contracted at the mouth, where are four shallow recurved lobes. Sepals like the leaves, but more hairy ; flower-stalk and seed-vessel downy.

Native of N. and W. Europe, and very commonly diffused through the British Isles, where it is the most abundant of the true heaths. It blossoms from June to October, and although so common in a wild state is well worth planting in masses in the garden. It is sometimes confused with *E. ciliaris*, under which the distinctions between the two are pointed out.

Var. ALBA, *Aiton*.—Flowers white.

Var. MOLLIS, *Hort*.—Flowers white ; foliage distinctly greyish, due to the abundant whitish down on the leaves and stems. The whole plant has a frosted appearance.

E. WILLIAMSII, *Druce*.—A supposed hybrid between *E. Tetralix* and *E. vagans*, growing at the Lizard, Cornwall ; found by Mr P. D. Williams. Its leaves have the glandular hairs of *E. Tetralix*. Corolla pitcher-shaped, rose-coloured ; stamens included within it ; ovary hairy. Flowers in umbels.

E. VAGANS, *Linnaeus*. CORNISH HEATH

A low, spreading shrub, from 1 to 1 $\frac{1}{2}$ ft. high, becoming ultimately 5 ft. or more wide, and rather sprawling ; branchlets smooth. Leaves arranged four or five in a whorl ; the whorls $\frac{1}{6}$ in. or less apart on the stems ; linear, $\frac{1}{8}$ to $\frac{1}{2}$ in. long, channelled beneath, dark green and smooth. Flowers produced usually in pairs from the leaf-axils, each on a smooth stalk $\frac{1}{3}$ in. long, the whole forming an erect, leafy, cylindrical raceme 4 to 7 ins. long, the flowers opening from below upwards from July to October. Corolla almost globular, about $\frac{1}{8}$ in. long, pinkish purple, the four lobes but little recurved ; sepals ovate ; anthers exposed and split to the base ; pink, rarely yellow.

Native of Cornwall and S.W. Europe. A showy and very attractive shrub in late summer and autumn, useful for planting on sunny slopes, and in broad masses. It is easily raised from cuttings, and thrives well in almost any soil not heavy or limy. Like the other late-flowering heaths it should be cut over occasionally in spring before growth recommences, removing all that part of the shoot that has borne flowers. This keeps the plants neater and causes them to flower more profusely, but done too often reduces the size of raceme.

Var. ALBA.—Habit denser and dwarfer ; flowers white.

Var. GRANDIFLORA.—Flowers larger.

Var. RUBRA.—Flowers more deeply rosy than the type.

E. VEITCHII, *Bean*. VEITCH'S HYBRID HEATH.

A hybrid raised in the Exeter nurseries of Messrs R. Veitch & Sons, and first exhibited by them at the Royal Horticultural Hall on 14th February 1905. It appears to have been of accidental origin, but there is no doubt that *E. arborea* and *E. lusitanica* are its parents. It is intermediate in many respects between them. In the colour of its foliage it resembles *E. lusitanica*, but the habit is rather that of *E. arborea*. The flowers are intermediate in shape, and white. They show their hybrid origin in the shape and colour of the stigma, the flattened shape being that of *E. arborea*, the pink colour being that of *E. lusitanica*; stamens pink. A further indication of hybridity is in the hairs on the young shoots, which are partly branched like those of *E. arborea*, and partly simple like those of *E. lusitanica*.

E. Veitchii is quite as beautiful a heath as its parents, and of more vigorous growth.

ERINACEA PUNGENS, *Boissier*. HEDGEHOG BROOM.
LEGUMINOSÆ.

(*E. Ervillei*, *Hort.*; *Anthyllis erinacea*, *Linnaeus*, *Bot. Mag.*, t. 676.)

A dwarf, much-branched, stiff, spiny shrub, under 1 ft. high in this country. The branches are erect, sharp-pointed, and in shape like small bodkins. They have very few leaves, and these are scarcely noticeable, being $\frac{1}{4}$ to $\frac{1}{2}$ in. long, very narrow. Flowers borne two to four together on a short stalk just below the apex of the branchlet; they are $\frac{1}{2}$ to $\frac{3}{4}$ in. long, with purplish blue petals, and a peculiarly large, membranous, silky calyx two-thirds the length of the flower. Pod oblong, $\frac{3}{4}$ in. long, glandular-hairy, one- to two-seeded. Flowers in April and May.

Native of Spain, whence it was introduced in 1759, but still remains one of the rarest of hardy plants. The distinct colour of its flowers, more blue than those of any other hardy leguminous shrub, should have gained it more notice. It is, however, very slow-growing, and misses the sunlight of its native mountains. It does not suffer from frost at Kew, but thrives better in the west of England. In the vicarage garden at Bitton it forms low dense tufts of spiny stems, occasionally perfecting seed. At the foot of a sunny wall in the Cambridge Botanic Garden it also flowers admirably. It can be propagated by cuttings or layers, occasionally by seed. It is said to grow so plentifully on some of the mountains of Spain that horses can scarcely make their way through it. Suitable for a sunny nook in the rock garden.

ERIOBOTRYA JAPONICA, *Lindley*. LOQUAT. ROSACEÆ.

(*Photinia japonica*, *Franchet*.)

An evergreen tree up to 20 or 30 ft. high, of rounded, bushy form; young branches thick and woolly. Leaves varying in size according to the vigour of the plant, sometimes 1 ft. long by 5 ins. wide; ordinarily 6 to 9 ins. long and 3 to 4 ins. wide; wrinkled, coarsely but not deeply toothed, strongly set with parallel ribs $\frac{1}{4}$ to $\frac{1}{2}$ in. apart; stalk very short and woolly. The lower surface is covered with a brownish wool, whilst

the upper is dark glossy green and smooth, except when young, being then covered with a loose white floss. Flowers $\frac{3}{4}$ in. across, fragrant like hawthorn, closely packed on a stiff, terminal, pyramidal panicle, 3 to 6 ins. high, the stalks and calyx covered with a dense brown wool; petals yellowish white. Fruit pear-shaped or oblong, $1\frac{1}{2}$ ins. long, yellow; sometimes formed but rarely ripened in England. Allied to Photinia, but differing in the much larger three- to five-celled fruit.

Native of China and Japan; introduced to England in 1787 by Sir Joseph Banks, but not hardy enough to have ever become widely cultivated. It can only be grown against a south wall at Kew, where a plant has grown well for over thirty years, and makes a handsome and striking display of foliage, but rarely flowers. In the south of Europe this tree is cultivated for its fruit, and is frequently put on table for dessert in the southern Italian hotels in spring. In the south-west of England there are trees over 15 ft. high in the open (nearly twice as high on walls). It is best raised from seeds obtained from S. Europe, where there are several named varieties. Its leaves are amongst the handsomest in all evergreens that can be grown out-of-doors.

ESCALLONIA. SAXIFRAGACEÆ.

A well-marked genus of hardy or half-hardy shrubs, of which all the species in cultivation except *E. Philippiana* are evergreen. The leading characters of the genus are: leaves alternate, simple, without stipules, often arranged in clusters on the twigs, each cluster in the axil of a larger leaf, and really representing a short branch; flowers white or red, mostly arranged in terminal racemes or panicles; petals five, long-clawed, free, but forming an imitation tube (except in *Philippiana*); fruits top-shaped, surmounted by the persistent style. Many *Escallonias* are furnished with resin glands on the leaves and branchlets, but these are far from being as abundant in cultivated plants as they are in wild ones. All of them are natives of S. America, and are most abundant in Chile. The genus was named in honour of Escallon by the Spanish botanist Mutis, his companion and teacher.

As garden shrubs the *Escallonias* are nearly all too tender to thrive well, except in the milder counties, without some protection. This protection is best afforded by a wall, and few evergreens make more effective and beautiful wall-coverings. For such as can be grown in the open a sunny position should be selected, and the soil should not be very rich—an ordinary sandy loam suffices, without manure or other fertilising material. They are easily increased by cuttings of half-ripened wood placed in pots of sandy soil in gentle heat. The wood is in proper condition in August.

E. Philippiana is quite hardy, and of the evergreen kinds the following are the hardiest: *exoniensis*, *langleyensis*, *illinita*, and *rubra*.

E. EXONIENSIS, Veitch.

An evergreen shrub or small tree up to 15 or 20 ft. high, of quick growth and open, graceful habit; branches ribbed, downy, and slightly glandular.

Leaves variable in size, from $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, half or less than half as wide ; doubly toothed, glossy green above, paler beneath, smooth on both sides except for a line of down along the midrib above. Flowers white or rose-tinted, produced from June to October in terminal panicles $1\frac{1}{2}$ to 3 ins. long, petals nearly $\frac{1}{2}$ in. long, the bases forming a tube, the ends expanded. Calyx and flower-stalks downy and glandular.

A hybrid between *E. pterocladon* and *rubra* raised in the nursery of Messrs Veitch of Exeter. It is a most attractive evergreen, flowering more or less continuously from June until the frosts come, and quite as hardy as *E. rubra*.

E. FLORIBUNDA, Kunth.

(Bot. Mag., t. 6404.)

An evergreen shrub up to 10 ft. or more high when grown on walls in this country, but occasionally attaining the dimensions of a small tree in S. America ; branchlets slightly viscid, but not downy. Leaves $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to 1 in. wide ; obovate or narrowly oval, tapering at the base, rounded or often conspicuously notched at the apex, entire or very minutely toothed, smooth and bright green above, furnished with small resinous dots beneath ; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers pure white, $\frac{1}{2}$ in. across, with a hawthorn-like fragrance, produced in terminal compound panicles, the largest of which are as much as 9 ins. long and 5 ins. wide, but usually much smaller ; the lower sections of the panicles come from the upper leaf-axils.

Introduced in 1827 from S. America, where it is widely spread, reaching from Venezuela to the south of Peru. Flowers in late summer and autumn.

E. MONTEVIDENSIS, De Candolle, is a close ally found on the eastern side of S. America, in S. Brazil, and in Uruguay near Mount Video. It differs in the young branches being not sticky ; in the flowers, twice as large ; in the flatter and more rounded flower-truss ; in the more pointed calyx-lobes being furnished with minute glandular teeth, and in the smaller toothed leaves.

These two are the handsomest of white-flowered Escallonias in cultivation. They can only be grown on walls except in the very mildest parts of the kingdom.

E. ILLINITA, Presl.

An open, loose-habited, evergreen shrub up to 10 (perhaps more) ft. high ; branchlets not downy, but furnished with stalked glands, and resinous when young. Leaves obovate or oval, from $\frac{3}{4}$ in. to $2\frac{1}{2}$ ins. long, nearly to quite half as wide ; tapered at the base, rounded or abruptly pointed at the apex, finely toothed, not downy on either surface, but glossy green above and more or less clammy with a resinous secretion when young ; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Panicle 3 or 4 ins. long, $1\frac{1}{2}$ ins. diameter, cylindrical, thinly hairy and glandular ; each branch of the panicle one- to five-, more often three-flowered, and springing from the axil of a leaflike bract. Flowers white, $\frac{1}{3}$ in. wide at the top, the claws of the petals forming a tube $\frac{1}{2}$ in. long. Calyx green, bell-shaped, with five linear lobes.

Native of Chile ; introduced early in the nineteenth century. This plant has an odour distinctly suggestive of the pigsty, but by no means so offensive as that comparison would suggest, and not so strong as that of *E. viscosa* (*g.v.*), a closely allied species. *E. illinita* is one of the hardiest of the genus. It has for many years been grown in the open at Kew, and survives even severe winters although sometimes badly cut.

E. LANGLEYENSIS, Veitch.

An elegant, evergreen, or in hard winters, semi-evergreen shrub, becoming eventually 8 ft. or more high, and producing long, slender, arching shoots in one season; branchlets copiously furnished with stalked glands. Leaves $\frac{1}{2}$ to 1 in. long, about half as wide; obovate or narrowly oval, toothed, stalkless; smooth and glossy green above, specked beneath with minute resin-glands. Flowers of a charmingly bright rosy carmine, $\frac{1}{2}$ in. across, produced during June and July (a few later) in short racemes of about half a dozen blossoms terminating short leafy twigs; calyx and flower-stalk slightly glandular.

This very attractive shrub was raised in Messrs Veitch's nursery at Langley about 1893, by crossing *E. Philippiana* with *E. punctata*. Although not quite so hardy as the first of these, it is hardy enough to stand all but the severest of frosts, and even then will break up again from the ground. It is distinct from other *Escallonias* in its slender arching branches, which bear the racemes on



ESCALLONIA LANGLEYENSIS.

the upper side. The colour of the flowers, too, is different from that of any other *Escallonia* except

E. EDINENSIS, a hybrid of similar origin and almost identical in leaf and flower, raised in the Edinburgh Botanic Garden.

E. MACRANTHA, Hooker.

(Bot. Mag., t. 4473.)

An evergreen shrub, 6 to 10 ft. high, forming a dense bush of luxuriant habit, the glutinous branchlets covered with down, intermingled with which are numerous erect glands. Leaves broadly oval or obovate, tapering at the base; 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide; doubly toothed, smooth, and of a dark shining green above, dotted beneath with numerous resinous glands; stalkless. Racemes terminal, sometimes branched and forming a panicle, 2 to 4 ins. long. Flowers bright rosy red, about $\frac{5}{8}$ in. long and wide; petals spreading at the top, their claws erect and forming a tube; calyx bell-shaped with narrow, pointed

lobes, and covered with sticky glands ; flower-stalk downy. Fruit top-shaped, with persistent calyx and style.

Introduced from the Island of Chiloe by Wm. Lobb, about 1846, and now one of the commonest evergreen shrubs in the south-western maritime districts, where it is frequently used to make hedges. In the London district and further north it needs in most places the protection of a wall, making indeed one of the handsomest of evergreen wall-coverings. It thrives admirably in most of the southern seaside resorts, flowering during June and the succeeding months.

E. INGRAMI, *Hort.*, appears to be intermediate (perhaps a hybrid) between E. macrantha and E. punctata ; its leaves are smaller and proportionately narrower than those of E. macrantha ; flowers of a similar colour, but scarcely so large.

E. ORGANENSIS, *Gardner.*

(Bot. Mag., t. 4274.)

An evergreen shrub of robust habit, 4 to 6 ft. high, with stout, angled, very leafy branchlets ; not downy but slightly glandular-resinous. Leaves narrowly obovate or oval, stiff, the largest 3 ins. long by 1 in. wide ; toothed except towards the tapering base, rather blunt at the apex, smooth ; stalk very short, reddish. Flowers clear rosy red, $\frac{1}{3}$ to $\frac{1}{2}$ in. across, produced late in the year in short, densely flowered, terminal panicles ; petals forming a tube at the base, upper part spreading ; flower-stalks and calyx quite smooth or minutely glandular, the latter with five narrow, awl-shaped lobes.

Discovered in ravines near the summit of the Organ Mountains of Brazil by Mr Gardner in 1841, and introduced to England by W. Lobb very soon after. Not hardy except in Cornwall, etc., but worth growing on a wall for its beautiful rosy flowers.

E. PHILIPPIANA, *Masters.*

A deciduous shrub of robust habit and graceful form, 6 to 8 ft. high, the branches very leafy, often arching. Leaves obovate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. or less wide, tapering at the base, toothed ; quite smooth on both surfaces. Flowers pure white, $\frac{1}{3}$ to $\frac{1}{2}$ in. across, produced during June and July in the uppermost leaf-axils and at the end of short twigs, the whole forming a leafy raceme $\frac{3}{4}$ to 1 $\frac{1}{2}$ ins. long ; calyx top-shaped, with five triangular lobes.

Native of Valdivia ; introduced by Pearce for Messrs Veitch, between 1860 and 1866, and first flowered in their nursery in 1873. This is undoubtedly the hardiest of all known Escallonias ; it has survived without any injury 32° of frost at Kew, quite unprotected. It is also very distinct ; besides being deciduous, its petals do not, as in so many species, form a kind of tube. Both in leaf and flower it bears a considerable resemblance to the Australian shrub—*Leptospermum scoparium*—an ally, however, of the myrtle. It is undoubtedly one of the most pleasing of later flowering shrubs.

E. PTEROCLADON, *Hooker.*

(Bot. Mag., t. 4827.)

An evergreen, bushy shrub, usually 4 to 8 ft. high, but twice as high when trained against a wall, or grown in very mild localities ; branchlets downy and distinctly angled. Leaves narrowly obovate, $\frac{1}{3}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide ; tapering at the base to a very short stalk, toothed ; dark shining green above, paler beneath and smooth on both surfaces except for a line of down on the midrib above. Flowers in slender racemes 1 $\frac{1}{2}$ to 3 ins. long, terminat-

ing short, rigid, leafy twigs, the lower flowers solitary in the axils of small leaves. Petals white, $\frac{1}{3}$ in. long, spreading at the ends, but erect at the base, and so close together as to form a tube; calyx quite smooth, top-shaped. Flowers fragrant, appearing from June to August.

Native of Patagonia; introduced for Messrs Veitch by Wm. Lobb, in 1847. It requires a wall in the London district, but in the south and west counties it thrives excellently as a bush in the open. In the garden of Mrs Chambers, near Haslemere I have seen it covered with blossom. In Co. Wicklow, Ireland, it is 15 ft. high.

E. PULVERULENTA, Persoon.

(Sweet's Flower Garden, ii., t. 310.)

An evergreen shrub, 10 to 12 ft. high, with downy, viscid, varnished branchlets. Leaves very viscid, oblong, with a rounded end and tapering



ESCALLONIA PHILIPPIANA.

base; 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; finely toothed, bristly hairy on both surfaces, the upper one with a varnished appearance. Flowers white, densely crowded on slender, cylindrical racemes 4 to 9 ins. long, $\frac{3}{4}$ to 1 in. through; sometimes branched at the base.

Native of Chile; introduced early in the nineteenth century, but now uncommon. It is not hardy in any but our warmest districts, although in colder ones it may live and thrive for many years on a wall. From all the other white-flowered Escallonias in cultivation this is readily distinguished by its long slender racemes. (*E. revoluta* is sometimes grown in gardens under the name, but is well distinguished by its thick grey down.)

E. PUNCTATA, De Candolle.

(*E. rubra* var. *punctata*, *Hooker fil.*; Bot. Mag., t. 6599.)

An evergreen bushy shrub, 6 to 10 ft. high, of free, vigorous habit; young branchlets sticky, clothed with down and gland-tipped bristles. Leaves obovate

or oval, up to 2 ins. long, $\frac{3}{4}$ in. wide, but mostly much smaller; tapering at both ends, but more gradually to the base, toothed on the terminal portion; upper surface smooth and glossy, the under-surface specked with numerous minute resin-glands; stalk very short. Flowers rich crimson, produced in terminal corymbose panicles, $1\frac{1}{2}$ to 2 ins. long and wide; the lower portion of the petals cohering to form a tube $\frac{1}{3}$ to $\frac{1}{2}$ in. long, spreading at the ends. Flower-stalk and calyx covered with glands, the latter with five triangular lobes. Blossoms from June to August.

Native of Chile; nearly allied to *E. rubra*, from which it differs chiefly in the deeper coloured flowers, and in the much more abundant glands on the young wood, under-surface of the leaves, calyx, and flower-stalks. Hardy in the warmer counties, it is best with the protection of a wall elsewhere.

E. REVOLUTA, *Persoon*.

(Bot. Mag., t. 694c.)

An evergreen shrub up to 20 ft. high; branchlets thickly covered with a grey felt, angled. Leaves $\frac{3}{4}$ to 2 ins. long, from $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; obovate, pointed or rounded at the apex, tapering at the base, unevenly toothed; both surfaces covered with a thick grey down. Flowers white, produced in racemes or panicles $1\frac{1}{2}$ to 3 ins. long, at the end of leafy twigs; petals $\frac{5}{8}$ in. long, the bases forming a slender tube; calyx and flower-stalks covered with grey hairs. Blossoms in September and October.

Native of Chile. It succeeds admirably in the south-western counties, but needs wall protection in colder localities. The name refers to the rolling inwards of the leaf-margins, which is usually more or less noticeable but is a character by no means confined to this species. Its most noticeable characteristic is the grey down which covers the entire plant, but varies in density.

E. RUBRA, *Persoon*.

(Bot. Mag., t. 289c.)

An evergreen shrub up to 15 ft. high, of vigorous, quick-growing, loose habit; young branches reddish, downy, somewhat viscid and glandular. Leaves obovate to lanceolate, the largest $1\frac{1}{2}$ to 2 ins. long, and $\frac{1}{2}$ to 1 in. wide; tapering at both ends, the upper part doubly toothed, but furnished with stalked glands near the base; both surfaces without down. Flowers red, $\frac{1}{3}$ in. wide at the top where the ends of the petals expand, the lower portions or claws forming a slender tube $\frac{1}{2}$ in. long; they are produced in loose terminal panicles, few- or many-flowered, and 1 to 3 ins. long; calyx top-shaped, with five narrow-linear lobes $\frac{1}{4}$ in. long, smooth; flower-stalk slender, $\frac{1}{4}$ to $\frac{1}{2}$ in. long.

Introduced in 1827 to the Botanic Garden of Liverpool from Chile, this *Escallonia* has since proved to be the hardiest of the evergreen species. I have only known it once cut to the ground at Kew, which was in February 1895, and the plants afterwards sprang up again freely from the ground. It is quite a handsome shrub, and useful in flowering from July onwards. The species is variable, and some forms approach *E. punctata* in having the calyx glandular and downy. In var. *ALBIFLORA*, *Hooker*, perhaps not now in cultivation, the flowers are white.

E. VISCOSA, *Forbes*.

A loose-habited, rather sprawling evergreen shrub up to 10 ft. high, the branchlets drooping, sticky with resinous glands. Leaves obovate, 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; finely toothed, abruptly pointed or rounded at the apex,

tapered at the base to a stalk $\frac{1}{3}$ in. or less long; upper surface dark shining green, clammy with resin; paler, but also resinous and glossy beneath. Flowers white, in a panicle 5 or 6 ins. long, rather thinly disposed, pendulous from the under-side of the main axis, each branch of the panicle one- to four-flowered, and springing from the axil of a leaflike bract; flower-stalk furnished with stalked glands. Corolla $\frac{1}{4}$ to $\frac{1}{3}$ in. across, the claws of the petals forming a slender tube nearly $\frac{1}{2}$ in. long; calyx green, bell-shaped, with awl-shaped teeth.

Native of Chile; long known in cultivation, but much confused with *illinita*. From that species, although unmistakably closely allied, it is very distinct as seen in the living state. It is laxer in habit; the panicles are longer, one-sided (instead of cylindrical); and the leaves and young shoots are much more sticky and resinous, especially in autumn, and much more scented. The most impressive peculiarity of this shrub, indeed, is its odour, even more suggestive of the pigsty than that of *illinita*, but intermingled with a resinous smell, and by no means so unpleasant as that comparison might imply. So strongly are the shoots imbued with it that herbarium specimens, years after drying, still retain it. On living plants it is strongest on damp, still days.

EUCALYPTUS. GUM-TREES. MYRTACEÆ.

The gum-trees are the most characteristic timber-trees of Australia and Tasmania, where they are known also as "mahogany-trees," "iron-barks," and by other common names. They are evergreen shrubs or trees with peeling bark, some of the species attaining to perhaps greater heights than any other trees in the world. Most of them are of remarkably quick growth when young. The leaves of young examples of many species are curiously different from those of adults; being in the juvenile state opposite, heart-shaped, stalkless, very glaucous white, and standing out horizontally; in the adult or flowering state they hang down vertically, become stalked, much longer, narrower and greener. The chief features of the flower are the funnel-shaped to urn-shaped calyx-tube, and a circular band of very numerous stamens borne on the calyx rim. The calyx-tube becomes a hard, woody fruit, containing numerous minute seeds.

An extensive collection of eucalypts, thirty to forty species, is grown at Menabilly, in Cornwall, planted there by the late Mr Jonathan Rashleigh. At Kew only one is really hardy—*E. Gunnii*. In the following notes I have described what I believe to be the three next hardiest, although subsequent knowledge may show that other species are capable of withstanding equal or greater cold. The eucalypts like a deep, moist loam, and are raised from seed. Growing at a great rate when young, they should be planted out when quite small. If they can be given a temporary covering during severe frost for two or three winters, it enables them to form a woody base, and better able to withstand subsequent cold.

The Eucalypti are permeated more or less by a resinous gum, which has a pleasant and very characteristic odour.

E. COCCIFERA, Hooker fil.

A tree 70 ft. or more high in this country, young shoots warted. Leaves in juvenile trees opposite, blue-white, stalkless, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, roundish or

oval, abruptly pointed, becoming in the adult or flowering state, thick, grey-green, alternate, narrowly oblong or lance-shaped; 2 to 4 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ ins. wide; with slender stalks up to 1 in. long. Flowers in axillary umbels of about seven, produced on a common stalk $\frac{1}{2}$ in. long, but scarcely stalked individually; stamens yellow, very numerous, forming a cluster $\frac{5}{8}$ in. across; calyx-tube slenderly tapered like a funnel to the base.

Confined in a wild state to the mountain-tops of Tasmania; hardy only in the milder parts of the kingdom. One of the most notable specimens in the country is at Powderham, in Devon. It differs from *E. cordata*, *E. Gunnii*, and *E. urnigera* in the more numerous flowers in a cluster. At Powderham it has flowered both at midwinter and midsummer.

E. CORDATA, Labillardière.

An evergreen tree with warted, slender young shoots. Leaves opposite, stalkless, vividly blue-white, warted; heart-shaped, with the basal lobes of each leaf overlapping those of the opposite one; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, 1 to $2\frac{1}{4}$ ins. wide; short-pointed or rounded at the apex. Flowers produced in November and December, usually three in a cluster at each leaf-axil; the bush-like cluster of yellow stamens $\frac{3}{4}$ to 1 in. across; calyx-tube vase-shaped, $\frac{1}{4}$ to $\frac{1}{3}$ in. deep. Fruit roundish cup-shaped.

Native of Tasmania. It is not very hardy, and can only be expected to thrive permanently in Cornwall and such-like places. Near London it has lived long enough to flower in the open, but this is owing to its reaching the flowering state very early. Its leaves do not change in colour or shape on its reaching the flowering stage, a character that well distinguishes it from all the other eucalypts here mentioned. A tree at Menabilly, Cornwall, in 1909, was 50 ft. high and 2 ft. 5 ins. in girth. In a small state it is used in summer bedding for the sake of its brilliantly glaucous foliage.

E. GUNNII, Hooker fil. CIDER-TREE.

(*E. whittingehamensis, Hort.*)

An evergreen tree, 60 to 80 ft. high in this country, some of its forms attaining larger dimensions in Australia and Tasmania; free from down in all its parts. Leaves of juvenile plants nearly or quite opposite, orbicular, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide, rounded or notched at the top, heart-shaped or rounded at the base, sometimes stalkless, sometimes with a stalk $\frac{1}{8}$ to $\frac{1}{2}$ in. long, glaucous. As the adult state is reached the leaves become elongated, alternate, and longer-stalked, until at the flowering state they are $2\frac{1}{2}$ to 4 ins. long, about $\frac{3}{4}$ in. wide; pointed, and tapered at the base to a stalk up to 1 in. long. At this stage the leaves are all pendent. Flowers produced in October and later from the leaf-axils, usually in twos or threes, the main-stalk $\frac{1}{4}$ in. long; the individual flower about $\frac{5}{8}$ in. across, the chief feature being an enormous number of pale yellow spreading stamens; the calyx-tube gradually tapered like a funnel to a very short stalk. (Fig. p. 534.)

Native of Tasmania and S. Australia, where a remarkable variety of forms are said to occur. The above description is made from a specimen 40 ft. high growing near the Pagoda at Kew, which was planted there in 1896, and appears to be quite hardy—the only one of which so much can be said. One of the most notable trees in Great Britain is in Mr A. J. Balfour's grounds at Whittingehame, which yields good seed and is the parent of the tree at Kew. It is considered by Prof. Henry to differ from typical *E. Gunnii* in being less glaucous, in having proportionately narrower leaves, and a more tapered calyx-tube.

E. URNIGERA, Hooker fil.

A tree up to 80 ft. high in this country. Young shoots of juvenile trees warted; leaves orbicular, often notched or with a small mucro at the apex; 1 to $1\frac{3}{4}$ ins. wide; those of adults ovate to lanceolate, 2 to 4 ins. long, $\frac{3}{4}$ to 2 ins. wide; tapered or rounded at the base. Flowers usually three together (sometimes one or two) on a main-stalk up to 1 in. long, the stalk of the individual flowers also distinctly developed and $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Calyx-tube urn-shaped, $\frac{1}{4}$ in. long; stamens yellow, forming a ring $\frac{1}{4}$ in. across.

Native of Alpine districts of Tasmania. Mr Bennett, late gardener at Menabilly, informs me that in 1909 a specimen 80 ft. high and 3 ft. 9 ins.



EUCALYPTUS GUNNII.

in girth of trunk, was the tallest gum-tree there. *E. urnigera* is much confused with *E. Gunnii*, but is well distinguished by the longer main flower-stalk, the well-developed secondary ones, and by the calyx-tube being more swollen towards the base, *i.e.* urn-shaped rather than funnel-shaped.

EUCOMMIA ULMOIDES, *Oliver*. TROCHODENDRACEÆ.

A deciduous tree, not yet found by Europeans in a wild state, but from 20 to 30 ft. high, as seen cultivated by the Chinese. It probably attains to a large size. Leaves alternate, ovate to oval, long and slender-pointed, toothed, 3 to 8 ins. long, slightly hairy on both surfaces when young, becoming smooth above. Flowers unisexual, the sexes on

separate trees; they are inconspicuous, the males consisting of brown stamens only; female ones not seen by me. Fruit flat and winged, one-seeded, rather like an enlarged fruit of wych-elm, oval-oblong, $1\frac{1}{2}$ ins. long, tapering at the base to a short stalk; apex notched.

Introduced to France from China about 1896, and a few years later to Kew, where several plants raised from the original plant (a male) are 15 to 20 ft. high, and have several times flowered. It was first discovered in China by Henry as a cultivated tree, 20 to 30 ft. high, but as its bark is and has for 2000 years been highly valued by the Chinese for its real or supposed tonic and other medicinal virtues, it is never allowed to reach its full size, but is cut down and stripped of its bark. To Europeans the most interesting attribute of the tree is its containing rubber. What its commercial value may be is doubtful; the rubber is apparently of inferior quality, but the tree is of peculiar interest as the only one hardy in our climate that is known to produce this substance. If a leaf be gently torn in two, strings of rubber are visible. At Kew, grown in good loam, it has proved absolutely hardy, and a vigorous grower; it can be propagated by cuttings made of half-ripened wood put in gentle heat. Wilson introduced seeds to the Coombe Wood nursery, from which, no doubt, trees of both sexes have been raised. Some authors place it in the witch-hazel family.

EUCRYPHIA. EUCRYPHIACEÆ.

A group of four species of evergreen shrubs and trees, two native of Chile, two of Australasia. The Chilean species only are grown out-of-doors in the British Isles. They are readily distinguished as follows:—

E. cordifolia.—Leaves simple; petals five.

E. pinnatifolia.—Leaves pinnate; petals four.

One of the Australasian species, *E. BILLARDIERII*, *Spach*, is sometimes grown in greenhouses, and has white flowers 1 in. or more across, and simple, narrowly oblong leaves, 2 to 3 ins. long. It is a tree occasionally 80 to 100 ft. high, and might be hardy in the south-western maritime counties. The genus is of peculiar botanical interest in having no known close allies, and its true place in the vegetable kingdom is doubtful. It is sometimes placed in the Rose family. (For cultivation, see *E. pinnatifolia*.)

E. CORDIFOLIA, *Cavanilles*.

An evergreen shrub or small tree, with downy branchlets and simple heart-shaped leaves, $1\frac{1}{2}$ to 3 ins. long, dull green; the margins wavy, very downy beneath. Flowers produced singly in the terminal leaf-axils, white, 2 ins. across; petals five.

Native of Valdivia and the Island of Chiloe, where it attains a stature of 30 ft. or more; introduced in 1851. More tender than *E. pinnatifolia*, this species has never obtained a good footing in gardens, and it is only adapted for places where the conditions are favourable. The finest specimen in the south of England is at Nyman's Gardens, Handcross, in Sussex, about 18 ft. high and 6 ft. through; another in the late Mr W. E. Gumbleton's garden at Queenstown was, in 1907, 10 ft. high. At Kew it has been killed over

and over again by frost, and even against a wall does not succeed well. Its needs in regard to soil, etc., are the same as those of the following species. According to Mr Comber, of Nyman's Gardens, the fruits require fourteen or fifteen months to mature.

E. PINNATIFOLIA, Gay,

(Bot. Mag., t. 6067.)

An evergreen or partially deciduous small tree, 10 to 15 ft. high, with erect branches, bearing the leaves in a cluster towards the end of each shoot. Leaves opposite, pinnate, composed of three or five leaflets, which are ovate to oval, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, regularly toothed, dark shining green. Flowers produced singly or in pairs from the end of the shoot, and from terminal leaf-axils, each one $2\frac{1}{2}$ ins. across; petals four, white; stamens numerous, with yellow anthers. Fruit a hard, woody, pear-shaped capsule $\frac{1}{2}$ to $\frac{3}{4}$ ins. long. The young wood, leaf-stalks and leaves are hairy when young.

Discovered by Gay, the Chilean botanist, about 1845, on the rocky banks



EUCRYPHIA PINNATIFOLIA.

of the river Biobio; introduced in 1859 by R. Pearce, when collecting in Chile for Messrs Veitch. It is the finest and best of the *Eucryphas*, and the only one hardy near London. Blossoming in July and August, it is then a plant of singular beauty with its large pure white petals and conspicuous tufts of stamens. Unfortunately, although hardy, it is not easy to propagate or transplant, consequently it has never become common. In a young state it is apt to die off without any apparent reason, although when once established it appears to continue in good health indefinitely, as witness the original tree in the Coombe Wood nursery. A moist peaty soil is best for it in the juvenile state, and a little plot of this should be provided for it when planted. Afterwards, when established and strong, its roots will spread into the ordinary soil around if it be free from lime. The best success with it at Kew has been obtained by planting it in beds of heaths where its roots are shaded. I think many premature deaths are due to the sun, on scorching summer days, beating on naked soil about its roots. Seeds are now being produced in this country, and will render its propagation more easy; previously it had to be increased solely by layering. Seedlings should be given peaty soil; they are worth every care.

EUONYMUS. SPINDLE-TREE. CELASTRACEÆ.

Few, if any, species of *Euonymus* have any beauty of flower. Their value in the garden dwells in the beauty of their fruits, in the autumnal colours of the foliage of some species, and in the rich evergreen foliage of others. They are evergreen or deciduous trees, shrubs, or creeping plants, with the young shoots often four-angled. The leaves are always opposite and toothed in the cultivated species, except *E. nanus*. The arrangement of the flowers is very characteristic in this genus; they are borne from May to June in cymes from the lower joints of the current season's growth. There is first a slender main-stalk usually about 1 in. long, which terminates in a single flower flanked by one at each side. This three-flowered cyme is seen in *E. europæus* and others; but often the main-stem forks instead of producing two side flowers into two parts, each with its terminal flower and two side ones. The inflorescence is then seven-flowered. Sometimes these secondary stems branch again and the inflorescence becomes fifteen-flowered.

The flowers are usually from $\frac{1}{8}$ to $\frac{1}{2}$ in. across, greenish, yellowish, or white, rarely purple. The parts of the flower (sepals, petals, stamens, and lobes of the fruit) are in fours or fives, which sometimes affords a convenient means of distinction. The fruits are pendulous and highly coloured, and are composed of three to five one-seeded cells or lobes—the lobes often angled, sometimes winged. The seed is partially covered with an outer coat, known as the aril, which is usually brilliantly coloured—scarlet, orange, etc., and adds much to the effect of the fruit when the cells burst.

The only other genus of hardy shrubs with which *Euonymus* can be confused is *Celastrus*, which has a similar fruit, but is well distinguished by its alternate leaves.

These plants are easily cultivated in a good, well-drained loam. Some of the species, like *E. atropurpureus* and *americanus*, like a position shaded during the hottest hours of the day, and all the evergreen sorts grow, if they do not bear fruit well, in permanent, if not too dense, shade. Propagation of the deciduous species is best effected by seeds. Failing this method, cuttings or layers may be used; cuttings of the evergreen species and varieties take root very readily, and may be struck at almost any season if a little bottom heat be given.

Several species, notably *E. europæus* and *japonicus*, are frequently badly attacked by a caterpillar at the flowering season, which swarms on the branches in cobwebby masses, feeding on the leaves and preventing the formation of a crop of fruit. A quick and effective remedy is to spray the tree with an arsenical wash. A solution of Paris green at the strength of 1 oz. to 12 galls. of water may be used.

E. ALATUS, Regel.

A deciduous shrub of open but stiff habit, 6 to 8 ft. high, and more in diameter, free from down in all its parts; young branches at first square, two

or four of the angles afterwards developing conspicuous thin, corky wings $\frac{1}{4}$ to $\frac{1}{2}$ in. broad. Leaves narrowly oval or obovate, 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; tapered at both ends, finely toothed, dark green; stalk $\frac{1}{2}$ in. long. Flowers not more than three on a cyme, greenish yellow, about $\frac{1}{4}$ in. across. Fruit purplish, composed normally of four ovoid lobes or pods, united only at the base, $\frac{1}{4}$ to $\frac{1}{2}$ in. long; frequently the number of pods is reduced to two or one, through the barrenness and non-development of the others; seed-coat scarlet.

Native of China and Japan. This is one of the most distinct in the genus through the curious corky wings that develop on the branches, and through the divided purplish segments of the fruit. As a garden shrub it is valuable for the rich rosy scarlet of its decaying leaves.

Var. *SUBTRIFLORUS*, *Franchet* (*E. Thunbergianus*, *Blume*).—This distinct variety has no corky wings to the branches; its leaves are thinner and usually longer, and its habit laxer.

E. AMERICANUS, *Linnaeus*. STRAWBERRY BUSH.

A deciduous shrub up to 6 ft. high, of upright or straggling habit, not downy in any part; twigs four-angled. Leaves of firm texture, glossy, narrowly oval to lanceolate, long-pointed, wedge-shaped at the base, shallowly toothed; 1 to 4 ins. long, $\frac{1}{3}$ to $1\frac{1}{4}$ ins. wide; stalks $\frac{1}{2}$ in. long. Flowers $\frac{1}{2}$ in. diameter, greenish purple, with five rounded, distinctly clawed petals; produced about midsummer singly or in threes on a slender stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Fruits $\frac{1}{2}$ to $\frac{3}{4}$ in. diameter, red, three to five-lobed, covered outside with prickly warts; the coat of the seed scarlet.

Native of the eastern United States; introduced in 1683, according to Aiton, but rarely seen. In my experience it rarely bears fruit in this country. It is distinguished among *Euonymus* by its spiny-warted fruits, and by having the parts of its flower in fives. The only other cultivated species uniting these two characters is *E. obovatus*, a prostrate plant with thin, dull green, obovate, short-pointed leaves.

Var. *ANGUSTIFOLIUS*, *Wood*.—Leaves narrow-lanceolate, one-fourth to one-fifth as wide as long.

E. ATROPURPUREUS, *Jacquin*. BURNING BUSH.

A deciduous shrub, 6 to 12 ft. high; young shoots smooth. Leaves oval or narrowly obovate, tapered at both ends; 2 to $5\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $2\frac{1}{4}$ ins. wide; finely toothed, dark green and nearly smooth above, downy beneath; stalk $\frac{1}{3}$ to $\frac{2}{3}$ in. long. Flowers seven to fifteen, in twice or thrice branched cymes 1 to 2 ins. long, expanding in July; each flower $\frac{1}{3}$ in. across, of a dark purple; the parts in fours. Fruit smooth, four-lobed, crimson on pendent stalks; seed-coat scarlet.

Native of the eastern and Central United States; introduced in 1756. In some parts of its native habitat it attains the dimensions of a tree 20 to 25 ft. high, with a trunk 1 to $1\frac{1}{2}$ ft. in girth. It has no special merit in this country.

E. BUNGEANUS, *Maximowicz*.

A deciduous shrub or small tree, ultimately 15 to 18 ft. high, of erect, rather thin habit, making long, slender, graceful, round branchlets, not downy in any part. Leaves oval or ovate; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; broadly wedge-shaped at the base, long and slender-pointed, the margins set with small incurved teeth; pale green and smooth; stalk slender, $\frac{1}{3}$ to 1 in. long. Flowers yellowish white, $\frac{1}{4}$ in. across, the parts in fours, anthers purple; produced in cymes 1 to 2 ins. long. Fruit four-lobed, smooth, $\frac{1}{2}$ in. across,

yellowish white tinged with pink, indented at the top, often unequal sided through the non-development of the seed in one or more lobes; lobes angled when barren, quite rounded when fertile. Seed-coat (or aril) orange-coloured.

Native of N. China, Manchuria, etc. Seeds were sent to Kew by the late Dr Bretschneider from N. China in 1883, which represent, so far as I am aware, its first introduction. In sunnier climates than ours it bears fruit abundantly and regularly. With us it grows well and flowers freely, but a fine crop of fruit is rather exceptional. On such an occasion, however, the shrub is extremely effective.

E. EUROPÆUS, *Linnaeus*. SPINDLE-TREE.

A deciduous shrub or small tree, from 10 to 25 ft. high, forming a spreading, bushy head, often naked towards the ground, not downy in any part. Leaves narrowly oval, sometimes inclined to ovate or obovate, 1 to $3\frac{1}{2}$ ins. long, $\frac{1}{3}$ to $1\frac{1}{4}$ ins. wide; slender-pointed, tapered at the base, minutely toothed; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Cymes slender-stalked, 1 to $1\frac{1}{2}$ ins. long, usually three- or five-flowered (sometimes more); flowers yellowish green, $\frac{1}{2}$ in. across; petals and stamens four. Fruit red, $\frac{1}{3}$ to $\frac{1}{2}$ in. across; seed-coat orange-coloured.

Native of Europe, including the British Isles. There is no more beautiful or striking object in autumn than a fine spindle-tree well laden with fruit. It has a number of varieties, some distinguished by the fruit, others by the foliage. One may frequently see it in gardens as a small tree with a well-formed single trunk, and Loudon records trees 25 to 35 ft. high in Scotland. The wood is hard, and was in earlier times much favoured for making spindles, hence the popular name.

Var. AUCUBÆFOLIUS.—Leaves blotched with yellow; rather unsightly.

Var. FRUCTU-ALBO.—Fruits white. Although this does not produce the rich effect of the type, it is very striking in contrast with it.

Var. PURPUREUS.—Young shoots and leaves suffused with purple. There are also white and yellow variegated forms of no value (argenteo-variegatis and aureo-variegatis).

E. JAPONICUS, *Thunberg*. EVERGREEN SPINDLE-TREE.

An evergreen shrub or small tree of densely leafy, bushy habit, 10 to 15, sometimes 25 ft. high, free from down in all its parts. Leaves obovate to narrowly oval, 1 to 3 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; leathery, dark polished green, tapered at the base, usually blunt or rounded at the apex, obscurely round-toothed; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers $\frac{1}{3}$ in. across, four-parted, greenish white, five to twelve in stoutly stalked cymes. Fruit smooth, globose, $\frac{3}{8}$ in. across, pinkish; seed-coat pale orange.

Native of Japan; introduced in 1804. Although tender in cold districts, this species is hardy over the south of England, only occasionally being injured. It is a handsome and cheerful evergreen much used in south coast watering-places for hedges, where the sea air seems to suit it. In Italian and Dalmatian gardens it is planted to a wearisome extent, and is now badly affected by a mildew (*Oidium Euonymi-japonicæ*). During a recent journey I noticed it to be free of this in one place only, which was the public garden at Venice, an immunity perhaps due to the isolated nature of the city. The same disease was very bad in Bournemouth a few years ago, but latterly has been less noticeable. Patches are sometimes seen at Kew, but it is apparently not so prevalent inland. A remedy is to spray the plants with a solution of liver of sulphur, 1 oz. to 2 galls. of water.

Var. ALBO-MARGINATUS.—Leaves with a thin margin of white.

Var. AUREUS.—Centre of leaf bright yellow with only a marginal line of

dark green. Like many shrubs with this type of variegation, it is very apt to revert to the green type.

Var. *LATIFOLIUS VARIEGATUS*.—Leaves broadly oval, with a wide margin of white.

Var. *MACROPHYLLUS*, *Siebold* (*E. robustus*, *Hort.*).—Leaves green, oval, $2\frac{1}{2}$ to 3 ins. long.

Var. *MICROPHYLLUS*, *Siebold*.—A very distinct, dwarf, small-leaved form, 1 to 3 ft. high, with quite erect branches; leaves dark green, oval-lanceolate, $\frac{1}{2}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{3}$ in. wide. More tender than the type.

Var. *OVATUS AUREUS*.—Perhaps the best golden variegated form. Leaves oval or ovate, with a broad margin of rich yellow.

There are numerous other forms slightly different from the above. *E. japonicus* and all its varieties need a soil of moderate richness only; they are all easily rooted from cuttings.

E. LATIFOLIUS, Miller.

A deciduous shrub or small tree, 10 ft. or more high, with a spreading, loose head of branches; young shoots angled and, like the remainder of the plant, free from down. Leaves oval, oblong or obovate, 3 to 5 ins. long, $1\frac{1}{2}$ to $2\frac{1}{4}$ ins. wide, rounded or wedge-shaped at the base, pointed, very finely and evenly toothed; stalk about $\frac{1}{4}$ in. long. Flowers greenish, about $\frac{3}{8}$ in. across, the parts normally five; produced in early May, seven to twelve together, on very slender-stalked cymes 2 to 3 ins. long. Fruits pendulous, $\frac{3}{4}$ in. across before bursting, rich rosy red, with five, sometimes four, winged lobes; seed-coat orange-coloured.

Native of Europe; introduced in 1730. Excepting the native *E. europæus*, this is the most ornamental of all the genus in our gardens; its individual fruit is much larger and more striking than that of the common spindle-tree, but is not borne in such profusion. Grown as a small tree in rich deep soil, it will reach 20 ft. in height, and such a specimen, hung with its long-stalked fruit in September, is one of the most beautiful objects of autumn.

E. NANUS, Bieberstein.

A low, deciduous, or partially evergreen shrub, of thin, spreading or procumbent habit, growing 1 to 3 ft. high; its young branches long and slender, smooth, but angled. Leaves alternate or opposite, linear or narrow-oblong; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{12}$ to $\frac{5}{16}$ in. wide; tapered at the base, blunt or pointed at the apex; margins toothed or entire, decurved, dark dull green, smooth on both surfaces; stalk $\frac{1}{12}$ in. long. Flowers inconspicuous, brown-purple, $\frac{1}{8}$ in. across, four-parted, one to three on a very slender stalk $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Fruit four-lobed, pink; outer coat (arillus) of the seed orange-coloured, inner one brown.

Native of the Caucasus, eastward to China; introduced in 1830. This species, so distinct from all others in cultivation in its narrow, rosemary-like, often alternate leaves, is an interesting plant, but of no great merit as an ornament. It does not bear its fruit regularly or freely in this country.

Var. *KOOPMANNI*, *Beissner*.—A form of sturdier habit and broader leaves, often over $\frac{1}{2}$ in. wide, not decurved at the margin. Found by Koopmann on the Thian-shan and Altai mountains.

E. OBOVATUS, Nuttall. CREEPING SPINDLE-TREE.

A deciduous shrub of usually trailing habit, rarely more than 1 ft. above the ground, not downy in any part. Leaves dull green, obovate, tapered at

the base, bluntish at the apex; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ in. wide; finely or obscurely toothed; stalk $\frac{1}{8}$ in. or less long. Flowers $\frac{1}{4}$ in. wide, greenish purple, with five rounded petals; they are produced during May and June singly, or in threes, on slender stalks $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long. Fruit usually three-lobed, $\frac{1}{2}$ to $\frac{3}{4}$ in. across, crimson, covered with prickly warts; covering of the seeds scarlet.

Native of Eastern N. America; introduced in 1820. This is one of the few warty-fruited species in cultivation, and is closely allied to *E. americana* (q.v.). Its prostrate habit enables it to take root as it spreads, and thus it may be used where an interesting low ground cover is desired. It thrives better under cultivation than *E. americanus*, and bears fruit occasionally, but is never showy. In a wild state it inhabits damp spots.

E. PATENS, Rehder.

An evergreen shrub up to 9 or 10 ft. high, of spreading habit, not downy in any part. Leaves oval or obovate, 2 to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; tapered at the base, pointed or bluntish at the apex, round-toothed, of firm texture, and bright green; stalk $\frac{1}{4}$ in. or less long. Flowers greenish white, $\frac{1}{8}$ in. across, four-parted, numerous, on loose erect cymes $1\frac{1}{2}$ to 4 ins. wide, on a main-stalk 1 to $1\frac{1}{2}$ ins. long. Fruit nearly $\frac{1}{2}$ in. across, pink, smooth and not lobed; seed-coat orange-red.

Originally described in Sargent's *Trees and Shrubs*, t. 64, by Mr Rehder, who states that it is probably a native of China, whence it was introduced into the United States, about 1860, by Dr G. R. Hall. Small plants were sent to Kew in 1905, but it may have been in cultivation, before as *E. japonicus*. To that species it is very closely allied, but is probably hardier. It has not yet flowered under recognition in this country, but it has a wider inflorescence, and its habit is laxer than in *E. japonicus*, the lower branches often taking root. The leaves are thinner, more pointed, and more finely toothed.

E. PLANIPES, Koehne.

A deciduous shrub or small tree, closely allied to *E. latifolius*, and of similar habit and dimensions. The leaves are like those of that species in most respects, but are more coarsely toothed, and the stalk is not channelled on the upper side. The fruit is rosy red and five-lobed, as in *E. latifolius*, but differs in having the top conical; nor are the wings of each lobe flattened and knife-like as in *E. latifolius*. Except in these respects the two differ but little.

Native of Japan; introduced to Kew from the Arnold Arboretum in 1895 (as *E. macropterus*); it has borne fruit for several years past, and promises to be as handsome as *latifolius*.

E. MACROPTERUS, Ruprecht (true), is probably not in cultivation. It has much the general aspect of *E. planipes* and *E. latifolius*, but is very distinct from both in having uniformly four-lobed fruits with a very conspicuous tapering wing, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, standing out from the side of each lobe. Native of N. China, Manchuria, etc.

E. RADICANS, Siebold.

A creeping, evergreen, glabrous shrub, rooting as it spreads over the ground, but when trained up house-fronts and such-like places reaching 20 ft. or more high; branches minutely warty. Leaves oval or somewhat ovate, ordinarily $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide; tapering about equally to the base and to the blunt apex, shallowly round-toothed, dark green and smooth; stalk $\frac{1}{12}$ in. long, warty.

Native of Japan. So far as I have observed, this *Euonymus* never bears flowers or fruit in what we regard as its typical climbing or trailing condition. It appears to be like the ivy, and when it has arrived at the adult or flowering state alters the character of its growth, and instead of the shoots being slender and trailing they become erect and bushy, and bear flowers and fruit of the same character as those of *E. japonicus*; the leaves also become larger. As a garden shrub it is extremely useful; it thrives almost as well as the ivy in deep shade, and makes an admirable ground covering in sunny positions also. It may be used as an edging for paths, being of less trouble, although not so neat, as box-edging. It can be increased with great rapidity and ease by simply pulling old plants apart into small pieces and replanting; every bit will grow. In the New England States, where ivy is not hardy, this plant is used for covering the fronts of dwelling-houses.

Var. *CARRIEREI*, *Nicholson*.—This I regard as the adult state of ordinary *E. radicans*, taken off and rooted as so-called "tree" ivies are. It is a low, spreading shrub with no inclination to climb; leaves 1 to 2 ins. long, $\frac{5}{8}$ in. to 1 in. wide, glossy. Flowers greenish, four-parted, five or more crowded at the end of a slender stalk; fruit orange-shaped, greenish white or tinged with red, $\frac{1}{2}$ in. across; seed with an orange-yellow coat.

There are various coloured-leaved forms; the commonest is var. *FOLIIS VARIEGATIS*, whose leaves are rather larger than in ordinary *radicans* and have a broad marginal band of white, the centre greyish. Introduced from Japan about 1860. When this variety reaches the adult state, the flowering portion assumes a shrubby character and the leaves become larger, as they do in var. *Carrieri*. Var. "Silver Queen" represents perhaps the best of these variegated "tree" forms on their own roots, the largest leaves being $2\frac{1}{2}$ ins. long and more than 1 in. wide, handsomely variegated in white.

Var. *KEWENSIS*, *Hort.* (minimus).—This curious little plant—an *E. radicans* in miniature—was introduced from Japan by Prof. Sargent, and sent by him to Kew in 1893. Leaves dull green, with the veins picked out in a paler shade; $\frac{1}{4}$ to $\frac{5}{8}$ in. long, $\frac{1}{8}$ to about $\frac{1}{4}$ in. diameter; ovate, rounded at the base, blunt at the apex, margin slightly decurved and with a few shallow teeth; distinctly, but very shortly stalked. The whole plant, but especially the young shoots, is densely covered with minute warts. In a young state this plant forms low patches an inch or two high. Afterwards, if near a shrub, it will climb up its stems. When support of this kind is lacking it will form a little pyramid of its own branches, growing erect and clinging together. It has not yet flowered in this country, and may prove to be a distinct species when it does. In the meantime it may be known as "kewensis," as it has become known in nurseries under that name through having been distributed from Kew.

Var. *ROSEO-MARGINATIS* has the leaf-border pinkish.

Var. *VEGETUS*, *Rehder*, in Sargent's *Trees and Shrubs*, t. 65.—A very distinct variety of bushy habit, with but few of the branches procumbent and rooting. Leaves stout, broadly oval to roundish, 1 to $1\frac{1}{2}$ ins. long. Introduced to the Arnold Arboretum from Japan in 1876. According to Mr Rehder it bears fruit abundantly, but even if it should fail in this respect here, it will make a useful sturdy evergreen for moderately shady places.

E. SANGUINEUS, *Loesener*.

A deciduous shrub 6 to 10 ft. high, devoid of down in all its parts; young shoots reddish. Leaves ovate, oval, or obovate, $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $2\frac{1}{4}$ ins. wide; margins set with fine incurved teeth, the base broadly wedge-shaped or rounded, the apex slenderly pointed; dull green; chief veins in four to seven pairs. Flowers yellow, produced in thin, forked cymes, 3 or 4 ins. wide and long. Fruit composed of four (rarely five) parts (capsules), each part

furnished with a wing $\frac{1}{2}$ in. long, the whole fruit nearly 1 in. wide, red, showing when split the yellow-coated seed.

Native of Central and Western China, introduced by Wilson in 1900. It appears to be closely allied to *E. latifolius*, which is, however, distinct in its larger, thinner leaves, more often five-parted flowers, larger fruits with shorter wings, and longer winter buds. (See also *E. planipes*.) It appears to be quite hardy.

E. SEMIPERSISTENS, *Sprague*.

(*E. Hamiltonianus* var. *semipersistens*, *Rehder*.)

A semi-evergreen shrub or small tree, 15 ft. or more high, not downy in any part. Leaves ovate, ovate-lanceolate, sometimes oval, 2 to $5\frac{1}{2}$ ins. long, 1 to $2\frac{1}{4}$ ins. wide, broadly wedge-shaped at the base, drawn out at the apex into a slender tail-like point, finely toothed; stalk $\frac{1}{2}$ to 1 in. long. Flowers four-parted, $\frac{1}{2}$ in. across, the anthers purple, produced during July in three- to twelve-flowered cymes. Fruit bright pink, $\frac{3}{8}$ in. wide, four-lobed, indented at the top, tapering towards the base, the lobes rounded.

Native of China; long cultivated in England as *E. Sieboldianus* (which is probably not introduced). It is more closely allied to, perhaps a variety of, *E. Bungeanus*, but its firmer, later-falling leaves and pink fruits tapered at the base distinguish it. It retains its leaves until March unless the winter is severe.

E. VERRUCOSUS, *Scopoli*. WARTY SPINDLE-TREE.

A deciduous shrub of dense-branched, rounded habit, 6 to 10 ft. high; bark of the younger branches covered densely with conspicuous warts. Leaves ovate, ovate-lanceolate, or oval; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide; finely toothed, slender-pointed, rounded or wedge-shaped at the base; stalk $\frac{1}{2}$ in. long. Cymes with very slender stalks about 1 in. long, usually three- sometimes seven-flowered. Flowers purplish brown, $\frac{1}{4}$ in. across, four-parted. Fruit yellowish, $\frac{1}{2}$ in. across; seed black, with an outer coat of orange.

Native of E. Europe and W. Asia; introduced from Austria in 1763. This species is readily recognised among all cultivated spindle-trees by the remarkably warted bark. It bears fruit very sparingly with us, and has little to recommend it as an ornamental shrub.

E. WILSONII, *Sprague*.

An evergreen shrub up to 20 ft. high, of lax or scandent habit, quite free from down in leaf and twig; young shoots slender. Leaves 3 to 6 ins. long, 1 to $1\frac{1}{2}$ ins. wide, lanceolate, wedge-shaped at the base, gradually tapered at the apex to a long slender point; shallowly and rather distinctly toothed; conspicuously veined beneath; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruits four-lobed, borne on a main-stalk $1\frac{1}{2}$ ins. long; they are clothed with conspicuous, awl-shaped spines $\frac{1}{2}$ in. long, and are altogether about $\frac{3}{4}$ in. across; seed-coat yellow.

Introduced from Mt. Omi in W. China by Wilson in 1904, and now growing vigorously in the collection at Kew. It is distinct from cultivated spindle-trees in the remarkable hedgehog-like fruits.

E. YEDOENSIS, *Koehne*.

A deciduous shrub or small tree, of sturdy, flat-topped habit, growing 10 feet or more high; branches stiff; young shoots smooth. Leaves obovate, usually broadly so, sometimes oval, tapered at both ends, but more abruptly

at the apex, minutely toothed; 2 to 5 ins. long, $1\frac{1}{2}$ to 3 ins. wide, smooth, strongly veined beneath; leaf-stalk $\frac{1}{2}$ to $\frac{3}{8}$ in. long. Flowers with styles of varying length. Fruit pinkish purple, about the size of those of *E. europæus*; seeds with an orange-coloured coat, but not much exposed.

Native of Japan; named by Prof. Koehne in 1904. It is allied to *E. europæus*, but is distinguished by the brown-purple anthers. I have not seen it in flower, but there is a fine bush in the Vicarage garden at Bitton, near Bristol, where its leaves turn a brilliant red in early autumn.

EUPTELEA. TROCHODENDRACEÆ.

A genus of three species—from N. India, China, and Japan. They are trees with conspicuously toothed, long-stalked leaves, and remarkable unisexual flowers of no beauty; they have no sepals or petals. The fruit is a curious flat samara, rather resembling that of the elm, but wedge-shaped, and tapering gradually from a rounded apex to a slender stalk. To gardens the two cultivated species introduce a new and distinct type of tree. They are quite hardy, of graceful form, and give good colour effects in autumn. They are of such recent introduction that little is known of their propagation, but if not by cuttings they can probably be increased by layers.

The Eupteleas are of considerable botanical interest in belonging to an anomalous group including *Cercidiphyllum*, *Eucommia*, *Tetracentron*, and *Trochodendron*, whose true place in the vegetable kingdom is variously estimated. Benthams and Hooker placed them near the *Magnolias*.

E. PLEIOSPERMA, *Hooker* (*E. Davidiana*, *Baillon*), is a native of N. India and W. Szechuen, China, where it has recently been collected by Wilson. In many respects similar to *E. Franchetii*, it can be distinguished by the leaves being more or less glaucous beneath. The fruits are also larger.

E. FRANCHETII, *Van Tieghem*.

A deciduous tree, 20 to 40 ft. high. Leaves broadly ovate, wedge-shaped at the base, the apex drawn out into a long narrow point; 2 to 4 ins. long and often three-fourths as much wide; the margins irregularly toothed, but not so markedly so as in *E. polyandra*, green beneath; the stalk is half to two-thirds as long as the blade. Male flowers made up of stamens only; females in umbels. Fruit flat, narrowly wedge-shaped, notched on one side, borne on a slender stalk $\frac{1}{2}$ in. long, one- to three-seeded.

Discovered by the Abbé David in the forests of Yunnan, W. China, at 7000 ft. altitude, in 1869, this interesting tree was afterwards found by Wilson in the province of Hupeh, and introduced by him in 1900. It much resembles *E. polyandra*, but its leaves are more narrowed at the base and more regularly toothed; the samara-like fruit contains usually more than one seed. The foliage dies off a pretty red in autumn.

E. POLYANDRA, *Siebold*.

A deciduous tree, 20 to 30 ft. high, with a slender, straight trunk. Leaves, broadly ovate to almost orbicular; 3 to 6 ins. long and almost as much in

width; often cut off straight or heart-shaped at the base, narrowing abruptly at the apex to a long drawn-out point; the margin is irregularly toothed, almost ragged; the leaf-stalk is often two-thirds as long as the blade. Male flowers are composed of stamens with red anthers; the females (on separate trees) of few clustered carpels. Fruit an oblanceolate, obliquely notched samara, containing one seed.

Native of the forests of Central Japan. This tree has some value in the garden, and although it has no beauty of flower its habit is good; its leaves are handsome and distinct in form, and they turn red and yellow before falling. A small male tree has flowered at Kew for some years past in April. In the arboretum at Segrez, in France, formed by the late Mr A. Lavallée, I saw a few years ago a tree about 20 ft. high.

EUROTIA CERATOIDES, *C. A. Meyer.* CHENOPODIACEÆ.

(*Diotis ceratoides*, *Willdenow.*)

A deciduous shrub of spreading habit, 3 to 4 ft. high, and twice or thrice as wide; branches long, slender, whitish, stellately downy. Leaves alternate, grey-white at first, becoming green, lance-shaped, pointed; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; stellately downy especially beneath, and with three longitudinal veins. Flowers produced in July, densely packed in spikes $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, and furnished with linear woolly bracts standing out beyond the flower; these spikes are terminal on short side twigs from the uppermost 1 or 2 feet of the year's shoot, the whole forming a slender panicle of that length. The upper part of each spike is composed of male flowers, grey and very woolly, with the yellow anthers protruding through the wool; below them, and situated in the leaf-axils, are one or two female flowers without sepals or petals, and so small as to be scarcely visible. The seed-vessel becomes covered with silky white hairs, $\frac{1}{4}$ in. long.

Native of the Caucasus and Asia Minor, eastward to China; introduced in 1780. Over this wide area it shows some variation in shape and size of the leaf, and in the amount of down upon it. In drying for the herbarium the leaves and fruits turn brown. The shrub has considerable botanical interest, but its only garden value is in providing a mass of grey-white foliage in summer. It is perfectly hardy, does not need a rich soil, and is easily increased by cuttings.

E. LANATA, *Moquin*, a species from Western N. America, is also in cultivation. It is a grey-white shrub a yard high, clothed with starry down. Leaves linear, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, like those of lavender. Flowers in slender panicles 4 to 9 ins. long, 1 to 2 ins. wide. It inhabits dry regions, and is known as "white sage." Not apparently so good for gardens as *E. ceratoides*, from which it is distinguished by the more recurved margins of the leaves.

EURYA JAPONICA, *Thunberg.* TERNSTRÆMIACEÆ.

(*E. pusilla*, *Siebold.*)

A dwarf evergreen shrub, with alternate, dark, glossy green leaves, which are $1\frac{1}{2}$ to 3 ins. long, oval or obovate, toothed, blunt at the apex,

quite smooth (like the twigs), shortly stalked. Flowers unisexual, very small and inconspicuous, white, produced singly or in twos or threes from the axils of the leaves; each flower $\frac{1}{8}$ in. across on a stalk about as long. Fruit black, and as large as a peppercorn.

At Kew this little shrub is hardy when once thoroughly established, but is sometimes injured by severe frost when young. It is easily increased by cuttings. What is considered by botanists to be the same species is found not only in China and Japan, but in the mountains of N. and S. India, Ceylon, the Malay Archipelago, even as far east as Fiji. In these places, even in Japan, it sometimes becomes a small tree 30 ft. high, but the form cultivated in Britain is quite a dwarf and slow-growing bush, and is perhaps the most northerly and hardiest form. It is 7 ft. high at Kilmacurragh, Co. Wicklow. It is evidently the plant distinguished as *E. PUSILLA* by Siebold, who gave several forms of this *Eurya* specific rank. It is an interesting ally of the tea plant, and a neat little evergreen. Distinguished from *Cleyera* by its dioecious flowers.

EUSCAPHIS STAPHYLEOIDES, *Siebold*. SAPINDACEÆ.

A deciduous bush up to 12 ft. high, with stout, pithy branchlets and prominent buds; twigs smooth. Leaves 6 to 10 ins. long, opposite, consisting usually of seven or nine leaflets. Leaflets opposite, ovate, $2\frac{1}{2}$ to 4 ins. long, long-pointed, shallowly toothed, smooth except for a little down near the base of the midrib. Panicle terminal, branching, 4 to 9 ins. long, carrying numerous yellowish white flowers, each about $\frac{1}{4}$ in. across. Fruit consisting of three somewhat boat-shaped, spreading, rosy pink pods, $\frac{1}{2}$ in. long; seeds black.

Native of China, Corea, and Japan. As the specific name implies, this shrub is not only closely related to the bladder-nuts (*Staphylea*), it also bears much resemblance to them. It differs in the larger number of leaflets, in the smaller individual flowers, and in the smaller, differently shaped fruit. Unfortunately it is not very hardy, and can only be grown outside permanently in the mildest localities.

EVODIA. RUTACEÆ.

A genus of unarmed trees and shrubs widely spread over Eastern Asia, and extending to Australia and Madagascar. The only hardy species in cultivation are a few deciduous ones which have recently been introduced from China by Wilson, and one from Corea. They are small trees of the same type as *Phellodendron*, sometimes aromatic. Young shoots very pithy, marked with lenticels, axillary buds exposed. Leaves opposite, pinnate. Flowers borne in broad flattish corymbs terminating the shoots of the year, often unisexual, small; sepals, petals, and stamens four or five in number. Fruit a capsule of four or five carpels which split from the top, revealing shining black seeds the size of gun-shot.

Among cultivated trees these new *Evodias* most closely resemble

Phellodendron, but they are very readily distinguished from that genus by the buds in the leaf-axils being exposed. (In *Phellodendron* the buds are quite hidden in the base of the leaf-stalk.) Although little can as yet be said about them with certainty, the following species promise to be hardy and fine-foliaged trees.

E. DANIELLII, *Hemsley*.—Leaves 9 to 15 ins. long; leaflets, five to eleven, ovate-cordate to ovate-oblong, broadly wedge-shaped to slightly heart-shaped at the base, narrowed at the apex to a slender point; 2 to 5 ins. long; smooth above, downy on the midrib and in the vein-axils beneath; stalk of leaflet about $\frac{1}{2}$ in. long. Native of N. China and Corea; introduced from the Arnold Arboretum to Kew in 1907.

E. GLAUCA, *Miquel* (*E. Fargesii*, *Dode*).—Leaves 6 to 10 ins. long; leaflets five to fifteen, oval-lanceolate to narrowly lanceolate, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; distinctly unequal at the base, tapering at the apex gradually to a slender point; indistinctly notched and ciliate on the margin, smooth and dark green above, vividly glaucous beneath, and furnished with white down at the base; stalk, midrib, and main-stalk red. Native of W. Hupeh; introduced by Wilson in 1907. As represented at Kew, its leaflets are the narrowest of all these new *Evodias*, and are distinct also in their very glaucous under-surface and red leaf-stalks.

E. HENRYI, *Dode*.—Leaves 6 to 12 ins. long. Leaflets three to nine, ovate to ovate-lanceolate, slender-pointed, tapered or rounded at the base, shallowly notched on the margin; 2 to 4 ins. long, about half as wide, becoming quite smooth on both sides, pale and rather glaucous beneath; stalk about $\frac{1}{4}$ in. long. Introduced from Hupeh in 1908 by Wilson (No. 324).

E. HUPEHENSIS, *Dode*.—Leaflets five to nine, narrowly ovate, $2\frac{1}{2}$ to 5 ins. long, very slender-pointed, shallowly notched on the margin, minutely ciliate; smooth on both surfaces except for tufts of whitish hairs in the vein-axils beneath. Flowers borne in a broad panicle. Discovered by Henry in Hupeh in 1887; introduced in 1908 by Wilson, who informs me this is his No. 387.

EXOCHORDA. ROSACEÆ.

A genus of about four species of deciduous shrubs found in N. Asia. The three species introduced are all beautiful white-flowered shrubs, allied to *Spiræa*, but differing in the larger flowers, and larger, bony fruits. They like a rich, loamy soil and a sunny position. Propagation may be effected by means of cuttings made of rather soft wood and placed in brisk heat, but they do not root with certainty. The best way to raise young plants is from seed. Sucker growths sometimes appear at the base of *E. grandiflora*, which can be separated with a piece of root attached, potted, and established in a little bottom heat.

E. ALBERTI, *Regel*.

(*E. Korolkowi*, *Hort. Lavallée*.)

A deciduous shrub of sturdy, erect habit, up to 12 or 15 ft. high, with erect branches; branchlets smooth. Leaves obovate, smooth, those of the sterile shoots $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; toothed towards the apex, which is pointed, the base tapering to a short stalk, occasionally with two deep, narrow lobes there; leaves of the flowering twigs much smaller, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, not toothed. Flowers pure white, 1 to $1\frac{1}{2}$ ins. across, in erect

racemes 3 to 4 ins. long ; stamens in five groups of five each. Fruit composed of five flattened, two-edged divisions, each $\frac{1}{2}$ to $\frac{3}{4}$ in. long, arranged starwise. Flowers in May.

Native of Turkestan, where it was discovered in the eastern part of Bokhara by Mr Albert Regel, at altitudes of 4000 to 6000 ft. It is very hardy, and more robust in habit than *E. grandiflora*, from which it differs in the greater number of stamens, in the smaller flowers, and larger fruits. The plant became generally known in cultivation in 1886 through Prof. Regel of St Petersburg, but it had previously been grown as *E. Korolkowi*, at the Segrez Arboretum in France by Mr Lavallée, who sent it to Kew in 1881 under that name.

E. GIRALDII, Hesse.

This species appears to have been introduced to Europe by means of seeds sent by Père Giraldi. Mr Hermann Hesse, of Weener, in N.W. Hanover, who

first distributed it from his nursery, describes it as a very fine, vigorous-growing shrub, with pink young shoots ; the leaf-stalks and veins are also pinkish, and remain so through the summer. The raceme is terminal, erect, and carries six to eight flowers, each of which is over 2 ins. across ; petals pure white, obovate, 1 in. long and $\frac{1}{2}$ in. wide. Calyx with a red margin. This *Exochorda* appears to be allied to, probably a variety of, *E. grandiflora*, but is, perhaps, an even superior shrub for gardens, but I have not yet seen it in flower. Introduced to England in 1909. Native of N. and W. China.



EXOCHORDA GIRALDII.

E. GRANDIFLORA, Lindley.

(*Spiræa grandiflora*, Hooker, Bot. Mag., t. 4795.)

A deciduous shrub of rounded, bushy form, up to 10 ft. high, with smooth branchlets. Leaves narrowly obovate, $1\frac{1}{2}$ to 3 ins. long, about one-third as wide ; short-pointed or rounded at the apex, tapering at the base, quite smooth, the margin entire, or toothed towards the apex. Flowers pure white, $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. across, produced on erect racemes 3 to 4 ins. long ; petals five, obovate ;

calyx $\frac{1}{2}$ in. across, with five rounded lobes. Stamens fifteen, in five groups of three each. Fruit composed of five flattened, two-edged, bony divisions, each $\frac{1}{2}$ in. long, arranged starwise.

Native of N. China ; introduced by Fortune about 1849. It flowers in May, and even at that season is one of the most strikingly beautiful of shrubs. The white racemes are produced at the end of short lateral twigs from the branches of the previous year, and thus transform each branch into one huge snow-white inflorescence, sometimes 12 to 18 ins. long and 8 to 10 ins. wide. In order to obtain these fine sprays the shrubs, as soon as they have flowered, should be thinned out ; the young shoots should be much reduced in number by weeding out all the weaker ones, especially where they are likely to be overcrowded.

E. MACRANTHA, Lemoine.

A hybrid raised about 1900 by Messrs Lemoine of Nancy from *E. Alberti* fertilised with pollen of *E. grandiflora*. It is a shrub of great beauty, producing a raceme of flowers from every bud of the previous year's growth. The raceme terminates a short leafy twig, and is 3 or 4 ins. long, carrying six to ten snowy white flowers, each $1\frac{1}{4}$ ins. across. In the grouping of the stamens it is



EXOCHORDA MACRANTHA.

intermediate between the two parents, the groups consisting of threes, fours, or fives. Messrs Lemoine describe the habit of this hybrid as resembling that of *E. grandiflora*. It blossoms in April and May.

FABIANA IMBRICATA. *Ruiz and Pavon.* SOLANACEÆ.

An evergreen shrub of heath-like appearance, ultimately reaching 6 to 8 ft. in diameter and in height; erect in habit when young, ultimately spreading. Branches downy, long, and tapered, densely furnished with short, slender twigs, from $\frac{1}{2}$ to 2 ins. long. These twigs are themselves completely covered with tiny, pointed, three-angled leaves, $\frac{1}{12}$ in. long, and, in June, are each terminated by a solitary

pure white flower. Corolla $\frac{5}{8}$ to $\frac{3}{4}$ in. long, tubular, but narrowing towards the base, with the rounded shallow lobes at the apex reflexed; calyx bell-shaped, $\frac{1}{12}$ in. long.



FABIANA IMBRICATA.

Native of Chile; introduced in 1838. This beautiful shrub is unfortunately rather tender, and at Kew, although it occasionally survives the winter, has never been a success in the open. In milder and more upland localities it is a shrub of great beauty, flowering freely and transforming each branch into a slender raceme of blossom. It likes a light soil, and can be increased easily by late summer cuttings in gentle heat.

FAGUS. BEECH. CUPULIFERÆ.

The beeches of the southern hemisphere are now generally regarded as forming a genus by themselves, and are here treated as such (see *NOTHOFAGUS*). The true beeches are confined to the northern hemisphere, where they are found on all three continents. They form a very homogeneous group of usually large trees with smooth grey trunks; about seven species are usually recognised. Of these, *F. orientalis* from Asia Minor, the Caucasus, etc., and *F. Sieboldii* from Japan are very near *F. sylvatica*, both being distinguished by leaflike appendages at the base of the husk. *F. orientalis* is further distinguished by large, more or less obovate leaves.

They are deciduous, with large, flat, alternate, parallel-ribbed leaves. Flowers unisexual; the males crowded and numerous on slender-stalked, globose heads; each flower consisting of a four- to six-lobed calyx, surrounding a cluster of eight to twelve stamens. Female flowers two or three in a cluster; the fruit a triangular nut with sharp edges, two nuts being entirely or partially enclosed in a four-lobed, woody husk (involucre).

All the beeches are quite hardy and thrive in a loamy soil, especially if situated on a limestone foundation. They should be increased by seeds, but the varieties distinguished by coloured foliage or by peculiarities of growth have to be grafted in spring.

F. FERRUGINEA, Aiton. AMERICAN BEECH.

(*F. americana*, Sweet.)

A deciduous tree, 70 to 80 ft. high, occasionally more, with a thin, smooth, grey bark; spreading by means of root suckers, so that one tree will form of



WEeping BEECH, *Fagus sylvatica* var. *pendula*.

itself a colony of stems ; young shoots at first clothed with long hairs, which soon fall away. Leaves ovate or oval, 2 to 5 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide, taper-pointed, usually wedge-shaped at the base, coarsely toothed, at first clothed with silky hairs, but soon dark green and quite smooth above except along the midrib ; paler below, and with tufts of hairs in the vein-axils and along the midrib ; stalk $\frac{1}{4}$ in. or rather more long ; veins usually eleven to fifteen pairs. Fruits about $\frac{3}{4}$ in. long ; the three-angled nuts enclosed by a downy, prickly husk, the prickles much recurved.

Native of Eastern N. America ; introduced in 1766. The American beech, like so many other trees of its region, has never been much of a success in Britain. It is easily distinguished from *F. sylvatica* by the suckering habit, the narrower, more pointed, regularly toothed leaves, with more numerous veins.

F. JAPONICA, *Maximowicz*. JAPANESE BEECH.

Little is known of this beech in this country, and so far as I am aware, it was not introduced in a living state until 1907, when it was sent to Kew by Prof. Sargent. In 1910, the Japanese authorities of the Shepherd's Bush Exhibition of that year brought over a few small trees. It is a small deciduous tree, often, it is said, a bush ; the quite young shoots are furnished with silky hairs. Leaves oval to ovate, sometimes rather diamond-shaped, tapered at both ends, but more abruptly towards the base ; 2 to $4\frac{1}{2}$ ins. long, 1 to $1\frac{3}{4}$ ins. wide ; wavy at the margin, rather glaucous beneath ; although silky at first, the leaf becomes smooth by autumn ; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long ; veins nine to thirteen. Male flowers on a slender stalk $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long. Nuts triangular, $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. wide ; the lobes of the husk little more than half as long as the nut, downy, and covered with short stiff spines ; the stalk slender, 1 to $1\frac{1}{2}$ ins. long. Its most distinctive characters appear to be the relative shortness of the husk to the nut, the long fruit-stalk, and the shallow undulations of the leaf-margin.

F. SIEBOLDII, *Endlicher*. SIEBOLD'S BEECH.

(*F. sylvatica* var. *Sieboldii*, *Maximowicz*.)

A deciduous tree, 100 ft. high, very closely allied to *F. sylvatica*. Leaves ovate to rhomboidal, the base tapered, rounded or slightly heart-shaped, the apex pointed ; 2 to 4 ins. long, 1 to $2\frac{1}{4}$ ins. wide ; margins wavy, edged with fine hairs ; silky hairy on the veins beneath ; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long ; veins in seven to ten pairs. Nut triangular, $\frac{5}{8}$ in. long ; the husk hard and woody, downy, furnished with long bristles, those near the base enlarged into linear or spatulate appendages $\frac{1}{2}$ in. long ; fruit-stalks stout, thick, and about $\frac{1}{2}$ in. long.

Native of Japan, where it forms considerable forests. The tree itself and its timber are similar in most respects to the British tree. Botanically, it differs chiefly in the leaflike appendages attached to the base of the husk ; the latter also is more truncate, and less tapered at the base than in *F. sylvatica*.

F. SYLVATICA, *Linnaeus*. COMMON BEECH.

A deciduous tree up to 100 ft. high, occasionally almost 150 ft., with a smooth grey trunk, sometimes of enormous thickness—6 to 8 ft. through ; young shoots at first silky hairy, soon becoming smooth. Leaves oval, inclined to ovate, pointed, unequally rounded at the base, ordinarily 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide, but as much as 5 ins. by 3 ins. ; obscurely toothed or merely unevenly undulated at the margin ; midrib and veins hairy, especially beneath ; stalk downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Nut triangular, $\frac{5}{8}$ in. long, usually a pair enclosed in a hard, woody, pear-shaped, four-lobed husk,

covered with bristles and $\frac{3}{4}$ to 1 in. long, solitary on an erect downy stalk about as long as itself.

Native of Europe, and indigenous to England. Few trees are more pleasing than a well-grown beech, either in the wide, spreading form it takes when growing in an isolated position, or when, in close association with others of its kind, and drawn up by them, it forms a tall, smooth, column-like trunk. The largest of the former kind in Britain is the famous beech at Newbattle Abbey, 100 ft. high, 130 ft. in diameter, the trunk 21 ft. in girth. Of the latter the finest is in Ashridge Park, Bucks, known as the "Queen Beech"—130 to 140 ft. high. The young foliage of the beech is one of the most beautiful objects in nature in May—a tender shimmering green of a shade not quite matched by any other tree. The beech has produced many varieties, some of which have first been noticed in gardens, others in a wild state. The following is a selection of the more important:—

Var. CONGLOMERATA.—A dwarf bush of rounded form, leaves small, contorted.

Var. CRISTATA, *Loddiges*.—Leaves very shortly stalked, coarsely triangular-toothed, apex decurved.

Var. CUPREA, *Loddiges*. Copper Beech.—This probably originated as a seedling from the purple beech (var. *purpurea*). Its leaves are paler than in that variety, and of a coppery red.

Var. FASTIGIATA. Dawyck Beech.—A tree of fastigiate habit first noticed in the grounds of Mr F. R. S. Balfour of Dawyck; it may be similar to one called PYRAMIDALIS by Petzold in 1864.

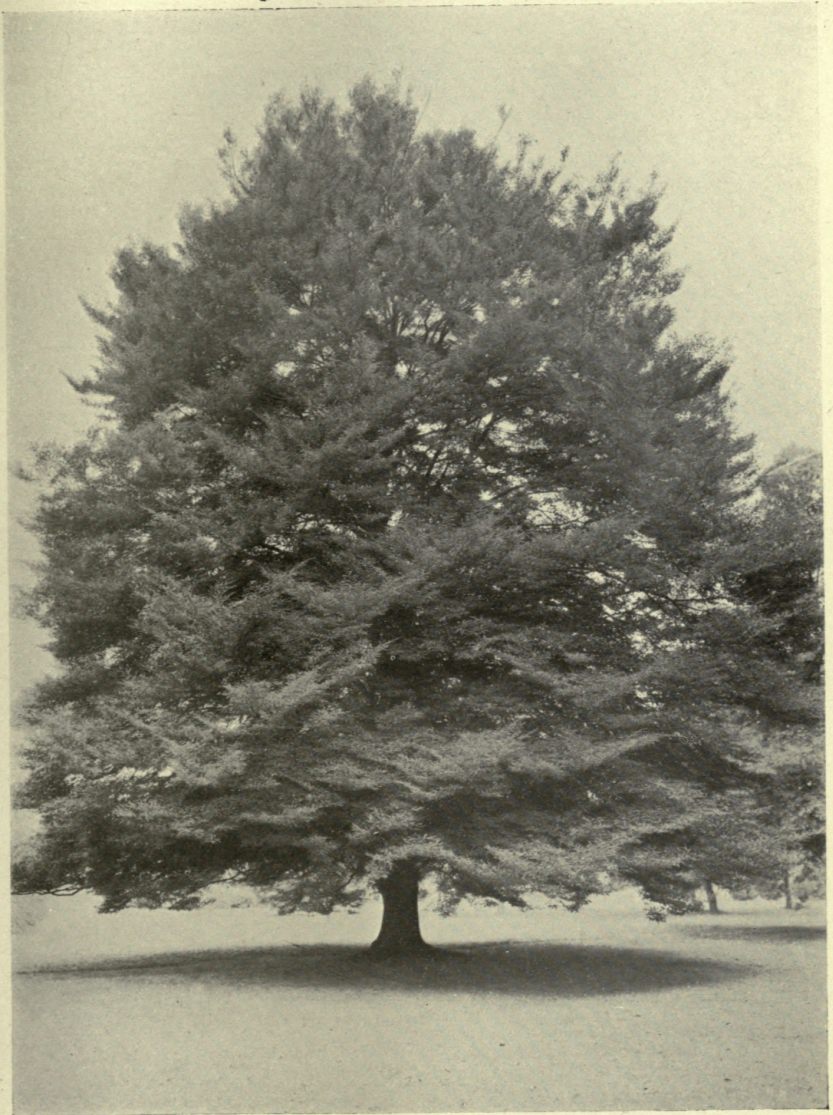
Var. GRANDIDENTATA.—Leaves coarsely toothed; branches slender.

Var. HETEROPHYLLA, *Loudon*. Fern-leaved Beech.—Of all the forms of beech marked by differences in shape of leaf, this is the handsomest. In this variety the leaf assumes various shapes; sometimes it is long and narrow (4 ins. long by $\frac{1}{4}$ in. wide), sometimes deeply and pinnately lobed, some of the lobes penetrating to the midrib; between these two, numerous intermediate shapes occur, often on the same branch. Unlike many of the varieties of beech with curious foliage, this makes a fine shapely tree, and it is a distinct ornament to any garden. There is a fine specimen in Mr Hamilton Buchanan's garden at Leny, near Callander, N.B., which is about 60 ft. high, and whose trunk is over 7 ft. in girth. Others are at Devonhurst House, Chiswick, and in Mr A. Waterer's nursery at Knap Hill. The forms called *asplenifolia*, *incisa*, *laciniata*, and *salicifolia* belong here.

Var. MACROPHYLLA (*latifolia*).—Some of the beeches are remarkable for large leaves, and the one long known in gardens under both these names is a striking form; its leaves are usually 3 to 5 ins. long, 2 to $3\frac{1}{2}$ ins. wide. In 1898, the King of Denmark's gardener sent to Kew a variety that had been called "Prince George of Crete." This is the biggest-leaved beech I have seen, some leaves being 7 ins. long, $5\frac{1}{2}$ ins. wide.

Var. PENDULA. Weeping Beech.—There are several types of weeping beech. The one best known under the name *pendula* is not a high tree, but sends out its great arms in a horizontal or drooping direction; from these the smaller branches depend almost vertically, the whole making a tent-like mass. Var. MILTONENSIS is a weeping beech which originated at Milton Park, Northamptonshire; the trunk of this form is erect, the branches horizontal and pendulous. Var. BORNYESIS has a somewhat similar habit, but the side branches are more pendulous. Var. PAGNYENSIS, found originally in the forest of Pagny (Meurthe-et-Moselle), forms a spreading head of drooping branches, the whole tree of umbrella-like shape. Var. REMILLYENSIS and var. TORTUOSA are of the same class.

Var. PURPUREA, *Aiton*. Purple Beech.—Leaves deep purple when mature; of a beautiful pale red in spring. This is by far the most popular



CUT-LEAVED BEECH, *Fagus sylvatica* var. *heterophylla*.

of the varieties of beech. It is not of garden origin, but appears to have been observed growing naturally in at least three places, viz.:—in the Hanleiter Forest, near Sonderhausen, in Thuringia; in the Darney Forest in the Vosges; and in the village of Buchs, in the canton of Zurich, Switzerland. The last is the oldest recorded site of the purple beech, three trees there being mentioned in a work dated 1680. They were the survivors of a group originally of five, which, according to legend, had sprung up on the spot where five brothers had killed each other. Most of the trees in cultivation are considered to have sprung from the Hanleiter tree. The purple beech comes partially true from seed, and some deeper or brighter coloured forms have in this way been obtained, such as *nigra*, *atropurpurea*, *purpurea major* p. nova, "Swat Magret," etc. The majority of the seedlings, however, are either the ordinary green type, or but faintly coloured.

Var. *PURPUREA PENDULA*.—A weeping purple beech.

Var. *QUERCOIDES*. Oak-leaved Beech.—Leaves narrowly ovate; deeply, irregularly, sometimes doubly toothed. I have seen a shoot of var. *heterophylla* growing on a tree of this variety.

Var. *ROTUNDIFOLIA*.—Perhaps the daintiest of beech varieties; leaves round, with a slightly heart-shaped base; $\frac{1}{2}$ to $1\frac{1}{4}$ ins. diameter, very closely set on the branches. It appears to have originated at Brookwood, Knap Hill, Woking, whence a specimen was sent to Kew by Major McNair in 1872. Afterwards it was put in commerce by Messrs Jackman of Woking.

Var. *VARIEGATA*.—There are several variegated beeches, the commonest being striped with white (*argenteo-variegata*). A yellow striped one is *aureo-variegata*. In var. *TRICOLOR* the leaves are purplish, edged and striped with rose and pinkish white; this is very pretty when the leaves are young.

Var. *ZLATIA*, *Spath*. Golden Beech.—Leaves yellow when young, but of a shade not deep enough to be termed "golden"; when mature they scarcely differ from those of ordinary beech.

The timber of beech makes an excellent fuel, but is not highly valued for constructive purposes, especially in the open air. For articles in domestic use and kept under cover it is useful, being hard and close in texture. The most important industry connected with beech timber is that of chair-making in the High Wycombe district of Buckinghamshire.

Much alarm has in recent years been felt in regard to the effects on British beechwoods of the "Beech Coccus" (*Cryptococcus fagi*). This insect surrounds itself with a white cottony substance, and sometimes infests trunks and limbs so badly as to resemble drifts of snow. As a result of its attacks the complete doom of the beech in this country has been foretold. These fears are much exaggerated; and an investigation made at Kew into the matter did not reveal the death of a single tree that could indubitably be traced to this insect. (See *Kew Bulletin*, 1911, p. 332.)

FALLUGIA PARADOXA, *Endlicher*. ROSACEÆ.

(Bot. Mag., t. 666o.)

A slender shrub, 2 to 4 ft. high, much branched below, more thinly above; branchlets white, covered with down. Leaves produced in clusters closely and alternately along the twigs, $\frac{1}{2}$ to $\frac{2}{3}$ in. long, $\frac{1}{3}$ in. wide, cut usually into three or five (occasionally seven) narrow-linear lobes, recurved at the edges and $\frac{1}{12}$ in. wide; dark green above, paler below, and covered all over with pale down. Flowers produced either singly or

a few together on a raceme $1\frac{1}{4}$ to 4 ins. long, from the end of the shoot or from the leaf-axils near the end. Each flower is 1 to $1\frac{1}{4}$ ins. across, petals white; calyx $\frac{1}{4}$ in. diameter, downy, with five ovate, pointed lobes; and five small bracts alternating with them. The heads of fruits are very handsome, each carpel being terminated by a slender style 1 in. to $1\frac{1}{2}$ ins. long, clothed with silky hairs, the whole forming a dense feathery mass, $1\frac{1}{2}$ ins. across.

Native of New Mexico, Utah, and Nevada; introduced in 1877. This interesting and beautiful shrub is very rare in cultivation, and likely to remain so. Coming from the dry, sun-baked hills of the southwestern United States, it finds in the English climate conditions almost the opposite of its native surroundings. It would probably be best suited on a warm slope in the Isles of Scilly. Elsewhere it will thrive best in well-drained soil at the base of a sunny wall.

FATSIA JAPONICA, *Decaisne*. ARAIACEÆ.

(*Aralia japonica*, *Thunberg*.)

An evergreen shrub or small tree, oftenest a spreading bush from 6 to 15 ft. high. Stems very thick, not much branched, unarmed, marked with large scars left by fallen leaves. Leaves leathery, varying in size according to the size and vigour of the plant, ordinarily 12 to 16 ins. across; palmate, with a broad heart-shaped base and usually nine lobes, the lobes reaching more than half-way to the base, ovate, coarsely and bluntly toothed except towards the base, where the opening between the lobes is wide and rounded; stalk round, stout, smooth, often 1 ft. or more long. The upper surface is dark shining green, the lower one paler, both quite smooth. Flowers milky white, produced in the autumn on large branching panicles of globose heads, each head 2 to 3 ins. wide; stalks white like the flowers. Fruits black, pea-shaped.

Native of Japan; introduced in 1838. This very handsome shrub, which bears about the largest leaves of any hardy evergreen, is well known as a plant grown in pots for house decoration. It is not so well known that it succeeds very well out-of-doors, and often makes a striking display in October, provided it is given a sheltered, semi-shaded spot. Plants near London, 8 ft. high, have been outside and unprotected for the last twenty years. It is well worth growing for its bold and striking foliage. Propagated by cuttings put singly in pots, and plunged in mild bottom heat any time after the wood is fairly firm. Var. *VARIEGATA* has large blotches of white towards the end of the lobes.

FATSIA HORRIDA, *Bentham and Hooker*, a very spiny, deciduous shrub from Western N. America and Japan, ought, if one judged from the climate in which it is naturally found, to thrive in this country. But owing to the warm soft weather we frequently experience in the early New Year, it starts into growth too soon, and is almost invariably cut off by frost. Prof. Sargent found it growing in the dense shade of hemlock forests in Japan, so possibly it might succeed better in some such situation here than fully in the open. It is a low bush with stout stems and leaf-stalks, densely covered with sharp, needle-like

spines. Leaves palmately lobed and thickly set with slender prickles on the midrib and veins. Flowers produced in late spring closely packed in a short, dense, prickly and woolly panicle, green. Fruit scarlet. With the same specific name, it has, by various authors, been placed in various genera, viz., *Echinopanax*, *Oplopanax*, and *Panax*.

FENDLERIA RUPICOLA, *Engelmann*. SAXIFRAGACEÆ.

(Bot. Mag., t. 7924.)

A deciduous shrub, 3 to 6 ft. high, of somewhat thin, straggling habit under cultivation, and with ribbed, downy young shoots. Leaves opposite, lanceolate on the sterile branches; $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; prominently three-nerved, rough with stiff, short bristles above, hairy beneath, almost without stalks. On the flowering twigs the leaves are much smaller, linear, clustered on short twigs. Flowers white or faintly rose-tinted, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. across, usually solitary, sometimes in threes, produced during May and June on short twigs springing from the wood of the previous year; petals four, contracted at the base into a distinct claw, hairy outside; calyx downy, with four narrow, ovate lobes; seed-vessel conical, $\frac{1}{2}$ in. long, with the calyx persisting at the base.

Native of the south-western United States; introduced to Europe about 1879. This shrub—one of the most beautiful of its own region—is too much of a sun-lover to be seen at its best in our climate. It comes from the sunburnt slopes of the mountainous regions of Texas, Arizona, etc., where it is a sturdy, rigid-branched shrub, and produces a great wealth of rosy-tinted flowers, which are said to give it the appearance of a peach-tree, although the four petals and opposite leaves, of course, proclaim a different affinity. I have seen it very fine in continental gardens. In Britain it needs the sunniest position that can be given it against a wall. Mr E. A. Bowles, of Waltham Cross, is very successful with it. Propagated by cuttings of rather soft wood in gentle heat.

FICUS CARICA, *Linnaeus*. FIG. URTICACEÆ.

A deciduous tree, forming in the south of Europe and in the East a short, rugged trunk, 2 to 3 ft. in diameter, and a low, spreading head of branches; in Britain it is mostly a shrub. Leaves alternate, three- or five-lobed, 4 to 8 ins. or even more in length and width; heart-shaped at the base, varying much in the depth of the lobes, which themselves are blunt or rounded at the end, and usually scalloped into broad rounded teeth; both surfaces, but especially the upper one, rough to the touch, with short stiff hairs; stalk 1 to 2 ins. long. Flowers produced on the inner surface of a roundish, pear-shaped receptacle, nearly closed at the top, which afterwards develops into the succulent sweet fruit we know as the fig.

Native of W. Asia and the eastern Mediterranean region, cultivated in the south and west of Europe, even in Britain, from early times. The cultivation of the fig in this country for its fruits does not come within

the province of this book. Except in the mild parts of the south and west, where its fruits ripen in the open air, it needs more or less the protection of glass, or at least of a south wall. In the open at Kew the fig gets to be a shrub 6 to 10 ft. high, according to the mildness or otherwise of successive winters. The severest frosts cut it to the ground, whence strong young shoots spring up the following summer. Only once or twice in twenty years has it borne palatable fruit. On the whole, unless wall protection can be given, the fig is not worth growing in our average climate except for its interest and associations.

The plants cultivated in gardens are exclusively females, which have the power, like the cucumber, to develop fruit without being fertilised. The fertilisation of the wild fig, through the agency of two generations yearly of an insect (*Blastophaga*), is one of the most remarkable instances known of the interrelation of insect and plant life for their mutual benefit. The cultivated fig in the south of Europe is fertilised through the agency of the same insect, but the pollen is taken from a (functionally) male form of the fig known as the *Caprifig*. (See *Gardeners' Chronicle*, Oct. 14, 1911, p. 267.)

FITZROYA PATAGONICA, *Hooker fl.* PATAGONIAN CYPRESS.
CONIFERÆ.

(Bot. Mag., t. 4616.)

A unisexual evergreen tree, described as from 50 to 80 ft. high in a wild state, forming in cultivation in this country a widely pyramidal small tree of dense habit, the terminal portions of the branches slender and pendulous. Leaves linear or slightly obovate, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, arranged in pairs or in whorls of threes, often thickened and keeled beneath; sometimes rounded, sometimes tapered to a bluntish apex, spreading, dark green, with two bands of stomata on both surfaces. Cones globose, $\frac{1}{3}$ in. wide, with few scales.

Native of the mountains of W. Patagonia and S. Chile; discovered in 1834 by Capt. Fitzroy, commander of the "Beagle"; introduced for Messrs Veitch by W. Lobb in 1849. It is an interesting and elegant small tree or shrub, but is only at home in the mildest parts of our islands, such as Fota, near Cork, Pencarrow in Cornwall, in the west of Scotland, etc. At Kew it has lived outside in a very sheltered spot for ten or twelve years, but it is doubtful if it could survive a winter like that of 1894-5. In young plants the leaves are larger, flatter, and more spreading than in adult ones. Female trees bear cones freely, in even a small state, but they are usually infertile.

A second species, *F. ARCHERI*, *Bentham* (*Diselma Archeri*, *Hooker fl.*), is found in Tasmania, but it is more tender than the South American species.

FONTANESIA. OLEACEÆ

A genus named in honour of R. L. Desfontaines, a French savant born in 1750, in Brittany; died in Paris, 1833. It is composed of two

deciduous shrubs, or as some authorities hold, but one, closely allied to the ashes, but with simple opposite leaves. Flowers numerous, small and greenish; petals four; stamens two. Fruit a thin, flat capsule whose two cells are surrounded by a wing. These shrubs have about the same value in gardens as the privet, being easily cultivated in any soil of moderate quality, and readily propagated by late summer cuttings.

F. FORTUNEI, *Carrière*.

(F. phillyreoides var. sinensis, *Desbeaux*.)

A deciduous shrub, 10 to 15 ft. high in gardens, but said to become a tree 30 to 40 ft. high in China; young branchlets angular, smooth. Leaves lanceolate, long-pointed, 1 to 4½ ins. long, ½ to 1 in. wide, entire, bright green, and quite smooth. Flowers greenish white, produced in terminal, slender panicles 1 to 2 ins. long, and in axillary shorter ones; each flower ½ in. long. Fruit a flat oblong disk, ⅜ in. long, with winged margins, notched at the apex.

Native of China; found by Fortune in 1845, and later by several other collectors, near Shanghai. It is very closely allied to the following better known species from Asia Minor, of which, by some authors, it is considered merely a variety. The most obvious distinctions are the larger more uniformly lance-shaped leaves (often oval or oblong in the other), and the more slender, elongated panicles. In a note by Commander W. Perry preserved in the Kew Herbarium, it is stated that the Chinese make fences round their compounds with branches of this tree interlaced. These take root and form a graceful hedge.

F. PHILLYREOIDES, *Labillardière*.

A privet-like, deciduous shrub, 6 to 10 ft. high, forming a great number of slender twigs, angular and smooth when young. Leaves ovate-lanceolate, oval, or oblong; ½ to 2½ ins. long, ¼ to ⅝ in. wide; usually with a tapering point, entire, smooth. Flowers about ⅝ in. long, greenish white, very numerous on terminal panicles ½ to 1 in. long, supplemented by smaller clusters in the leaf-axils, produced during June on leafy twigs. A prominent feature of the flower are the protruded stamens. Fruit a flat disk, roundish or oblong, two-seeded, and surrounded by a membranous wing; ¼ to ⅜ in. long.

Native of the Orient (Cilicia, Syria, etc.); introduced in 1787. This shrub retains its leaves long in the autumn. It is perfectly hardy and flowers copiously, and has about the same decorative value as the privet.

Var. NANA.—A form of more compact habit and slower growth.

FORSYTHIA. OLEACEÆ.

This genus, consisting, so far as is known at present, of three or four species of deciduous shrubs, commemorates Wm. Forsyth, once superintendent of the Royal Gardens at Kensington (1737-1804). They are allied to the lilacs and jasmines, having opposite, trifoliate or simple leaves, angular stems, and yellow flowers produced in spring on short stalks from the joints of the previous year's wood. Calyx four-lobed, green; corolla also four-lobed, the lobes uniting at the base into a short tube; stamens two, styles either long or short, both long-styled and short-

styled forms belonging to each species. Two or three species are Chinese; one East European.

All are very easily cultivated; they are gross feeders, and like a rich, deep, loamy soil. Propagated very easily by cuttings made of half-ripened shoots. *F. viridissima* needs no pruning, nor does *F. intermedia*, but *F. suspensa* var. *Fortunei*, may if desired be cut hard back every spring as soon as the flowers are past. There are some worthless variegated Forsythias that need no detailed mention.

F. EUROPÆA, *Degen*. ALBANIAN FORSYTHIA.

(Bot. Mag., t. 8039.)

A deciduous shrub, of erect habit, from 3 to 6 ft. high; young wood not downy, but dotted with lenticels. Leaves ovate, 2 to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; of firm texture, smooth, sometimes sharply and unequally toothed, but usually entire; pointed at the apex, rounded at the base; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers yellow, produced in March from the buds of the previous year's growth, mostly singly, occasionally in pairs. Corolla $1\frac{1}{4}$ ins. diameter, with four narrow-oblong divisions. Calyx-lobes ovate, green, $\frac{1}{8}$ in. long.

Native of Albania, discovered by Dr A. Baldacchi in 1897, and first introduced by him to this country by means of seeds sent to Kew in 1899. Some doubt has been expressed as to its being truly native of Europe, as its fellow species are only found in the Far East; but from the wild nature of the country in which it was found, and the fact that several cases of analogous distribution in other genera exist, this does not seem justified. It is allied to *F. viridissima*, but differs in the ovate leaves (widest near the base), and by a lanky habit which makes it more ungainly. It is the least ornamental of Forsythias, but of geographical interest.

F. INTERMEDIA, *Zabel*.

This is supposed, and no doubt justly, to be a hybrid between *F. suspensa* and *F. viridissima*. It opens its blossoms immediately after *F. suspensa*, and before the other parent. Its branching, too, is intermediate, and rather like that of the erect form of *suspensa*. Leaves occasionally trifoliolate, but mostly intermediate between the simple leaves of both parents; more tapering at the base than in *F. suspensa*. Flowers as in *suspensa*, to which this beautiful shrub is in no way inferior in beauty. It is not so good for covering arbours, etc., but is more suitable for grouping on lawns. The three following forms of this hybrid have been named by a German botanist, and distinguished as follows:—

Var. *DENSIFLORA*, *Koehne*.—Flowers densely crowded on the shoots; a very distinct form; style longer than stamens.

Var. *SPECTABILIS*, *Koehne*.—A seedling form, with larger, deeper yellow, and more abundant flowers; style shorter than stamens. In many respects the most beautiful of Forsythias.

Var. *VITELLINA*, *Koehne*.—Of erect, strong habit; flowers rich dark yellow; style longer than stamens.

F. SUSPENSА, *Vahl*. GOLDEN BELL.

(Bot. Mag., t. 4995.)

A deciduous shrub of rambling habit, which, if trained on a wall will grow 30 ft. high, but in the open, and unsupported, forms a mass of interlacing,

often pendulous branches, 8 or 10 ft. high; young branches smooth. Leaves mostly simple, 2 to 4 ins. long, 1 to 2 ins. wide; but occasionally on strong shoots trifoliate, three-lobed, or two-lobed; coarsely toothed, pointed; the simple leaves are rounded or broadly wedge-shaped at the base; the leaflets tapering there; stalk about $\frac{1}{2}$ in. long. Flowers golden yellow, produced one to as many as six in a cluster from the buds of last year's wood in late March and early April, lasting a month in beauty; each flower 1 to $1\frac{1}{4}$ ins. across. Calyx-lobes oblong-lanceolate, $\frac{1}{4}$ in. long.

Native of China, but introduced from Japanese gardens to Holland in 1833, and thence, nearly twenty years later, to England. It and *F. intermedia* are the finest of early, yellow-flowering shrubs. In gardens it is represented by two distinct forms, viz., *FORTUNEI*, a shrub of stiffer growth, with erect or arching (not so pendulous) shoots; and *SIEBOLDII*, a form with slender pendent shoots which reach the ground and take root. There are, however, plants in cultivation which it is difficult to assign to either. *Forsythia suspensa* may be used in a variety of ways; the slender creeping form (*Sieboldii*) is useful for covering a steep slope, and for using as a climber on house fronts, arbours, etc. The stiffer one (*Fortunei*) is the best for massing on a lawn. It may, if desired, be pruned hard back every spring as soon as the flowers are over. Treated in this way, healthy plants will make shoots 6 to 8 ft. long in a season, furnished the following spring from end to end with golden yellow blossom.

A form with lemon-yellow flowers has recently been introduced from Central China by Wilson. It has shorter and comparatively broader petals. There is another with dark purplish young shoots (var. *ATROCAULIS*, *Rehder*).

F. VIRIDISSIMA, *Lindley*.

(Bot. Mag., t. 4587.)

A deciduous or partially evergreen shrub, 5 to 8 ft. high, with stiff, erect branches, smooth when young. Leaves lance-shaped, 3 to 6 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide, tapering at both ends, but more slenderly towards the pointed apex, toothed on the upper half, or quite entire; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers bright yellow, $1\frac{1}{4}$ ins. across, the four corolla lobes narrow-oblong, $\frac{1}{2}$ in. long. Calyx-lobes convex, ovate, $\frac{1}{8}$ in. long. (See Fig. p. 560.)

Native of China; introduced by Fortune in 1844. Although this species is not so wonderful a garden shrub as *F. suspensa*, it is a very handsome and useful one. It flowers one or two weeks later, usually in April, and is sturdy enough to hold its branches erect. It is distinguished from both its fellow species, *F. europæa* and *F. suspensa*, by the shape of its leaves.

FOTHERGILLA. HAMAMELIDACEÆ.

A genus of two or three deciduous shrubs from Eastern N. America, which commemorates Dr John Fothergill, who in the eighteenth century cultivated in his garden at Stratford-le-Bow, in Essex, one of the earliest and most extensive collections of American plants. They are allies of the witch-hazels, and their flowers appear before the leaves in bottle-brush like spikes terminating short branches. Their sole beauty is in the numerous long stamens. There are no petals, and the seed-vessel is a downy, hard-shelled capsule, opening at the top and containing two seeds.

F. GARDENI, *Murray*.(F. *alnifolia*, *Linnaeus fil.*, Bot. Mag., t. 1341; *F. carolina*, *Britton*.)

A deciduous shrub of thin habit, rarely more than 2 or 3 ft. high, with slender, crooked, often rather weak and spreading branches; young twigs covered with white, stellate hairs. Leaves oval or obovate, 1 to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; heart-shaped, rounded or tapering at the base, with several large unequal teeth above the middle, downy, and green or whitish beneath; stalk $\frac{1}{4}$ in. long, downy. Flowers in cylindrical terminal spikes, consisting chiefly of a mass, 1 to $1\frac{1}{2}$ ins. long, and about 1 in. through, of white stamens with yellow anthers; petals none.



FORSYTHIA VIRIDISSIMA.

Native of the south-eastern United States; first discovered by Dr Garden of Charlestown, U.S.A., and introduced in 1765. It flowers on the naked branches in April and May, and is then very pretty and fragrant. Although hardy, this shrub is not robust. It does not like a heavy soil so much as one of peat and sandy loam combined. The leaf is variable in shape, on account of which attempts have been made to differentiate two or three varieties such as *OBTUSA* (Bot. Mag., 1341), with obovate bluntish leaves; and *ACUTA*, with ovate, pointed leaves. The foliage often turns beautiful crimson before falling. This species differs from the following in its much smaller stature, and in the inflorescence being from half to two-thirds as wide.

F. MAJOR, *Loddiges*.(F. alnifolia var. major, Bot. Mag., t. 1342; F. monticola, *Ash.*)

A deciduous shrub, ultimately 6 to 8 ft. high, forming a rounded bush with mostly erect stems; young branchlets covered with stellate, whitish hairs. Leaves roundish oval or broadly ovate, 2 to 4 ins. long, and from two-thirds to nearly as wide, with a few teeth above the middle, or almost entire; upper surface dark glossy green becoming almost or quite smooth, lower one glaucous, with stellate hairs, especially on the midrib and veins; stalk downy, about $\frac{1}{3}$ in. long. Flowers numerous, in an erect, cylindrical spike, 1 to 2 ins. long, terminating short lateral twigs; the inflorescence owes its beauty to the numerous clustered stamens, which have pinkish white stalks $\frac{3}{4}$ in. long, and yellow anthers; petals none. The seed-vessel is a downy, woody capsule $\frac{1}{2}$ in. long, splitting at the top.

Native of the Allegheny Mountains from Virginia to S. Carolina; grown in English gardens in 1780, but apparently long lost to cultivation until



FOTHERGILLA MAJOR.

reintroduced to Kew from the Arnold Arboretum in 1902. It is a most charming shrub, especially to those who love out-of-the-way plants. It succeeds extremely well in a mixture of peat and sandy loam, producing its fragrant spikes profusely in May. The leaves turn orange-yellow before falling. It strikes root freely from cuttings of fairly firm wood in gentle heat, and is quite hardy. Certainly it is in every way superior to the commoner F. Gardeni, and it is strange that it was so long lost to gardens. F. MONTICOLA is scarcely specifically distinct from F. major, although it is said to be of more spreading habit; the leaves are not so white beneath.

FRAXINUS. ASH. OLEACEÆ.

A group of some forty to fifty species of deciduous trees and a few shrubs, all except three found in the temperate latitudes of the northern hemisphere. They have normally opposite, unequally pinnate leaves, but in some species and varieties the leaflets are reduced to one, and the leaves are sometimes in whorls of three, and on odd shoots not in-

frequently alternate. The inflorescences vary considerably in beauty in different species. In the most ornamental groups, the "flowering" ashes, both corolla and calyx are present, and the flowers are borne very numerous in panicles from the end of the young shoot and from the axils of the terminal pair of leaves. This is the manna ash or *ORNUS* group, sometimes made into a distinct genus. In another group to which our common ash belongs—*FRAXINASTER*—the flowers have no beauty, being without calyx or corolla; they are borne in short panicles from the buds of the previous year's wood. The remainder of the species have a calyx, but no corolla.

The flowers are sometimes perfect, sometimes unisexual; and perfect male and female flowers may be found either altogether or separately on one tree. It is said that the flowers of a tree may sometimes be all or mostly one sex one year, and the other sex the next. Stamens usually two. Fruit one- or two-celled, one- or two-seeded, developing at the end a long, flattened wing or membrane, usually from $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long and $\frac{1}{4}$ to $\frac{1}{3}$ in. wide. Many of the species hereinafter described do not flower in this country, and even those that do, like the common ash, do not carry crops of fruit every year. From all its allies in gardens, except *Jasminum* and one species of *Syringa*, *Fraxinus* is distinguished by its pinnate leaves.

In gardens and parks, the ashes are welcome for their stately form and fine pinnate foliage. Some of them, like *excelsior* and *americana*, yield an admirable timber. They are frequently found in nature on a limestone formation, and should be especially noted by those whose ground is so situated. For the rest, they are gross feeders, and like a good loamy soil and abundant moisture. They should always, if possible, be raised from seed, which may be sown in cold frames or shallow boxes, and thinly covered with soil. Grafting for the weeping, coloured, and other garden varieties has, perforce, to be resorted to, but the stock should always be of the species to which the variety belongs. The ashes produce a very fibrous and extensive root system, which renders their transplanting safe and easy. The only species at all unsatisfactory in cultivation are those like *nigra* and *mandshurica*, which, being excited into growth by unseasonable warmth early in the year, are almost invariably cut back by later frost. Some species, like *dipetala*, need rather more warmth than our climate affords. But given a good soil, and not too exposed a position, the ashes generally are satisfactory.

The following is a selection of the more desirable species:—

For timber.—*Excelsior*, *americana*.

For beauty of foliage and habit.—*Angustifolia*, *americana*, *biltmoreana*, *oregona*, *pennsylvanica*, *excelsior*, ex. var. *heterophylla*, ex. var. *pendula*.

For flower.—*Ornus*, *Mariesii*.

For interest.—*Spæthiana*, *anomala*.

For small gardens.—*Bungeana*, *dimorpha*, *excelsior* var. *globosa*.

F. AMERICANA, *Linneus*. WHITE ASH.

A fine timber tree up to 120 ft. high in a wild state, with a trunk 5 or 6 ft. in thickness; young shoots smooth, dark polished green or brownish, becoming

grey the second year. Leaves 8 to 15 ins. long; leaflets seven or nine (sometimes five), oblong-lanceolate or oval, stalked; ordinarily 4 to 6 ins. long (on vigorous young trees 7 or 8 ins.), 1 to 3 ins. wide; rounded or tapered at the base, long and slender-pointed, entire or the terminal part toothed; dark green and smooth above, whitish and downy along the midrib and veins beneath. Common stalk yellowish white, smooth, round, with a scarcely perceptible groove on the upper side; stalk of lateral leaflets about $\frac{1}{2}$ in. long, of the terminal one $\frac{1}{2}$ to 1 in. long. Flowers without petals, produced on the previous year's growth. Fruit 1 to 2 ins. long, $\frac{1}{4}$ in. wide; the body roundish.

Native of Eastern N. America; introduced in 1724. This handsome and striking ash is one of the best of American deciduous trees in this country, being quick-growing and producing timber of similar quality to that of our native species, much esteemed for making oars. There are trees over 80 ft. high at Kew. Whilst there is nothing to show that it is superior to our native ash, it would be worth planting in quantity under forest conditions as an experiment. It appears to grow more quickly in a small state. The distinguishing characters of this ash as compared with other American species of the same character are: its round main leaf-stalk, the white under-surface of the stalked leaflets, and the smooth, dark, young wood. (Compare with *F. texensis* and *F. biltmoreana*, its nearest allies.)

Var. *ACUMINATA*, *Wesmael* (*F. epiptera*, *Michaux*).—Leaflets almost without down beneath, bright green above, and nearly or quite entire.

Var. *JUGLANDIFOLIA*, *Rehder*.—This striking variety has leaflets as much as 9 ins. long, by 3 ins. wide, not conspicuously toothed at the upper half, densely pubescent over the whole under-surface, but not on the main leaf-stalk or young shoots.

Var. *MICROCARPA*, *Gray*.—Fruit about $\frac{1}{2}$ in. long; common in the south-eastern United States.

F. ANGUSTIFOLIA, *Vahl*. NARROW-LEAVED ASH.

(*F. numidica*, *Dippel*.)

A tree 60 to 70 ft., occasionally 90 ft. high; young shoots and leaves perfectly smooth. Leaves 6 to 10 ins. long; leaflets seven to thirteen, lanceolate, 1 to 3 ins. long, $\frac{1}{3}$ to $\frac{3}{4}$ in. wide, sharply and rather coarsely or even jaggedly toothed except towards the narrowly tapered base; apex long-pointed; dark glossy green above. The terminal leaflet is the only one that has a stalk ($\frac{1}{4}$ to $\frac{1}{2}$ in. long); main-stalk with two wings on the upper side forming a groove that is open from the base to the lowest pair of leaflets, but beyond them closed, except where the leaflets are attached. Flowers produced from the joints of the previous year's wood, and with neither calyx nor corolla. Fruits 1 to 1 $\frac{1}{2}$ ins. long.

Native of S. Europe and N. Africa. The most distinctive character of the species is the entire absence of down, differing in this respect from its near ally *F. oxycarpa*. It is an elegant tree, allied botanically to the common ash.

Var. *LENTISCIFOLIA*, *Henry*.—Leaflets more spreading (in the typical form they point forwards) and set further apart on the main-stalk, making the leaf sometimes 10 ins. or more long, and the tree very graceful. A form with more slender, pendulous branches is distinguished as *PENDULA*.

Nearly allied to, and perhaps scarcely specifically distinct from *F. angustifolia*, is

F. OXYCARPA, *Willdenow* (*F. oxyphylla*, *Bieberstein*).—Its leaves have the same number of leaflets, mostly of the same shape and size, but they are always downy about the midrib and lower veins. Fruits more tapered at the base. The species has a more Eastern natural habitat than *F. angustifolia*, reaching to Persia, the Caucasus, and Asia Minor. (See *F. parvifolia*.)

F. ANOMALA, *Torrey*. UTAH ASH.

A tree 18 to 20 ft. high, with smooth, square, slightly winged, slender, young shoots. Leaves simple (rarely with two or three leaflets), ovate, sometimes roundish or obovate, tapered at the base, bluntish or pointed at the apex, inconspicuously toothed; 1 to $2\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; grey-green, smooth on both surfaces; stalk $\frac{1}{2}$ to 1 in. long. It flowers on the previous year's growths, and the fruits (not seen in this country) are $\frac{3}{8}$ in. long, obovate or oval.

Native of Colorado, Utah, and Nevada; said by Sargent to be not rare. Introduced in 1893 to Kew, where it forms a lax-branched, small tree, quite distinct from every other cultivated ash in the combination of square stems and simple leaves, but only worth growing as a curiosity.

F. BERLANDIERIANA, *De Candolle*.

A tree up to 30 ft. high, with quite smooth, round branchlets. Leaflets usually five, deep lustrous green above, paler beneath; the terminal one obovate, $2\frac{1}{2}$ to 4 ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; the lateral ones more oval and smaller, all coarsely toothed above the middle, soon quite smooth; midrib prominent below, the side ribs connected by conspicuous netted veins; main leaf-stalk grooved. Fruit 1 to $1\frac{1}{2}$ ins. long; often three-winged (Sargent).

Native of Texas and Mexico; introduced to Kew under the name of *F. coriacea* in 1897. (The true *F. coriacea*, *S. Watson*, according to Sargent, has the shoots tomentose when they appear, remaining downy for one or two years.) As seen at Kew, *F. Berlandieriana* is a pleasing small tree of free growth, and distinct in the deep glossy green, smooth leaves and branchlets; in these respects it resembles *F. lanceolata*, but is smaller in all its parts.

F. BILTMOREANA, *Beadle*. BILTMORE ASH.

As lately as 1898, this ash was distinguished from *F. americana* and named by Mr Beadle. No doubt it exists in some gardens; looked upon as ordinary white ash. There is one on the hill at Kew crowned by the Temple of Æolus, which is over 80 ft. high and more than 8 ft. in girth. It is close to a true white ash of about the same size, which Mr Elwes regards as the largest in England. The chief distinction of the Biltmore from the white ash resides in its densely downy young shoots, the down persisting for two years; the white under-surface of the leaflets and their common stalk are similarly downy. On the old tree at Kew the largest leaflets are 6 ins. long by 3 ins. wide, and the entire leaf up to 20 ins. long. The trunk is similar to that of *F. americana*, but the first year wood is dull grey (not green or brown as in *americana*), nor does it acquire during the second season the pale, polished surface of the white ash. In other respects it resembles that species, especially its var. *juglandifolia*, but the wing of the fruit is not extended down the body so much. In its downy shoots it resembles *F. pennsylvanica*, but that species has the leaflets green beneath and the main leaf-stalk more distinctly grooved. Elwes figures a handsome tree at Fawley Court, Oxfordshire, 68 ft. high.

F. BRACTEATA, *Hemsley*.

A deciduous tree of the *Ornus* group, 40 ft. high; young shoots smooth, four-angled, bright green. Leaves variable in size; on young trees 6 to 12 ins. long. Leaflets five to eleven, ovate, wedge-shaped or rounded at the base, tapered at the apex to a bluntish point, very variable in size; ordinarily 1 to 3 ins. long (but sometimes 5 ins.), about half as wide; not toothed, deep

polished green, perfectly smooth, and with impressed veins above; paler and smooth beneath. The main leaf-stalk has an even, well-defined groove above; terminal leaflet long-stalked, the others shortly so. Panicles terminal, also borne in the upper leaf-axils; downy, pyramidal, 3 to 6 ins. long, with a pair of small oblong bracts at the base of each subdivision. The flowers are probably white, but have not yet been seen in this country. Fruit 1 to $1\frac{1}{4}$ ins. long, $\frac{1}{12}$ in. wide.

Native of Hupeh, China; discovered by Henry in 1887; introduced by Wilson for Messrs Veitch in 1900. It is a distinct ash in its square branchlets and smooth, shining, entire leaflets, the largest of which resemble the leaf of *Ligustrum lucidum*. A promising species, whose hardiness, however, has scarcely yet been put to the test.

F. BUNGEANA, *De Candolle*.

A shrub 5 or 6 ft. high; twigs minutely downy. Leaves of thin texture, 4 to 6 ins. long; leaflets five or seven, stalked, unequal-sided, oval and obovate; 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; tapered at the base, with abrupt slender points, round-toothed except towards the base, quite smooth. Main leaf-stalk minutely downy, with a narrow groove on the upper side; stalk of leaflets $\frac{1}{8}$ to $\frac{1}{4}$ in. long, minutely downy. Flowers (with petals) produced in terminal panicles; fruit a little over 1 in. long, $\frac{1}{2}$ in. wide.

Native of N. China; introduced in 1881 to the Arnold Arboretum, Mass., where I have seen healthy bushes 4 or 5 ft. high and through. The true plant is little known in Britain, although many ashes under the name have been introduced, which have turned out to be *chinensis* or other species. It belongs to the *Ornus* group, and is very distinct from the only other shrubby ashes in cultivation—the tiny leaved *dimorpha* and *xanthoxyloides*. Bunge's ash is one of the few whose twigs and leaf-stalks are downy, whilst the leaf-blades are smooth.

F. DIPPELIANA, *Lingelsheim*, as sold by Spath of Berlin, is apparently a form of *F. Bungeana*, or very closely allied to it, the leaves perhaps broader (up to $1\frac{1}{2}$ ins. wide) and shorter pointed. Not seen in flower.

F. CAROLINIANA, *Miller*. SWAMP ASH.

A tree rarely more than 40 ft. high; young shoots smooth, brown. Leaves 5 to 12 ins. long; leaflets five or seven, stalked, oval, 2 to 4 ins. long, $1\frac{1}{4}$ to 2 ins. wide (terminal one larger and up to 6 ins. long, sometimes obovate), mostly tapered, sometimes rounded at the base, pointed, sharply toothed; dark green and smooth above; pale duller green beneath, with white hairs along the sides of the midrib and lower veins. Main leaf-stalk round, with a slight groove on the upper side; stalks of side leaflets up to $\frac{1}{2}$ in. long, that of terminal one up to 1 in. long. Flowers without petals, produced in short panicles on the shoots of the preceding year. Fruit (not seen in this country), described by Sargent as elliptical or obovate, up to 2 ins. long, frequently three-winged, $\frac{1}{3}$ to $\frac{1}{2}$ in. wide.

Native of the south-eastern United States; introduced in 1783, but extremely rare. Trees which in vegetative characters appear to be true, and which were received from the United States as *F. caroliniana*, are in the collection at Kew; but one would scarcely expect the tree to be hardy in this country, as it comes from the coast region of the Atlantic and Gulf States, and reaches even to Cuba.

F. CHINENSIS, *Roxburgh*.

A small tree with stout, greyish, smooth young shoots, and grey buds. Leaflets usually seven, sometimes nine, variable in shape and size; terminal

(and largest) one oval or obovate, 3 to $5\frac{1}{2}$ ins. long, 2 to 3 ins. wide, its stalk $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long; the pairs towards the base smaller, oval, the lowest pair $1\frac{1}{2}$ to 3 ins. long, sometimes roundish oval; all shallowly round-toothed, stalked; dark dull green above, pale beneath, with dense brown down at the sides of the midrib and base of the veins only. Common stalk with a continuous open channel on the upper side with tufts of down where the leaflets are attached. Flowers and fruit not seen in this country; the latter described by Henry as about $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ in. wide, oblanceolate, and either rounded or pointed at the apex.

Native of China; introduced under the name of "Bungeana" in 1891. It has been also wrongly named "F. obovata" in gardens. Young trees are striking in the large size of their leaflets. Henry says this is one of the trees on which the wax insect lives.

F. DIMORPHA, *Cosson and Durieu*. ALGERIAN ASH.

A deciduous bush or a small tree, 20 ft. or more high; branchlets smooth, purplish on the upper side. Leaves $1\frac{1}{2}$ to 3 ins. long, composed of five to eleven (mostly seven or nine) leaflets, which are ovate, $\frac{3}{8}$ to $1\frac{1}{8}$ ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide; rather prominently toothed, scarcely stalked; smooth, except for a tuft of down at the base of the midrib beneath; the main leaf-stalk is slightly winged between each pair of leaflets. Flowers (not seen in this country) produced from the axils of the previous year's wood. Fruits $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ in. wide.

Var. *DUMOSA*, *Carrière*.—A purely shrubby variety, forming a dense rounded bush with interlacing branches. Leaves uniformly smaller than in the type, and only $\frac{1}{4}$ to $\frac{5}{8}$ in. long.

Native of N. Africa, in the mountains of Algeria and Morocco. It is rare in gardens, but very distinct among cultivated ashes, and worth growing for its dwarf habit and minute leaflets. Var. *dumosa* makes a neat and pleasing bush.

F. *XANTHOXYLOIDES*, *Wallich*, is very closely allied and very similar to *F. dimorpha*, but differs in having the branchlets covered with a dense but extremely minute dark down; the leaves and leaf-stalks have a scattered but longer down. It is a native of the north-western Himalaya, Afghanistan, etc. Bushes at Kew raised from seed sent from India do not appear to be quite so hardy as *F. dimorpha*.

F. DIPETALA, *Hooker*. FRINGE-FLOWERED ASH.

A shrub 10 to 12 ft. high, or occasionally a small tree; young shoots four-sided and four-winged, slightly warted, not downy. Leaves 2 to 5 ins. long; leaflets commonly five, but varying from three to nine; obovate or oval, tapered at the base, rounded or hardly pointed at the apex; $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, toothed except at the lowest third; quite smooth on both surfaces. Main leaf-stalk smooth, grooved above; the terminal leaflet rather long-stalked, the uppermost pair stalkless, those below more or less stalked. Flowers creamy white, $\frac{1}{3}$ in. long, produced from the joints of the previous year's growth in panicles 2 to 4 ins. long. Fruits about 1 in. long, $\frac{1}{4}$ in. wide, with a notched tip.

Native of California, where it was discovered in 1830 by David Douglas; but not introduced, so far as I am aware, until 1879, when Prof. Sargent sent it to Kew. There is now a small tree there about 10 ft. high, which does not flower, and is sometimes injured at the tips by frost. It appears to be one of the most ornamental of ashes in flower, but needs a rather warmer climate than near London. It should be tried in the south-west. Its four-angled

stems, smooth leaves, and the production of flowers on the old wood, distinguish it well among the ashes with petalled flowers.

F. ELONZA, *Dippel*.

A small, elegant tree with glabrous, grey-green young shoots furnished with whitish warts; buds dark brown, scurfy. Leaves up to 10 or 11 ins. long, with nine to thirteen leaflets, which are ovate, oval or lance-shaped, broadly tapered at the base, shortly pointed, sharply toothed; 1 to 3 ins. long, $\frac{1}{2}$ to 1 in. wide; stalkless, dark dull green, and smooth above, with brownish down densely tufted near the base of the midrib beneath. The main leaf-stalk is whitish beneath, downy in places, winged on the upper side, the wings erect and forming a narrow groove. Flowers and fruit not seen. This ash is of uncertain origin, and is supposed to be a hybrid, probably with *F. oxycarpa* or *F. parvifolia* as one parent. It has been cultivated in England since 1878.

F. EXCELSIOR, *Linnaeus*. COMMON ASH.

One of the largest of European deciduous trees, reaching in favoured sites from 100 to 140 ft. in height; bark of the trunk pale, fissured; young wood grey, smooth; buds black. Leaves 10 to 12 ins. long; leaflets most frequently nine or eleven, sometimes less or more; oblong lance-shaped, tapered at the base, slender-pointed, toothed; 2 to $4\frac{1}{2}$ ins. long, 1 to $1\frac{1}{2}$ ins. wide; dark green and smooth above, paler beneath, and with fluffy brown down at the sides of the lower part of the midrib. Main leaf-stalk usually more or less downy, the wings on the upper side meeting and forming a sharp angle. The terminal leaflet is stalked, the lateral ones scarcely so. Flowers produced from the joints of the previous year's wood in short, dense panicles in April. Fruits (commonly called "keys") pendent in large bunches, each fruit about $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide.

Native of Europe, including Britain and the Caucasus. It is one of the most valuable of all our timber trees, yielding a whitish wood of great toughness and durability. Elwes considers it at the present time the most economically valuable of British timber trees. For some purposes, especially in coachbuilding and implement-making, it has no rival either native or foreign. An isolated ash of goodly size makes a tree of great beauty and dignity, forming a shapely, oval, or rounded head of branches. It likes a deep, moist, loamy soil, and thrives well on calcareous formations. In some parts of the north of England, on the east side of the Plain of York for instance, it is a common hedgerow tree, almost as common as the elm is in the south. In such positions, especially where the adjoining fields are arable, it is not an unmixed advantage, being one of the grossest of feeders. Both in nature and in gardens the common ash has produced a large number of varieties. A considerable number of those that have received names must be considered worthless from any point of view, and the following list only includes the more distinct or the more ornamental:—

Var. *ANGUSTIFOLIA*, *Schelle*.—Leaves as a rule not more than $\frac{5}{8}$ in. wide. It is apt to be confused with *F. oxycarpa*, but is distinguished by its black bud and the longer stalk of the terminal leaflet.

Var. *ASPLENIFOLIA*.—Leaflets only $\frac{1}{8}$ to $\frac{1}{4}$ in. wide—a monstrosity merely.

Var. *AUREA*.—Young shoots yellow; older bark yellowish, especially noticeable in winter.

Var. *AUREA PENDULA*.—Young shoots yellow, branches weeping and forming a flat, umbrella-shaped head.

Var. *CONCAVIFOLIA*.—Leaflets small, boat-shaped.

Var. *CRISPA* (syn. *atrovirens*).—A deformed, stunted bush with leaves 2 or 3 ins. long, the leaflets much curved.

Var. *FOLIIS ARGENTEIS*.—Leaflets bordered with white; often deformed.

Var. *GLOBOSA*.—A dwarf rounded bush, densely branched. Vars. *NANA* and *MYRTIFOLIA* are much the same.

Var. *GLOMERATA*, *Simon-Louis*.—Leaflets as many as fifteen closely set on the common stalk, comparatively short and broad; some of them 3 ins. long and 2 ins. broad, stout in texture, basal pair of leaflets close to the branch; all somewhat hooded and puckered. Very distinct.

Var. *HETEROPHYLLA*. One-leaved Ash.—In this remarkable variety the terminal leaflet only, or occasionally one or two more, is developed. In other respects it is the same as the common ash. Its one leaflet is oval or ovate, long-stalked, toothed, and variable in size, usually 3 to 6 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide, but often proportionately broader or shorter. I have measured it as much as 8 ins. long and 5 ins. wide. This variety has arisen independently in many places, both cultivated and wild, and varies considerably. It is also known as *integrifolia*, *monophylla*, and *simplicifolia*.

Var. *HETEROPHYLLA LACINIATA*.—Leaves jaggedly and coarsely toothed.

Var. *HETEROPHYLLA PENDULA*.—All the branches weeping; this and the preceding varieties have leaves as in *heterophylla*.

Var. *MONSTROSA*.—Branchlets often fasciated; leaves often alternate.

Var. *PENDULA*, *Aiton*. Weeping Ash.—There are various forms of weeping ash. The commonest has all its branches weeping, forming a spreading, umbrella-like head. The most remarkable example is in the Earl of Harrington's garden at Elvaston, and is 98 ft. high, with streamer branches reaching to within 20 ft. of the ground. Var. *PENDULA WENTWORTHII*, *Wentworth Weeping Ash*, has an erect trunk and leading shoot, but the branches are very pendulous. It thus makes a tall, slender pyramid or spire. (See also vars. *aurea pendula* and *heterophylla pendula*.)

Var. *SCOLOPENDRIFOLIA*.—Leaflets narrow, often curled and deformed, narrower than in the type. Not free-growing.

Var. *TRANSONI*.—Leaves yellow.

Var. *VERTICILLATA*.—Leaves occasionally in threes instead of the usual pairs, but in this, as in some other abnormal forms of common ash, the leaves are frequently alternate.

F. FLORIBUNDA, *Wallich*. HIMALAYAN ASH.

In 1876 the late Sir George King, then of the Calcutta Botanic Gardens, sent seeds of this fine ash to Kew. Of the trees raised one survives, which was cut to the ground in the winter of 1880-1, but is now about 15 ft. high. Although it withstood the frosts of February 1895 without injury, and is now apparently perfectly hardy, its rate of growth with us is not such as to recommend it for general cultivation, except in the milder counties. It is one of the *Ornus* group, and in the north-western Himalaya, where it is native, reaches 80 to 100 ft. in height. Its branches are without down, and its leaves 10 to 15 ins. long. Leaflets usually seven or nine, oblong (terminal one obovate), tapered at both ends; 3 to 6 ins. long, 1 to $2\frac{1}{2}$ ins. wide; sharply toothed, smooth above, downy beneath, chiefly on the midrib and veins. Main-stalk grooved, stalk of leaflets $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers white, in large terminal panicles. It resembles some of the big-leaved forms of *F. Ornus*, but the leaflets are normally much larger, more prominently ribbed beneath, and longer pointed. I have not seen it in flower, but the blossoms appear in panicles. Introduced first, Loudon says, in 1822, but killed in the winter of 1836-7.

F. HOLOTRICHA, *Koehne*.

A small tree, with the young branchlets, leaf-stalks, and both surfaces of the leaves clothed with a dense soft down. Leaflets nine to thirteen on each leaf,

of pretty even size, lanceolate, tapered at the base, sharply and slenderly toothed, margins hairy; $1\frac{3}{4}$ to $2\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; dull green on both surfaces. Common stalk pale beneath, shallowly grooved above. The entire leaf is 6 to 10 ins. long, the terminal leaflet usually stalked, the others nearly or quite stalkless.

A species of unknown origin first noticed in cultivation in several parts of Germany. It has flowered there, but not in this country, and belongs to the common ash group. When in leaf it is very distinct among the ashes with nine to thirteen leaflets, in the dense down which covers all the younger parts. Introduced from Spath's nursery, Berlin, in 1909, and thriving well in cultivation.

F. LANCEOLATA, *Borkhausen*. GREEN ASH.

(*F. viridis*, *Michaux*.)

Nearly allied to *F. pennsylvanica*, the red ash, of which some authorities regard it as a variety, this species is most readily distinguished by its bright green, smooth young shoots, and by its narrower, slightly stalked, more sharply and conspicuously toothed leaflets, which are 3 to 6 ins. long, lance-shaped, green on both surfaces, smooth above except along the midrib, and downy at the sides of the midrib beneath; main-stalk only slightly grooved. It is a tree rarely more than 60 ft. high, according to Sargent, and is most abundant in the south Central United States. It has long been cultivated in Europe, and is fairly common in gardens, but some forms approach *F. pennsylvanica*.

Var. ALBO-MARGINATIS.—This is a variegated form with white margins to the leaflets. Usually found in gardens as a variety of *americana* (or "*alba*"), it is, like typical *lanceolata*, distinguished by the leaves being pale bright green (not whitish) beneath, by their much shorter stalks, and the distinct groove along the main-stalk. The young branchlet, however, is more or less downy, and thus shows some affinity with *pennsylvanica*.

F. LONGICUSPIS, *Siebold*. JAPANESE FLOWERING ASH.

A slender tree, 20 to 30, sometimes 50 ft. high in Japan, belonging to the *Ornus* or "flowering" group; young shoots smooth, grey. Leaves ordinarily 4 to 6 ins. long; leaflets usually five (rarely seven), which are $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide, ovate to obovate, tapered at the base, the apex abruptly contracted into a slender point, toothed, smooth above, downy only at the sides of the midrib near the base beneath. The terminal leaflet, which is the largest, has a stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the uppermost pair are stalkless, the lower pair or pairs shortly stalked; common stalk grooved on the upper side. Flowers white, in terminal and axillary panicles 3 to 5 ins. long, produced in June. Introduced from Japan in 1894, but rare in cultivation. It is the Japanese representative of *F. Ornus*, differing most obviously in the few leaflets. According to Sargent, it changes in autumn to a conspicuous purple colour.

F. MANDSHURICA, *Ruprecht*. MANCHURIAN ASH

A fine tree, often 100 high; young shoots smooth, greyish. Leaves 8 to 15 ins. long; leaflets stalkless, or nearly so, usually nine or eleven, sometimes seven or thirteen; oval or oblong-lanceolate, 2 to $4\frac{1}{2}$ ins. long, 1 to 2 ins. wide; tapered to the base, slender-pointed, sharply (occasionally doubly) toothed; dull green and with scattered bristles above, paler beneath, and more conspicuously bristly, especially on the midrib and veins. Main leaf-stalk winged above, the two wings forming a deep groove with tufts of brown down where the leaflets join.

Native of Japan and the adjacent parts of the Asiatic mainland; introduced to Kew from St Petersburg in 1882. It is one of the greatest failures among

ashes on account of its susceptibility to injury by spring frost. Its broadly winged fruits, which Sargent says are borne on the previous year's wood in great clusters, have not been produced in Britain. It is a valuable tree in the Far East, and attains to noble dimensions there. The leaf is distinct in the conspicuous sunken veins above, correspondingly prominent beneath. Closely allied to *F. nigra*.

F. MARIESII, *Hooker fil.* MARIES' ASH.

A small deciduous tree, forming a rounded, bushy head of branches, and apparently unlikely to be more than 15 to 20 ft. high; branchlets and buds greyish, downy. Leaves 3 to 7 ins. long, with three or five leaflets attached to the upper third of the main leaf-stalk, which is scurfy and purplish on the upper side, and has a swollen, dark purple base. Leaflets oval or ovate,



FRAXINUS MARIESII (in fruit).

1 to $3\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $1\frac{3}{4}$ ins. wide; the apex abruptly tapered, the base rounded or wedge-shaped; shallowly toothed or almost entire; dull green, smooth; stalks of side leaflets $\frac{1}{10}$ to $\frac{1}{4}$ in. long, that of the terminal leaflet up to $\frac{3}{4}$ in. long; all purple at the base. Flowers creamy white, in axillary and terminal panicles 3 to 6 ins. long; produced in June. Fruits $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; very handsome in July, when they become deep purple.

Native of Central China; introduced by Maries for Messrs Veitch in 1878. Of the flowering ashes (*Ornus* group) this is, I consider, the most ornamental, being very pretty both in flower and fruit. Being of slow growth and never of large size, it is admirable for small gardens.

F. NIGRA, *Marshall.* BLACK ASH.

(*F. sambucifolia*, *Lamarck.*)

A native of Eastern N. America, whence it was introduced to England in 1800, this ash has never been a success, and appears to be unworthy of

cultivation. It is a tree 80 to 90 ft. high in a wild state, and grows in damp situations; young shoots smooth. Leaflets seven to eleven, oblong or oblong lance-shaped, slender-pointed, 3 to 5 ins. long, 1 to 2 ins. wide; smooth on both surfaces except for reddish down along the side of the midrib and veins, beneath which it is densest towards the base, and extends round the main-stalk. All the leaflets except the terminal ones are stalkless—even more distinctly so than in *F. mandshurica*. In many of its characters the black ash is similar to *F. mandshurica*; the leaflets, however, are much less tapered or even rounded at the base, and the marginal teeth are shallow and quite inconspicuous. It has little interest or value in gardens.

F. OBLIQUA, Tausch.

(*F. Willdenowiana, Koehne*; *F. rotundifolia, Hort.*, not *Lamarck*.)

A small tree free from down in all parts, forming a rounded, dense head of branches; young shoots with small white warts. Leaves often in threes, 9 to 12 ins. long; leaflets usually nine or eleven, sometimes seven, scarcely stalked, ovate-lanceolate, 2 to 3½ ins. long, ¾ to 1 in. wide; tapered at the base, long-pointed, rather coarsely triangular-toothed; the terminal one is up to 5 ins. long and 1½ ins. wide, the others decreasing in size successively towards the base. The main-stalk has a continuous groove on the upper side, which, with the large terminal leaflet, distinguishes this from the other ashes with perfectly smooth shoots and leaves. Fruit 1 in. long, ½ in. wide, pointed.

This ash was named *obliqua* by Tausch in 1834 (see *Flora*, xvii., p. 521), at which time it was in cultivation as *F. rotundifolia*, a name which clung to it for over seventy years, for plants so-called were in the Kew collection until a few years ago. According to Lingelsheim, a recent monographer of the ashes, it is a native of the eastern Mediterranean region and W. Asia, but a curious uncertainty as to its origin has always prevailed. Tausch thought it came from North America.

F. OREGONA Nuttall. OREGON ASH.

A tree up to 80 ft. high; young shoots reddish brown, rough with minute warts, more or less downy, sometimes densely so. Leaves 6 ins. to over 1 ft. long; leaflets five or seven, oval or oblong, 2 to 5 ins. long, 1 to 2 ins. broad; tapered or sometimes rounded at the base, contracted at the apex to a short or slender point; margins entire or obscurely toothed; dark green and with thin down above, pale and densely downy beneath. Main-stalk very pale, downy, grooved above; stalk of the terminal leaflets up to 1 in. long; lateral leaflets very shortly or not at all stalked. Flowers without petals, produced on the previous year's shoots. Fruit 1¼ to 2 ins. long, ½ in. wide towards the apex.

Native of Western N. America, where it is a valuable timber tree. It was discovered by Douglas in 1825, but does not seem to have been introduced until many years after. It was in cultivation at Kew about forty years ago, and trees up to 40 ft. high are very healthy and handsome. The finest tree known to Mr Elwes is at Nuneham, and now about 65 ft. high. It is distinguished among ashes that, like itself, have all the young vegetative parts downy, by the large size of the stalkless or nearly stalkless, scarcely toothed side leaflets.

Var. *PULVERULENTA, Hort.*—Leaflets specked with grey. A tree at Kew is very vigorous, but this marking spoils rather than improves it.

F. ORNUS, *Linnæus*. MANNA ASH(Ornus europæa, *Persoon*.)

A deciduous, very leafy tree, from 50 to 65 ft. high, forming a dense rounded head of branches; buds rough, grey; young shoots ordinarily without down. Leaves 5 or 8 ins. long, with five to nine leaflets which are ovate or oblong (the terminal one obovate), 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{3}{4}$ ins. wide; more or less tapered at the base, abruptly pointed at the apex, shallowly round-toothed; dull green and smooth above; the base of the midrib beneath and the stalk downy. Main-stalk grooved above, furnished with brownish down where the leaflets are attached. Flowers whitish, very abundantly produced in May in terminal and axillary panicles 3 or 4 ins. long, along with the leaves of the new shoots; petals linear, $\frac{1}{4}$ in. long. Fruit about 1 in. long.

Var. LATIFOLIA, *Aiton*.—Leaves broader than those of the type and roundish oval in outline.

Var. VARIEGATA.—Leaves speckled with yellow; a form to be avoided.

Native of S. Europe and Asia Minor; cultivated since early in the eighteenth century, if not before; now one of the best known of exotic trees. It is a handsome tree with very luxuriant leafage, and decidedly ornamental in flower, although the blossom has a faint, not agreeable odour. Manna sugar is obtained from the stems by incision.

• F. PARVIFOLIA, *Lamarck*.(F. oxycarpa var. parvifolia, *Boissier*.)

A small tree with green, smooth young shoots and black-buds. Leaves 5 to 8 ins. long, with seven to thirteen stalkless leaflets, which are oval or ovate, 1 to 2 ins. long, $\frac{1}{2}$ to 1 in. wide; tapered at both ends, sharply toothed except at the base; dull green and smooth above, downy along the midrib beneath. Main leaf-stalk whitish beneath, hairy and winged on the upper side, the two wings being closed except at the base and where the leaflets are attached.

Native of S. Europe and Asia Minor; introduced, according to Loudon, in 1822. Some authorities regard this ash as a variety of F. oxycarpa (see under F. angustifolia), but it differs so markedly in the shape and length of the leaflets and by their being so much more closely set on the main-stalk, and is, moreover, so much better known in gardens under the above name, that it seems better to retain it. At the same time the distinctions between angustifolia, oxycarpa, and parvifolia do not appear capable of very clear definition.

Var. NANA.—A dwarf form with smaller leaves averaging 1 in. long, $\frac{1}{2}$ to $\frac{5}{8}$ in. wide, with a patch of down near the base. A healthy bush at Kew thirty years old is only 5 ft. high.

F. PENNSYLVANICA, *Marshall*. RED ASH.(F. pubescens, *Lamarck*.)

A tree 40 to 60 ft., sometimes more, high; young shoots clothed with a dense pale down. Leaves up to 1 ft. long; leaflets seven or nine, oblong lanceolate or narrowly oval, 3 to 6 ins. long, 1 to 2 ins. wide, broadly tapered at the base, long and slenderly pointed, rather obscurely toothed, or entire, especially at the lower half; dull green on both surfaces, and nearly or quite smooth above, except along the sunken midrib which sometimes is downy; covered beneath with a pale down. The leaflets, especially the lower ones,



MANNA ASH, *Fraxinus Ornus*.

are stalked, the stalks grooved and downy, as is also the common stalk. Male and female flowers occur on separate trees, and are produced on the old wood just below the new shoot. Fruit 1 to 2 ins. long.

Native of Eastern N. America; introduced in 1783, often known under the name "*F. pubescens*" given to it by Lamarck in 1786, a year later than the accepted name. As common in gardens as *F. americana*, the red ash is not so striking and large a tree, although it grows quickly when young. From that species it is of course easily distinguished by its downy shoots and green under-side of the leaves. *F. pennsylvanica* exists in several forms in cultivation, some of which it is not easy to differentiate from *F. lanceolata*. *F. GLABRA*, *Koehne*, is an instance, regarded as a hybrid between the two.

Var. *AUCUBÆFOLIA*, *Rehder*.—Leaflets mottled with yellow. This variety in some of its characters is intermediate between *pennsylvanica* and *lanceolata*; the leaves are far from being as downy as the former, but the shoots are quite downy. A handsome variegated tree.

F. POTAMOPHILA, *Herder*.

A small tree up to 30 or 35 ft. high, with green shoots; free from down in all its parts. Leaves 4 to 12 ins. long; leaflets stalked, usually nine or eleven, sometimes seven or thirteen; 1 to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. broad; tapered at the base, triangular toothed, pointed, dull green. Main leaf-stalks whitish beneath, with a broad, shallow groove above; stalks of the leaflets $\frac{1}{4}$ to $\frac{1}{2}$ in. long, except the terminal one, which is $\frac{3}{4}$ to 1 in. long. Flowers and fruit not seen.

Native of Turkestan and other parts of W. Asia; introduced to Kew by way of St Petersburg Botanic Garden in 1891. It is an elegant small tree, very rare in cultivation, but quite distinct among ashes with the same number of leaflets, in their being conspicuously stalked, and, together with the young shoot, quite smooth.

F. QUADRANGULATA, *Michaux*. BLUE ASH.

A tree 60 to 70, occasionally over 100 ft. high; branchlets square and conspicuously four-winged, not downy; bark of the trunk covered with loose plates. Leaves 7 to 14 ins. long, with five to eleven leaflets, which are ovate to lanceolate, 3 to 5 ins. long, 1 to 2 ins. wide; rounded or broadly wedge-shaped and unequal at the base, tapering at the apex to a long, slender point, sharply toothed; yellowish green and smooth above, paler and downy beneath, especially about the midrib and veins. Common stalk minutely downy, and grooved on the upper side; stalks of leaflets $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers in short panicles from the previous year's wood; fruit $1\frac{1}{2}$ ins. long, $\frac{5}{16}$ in. wide, oblong, with a notch at the apex.

Native of the south-eastern and Central United States; introduced in 1823. It produces a valuable timber in the United States, but does not seem to have ever attained any great size in this country, although small trees at Kew are healthy and handsome. It is readily distinguished from all ashes with the same number of leaflets by its square, winged branchlets, except *F. bracteata*, and that has untoothed leaflets, and belongs to the *Ornus* group.

F. SPÆTHIANA, *Lingelsheim*. SPATH'S ASH.

(*F. serratifolia*, *Hort.*; *F. Sieboldiana*, *Dippel*, not *Blume*.)

A small or medium-sized tree of vigorous growth; young shoots shining, grey, stout, smooth. Leaves up to $1\frac{1}{2}$ ft. long, with seven or nine (sometimes five) leaflets, which are oblong or narrowly obovate, the largest 8 to 9 ins.

long, $2\frac{1}{2}$ to 3 ins. wide, but extremely variable in size according to the vigour of the shoot, the smallest being 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; they are stalkless, markedly unequal at the base, long-pointed, coarsely round-toothed; smooth above, pale beneath and slightly downy about the base of the midrib and lower veins. The common stalk is smooth, crooked on big leaves, slightly grooved on the upper side, with the bases dark brown, very much swollen, and clasping the shoots; the lowest pair of leaflets is much the smallest. Flowers in terminal panicles. Fruit $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ in. wide towards the apex, where it is broadest.

Native of Japan, belonging to the *Ornus* group; introduced over thirty years ago. Its leaves and leaflets are of remarkable dimensions on vigorous plants, but its most distinctive character is furnished by the enormous bases of the leaf-stalk. The whole tree has a yellowish tinge; worth cultivating as a striking and remarkable ash.

F SYRIACA, *Boissier*. SYRIAN ASH.

A deciduous tree, small in cultivation, and of slow growth; young branches without down, those of a year or two old usually packed closely with protuberances, which are the seats of the fallen leaves and buds. Leaves quite smooth, normally in whorls of three, and densely crowded, but on free-growing shoots often alternate and well apart. Leaflets one to five (usually three), lance-shaped, tapered at the base; 1 to 4 ins. long, $\frac{1}{3}$ to $1\frac{1}{4}$ ins. wide; coarsely and sharply toothed, glossy dark green. The whole leaf is from 4 to 8 ins. long, the main-stalk and midribs whitish beneath, the former grooved above. Flowers produced in short racemes on the wood of the previous year. Fruit narrowly obovate, 1 to $1\frac{1}{2}$ ins. long, $\frac{1}{3}$ in. wide.

Native of Syria and Afghanistan and the country between. It does not, so far as I have observed, possess any recommendation for gardens, but is very distinct in the remarkably crowded leaves, and in the conspicuous protuberances on the younger branches. It has been cultivated under the wrong name of "F. Sogdiana."

F. TEXENSIS, *Sargent*. TEXAN ASH.

A tree rarely 50 ft. high in nature; young shoots stout, smooth, deep brown. Leaves on young trees 6 to 15 ins. long. Leaflets five or seven, oval or ovate (terminal one sometimes obovate), rounded or tapered, and often very unequal at the base, pointed at the apex in young plants, sometimes rounded in adult ones; coarsely but shallowly round-toothed, dark green and smooth above, grey-white beneath, and at first downy, with the midrib and chief veins permanently beset with white hairs. The leaflets of adult trees are described by Sargent as 2 to $2\frac{1}{2}$ ins. long by 1 to 2 ins. wide, but on trees at Kew twelve years old they are as much as $6\frac{1}{2}$ ins. long by 3 ins. wide. Common stalk round except for a flattening at the top; stalk of leaflets up to $\frac{1}{2}$ in. long. The fruit apparently resembles that of *F. americana*.

Native of limestone districts in Texas; discovered by Dr Bigelow in 1852; introduced to Kew in 1901. It is closely allied to *F. americana*, but has broader, more shortly pointed leaflets, commonly only five to each leaf. Young trees are vigorous, and particularly striking for their large deep green leaflets.

F. VELTHEIMI, *Dieck*.

(*F. angustifolia* var. *monophylla*, *Henry*.)

A bushy habited tree very similar in form and arrangement of leaf to the one-leaved form of common ash, but easily distinguished from it by the leaves being

quite smooth beneath, and narrower. Leaflets usually solitary, sometimes in twos or threes, in which case the terminal one is always much larger than the lateral ones; lanceolate, 2 to 5 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; tapered towards both ends, the margins set with coarse, sharp, outstanding teeth; dark lustrous green above, quite smooth on both surfaces. Lateral leaflets, when present, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide. Stalk 1 to $2\frac{1}{2}$ ins. long. Henry considers this a monophyllous variety of *angustifolia*. It has been in cultivation at Kew under other names for forty years at least, and makes a distinct and curious as well as an attractive tree.

F. VELUTINA, *Torrey*. ARIZONA ASH

(*F. pistaciæfolia*, *Torrey*.)

A tree 30 to 40 ft. high, with a slender trunk; young shoots slender, and, like the leaf-stalks and leaflets, densely clothed with a velvety down. Leaves 4 to 6 ins. long, with five or seven leaflets which are lanceolate or narrowly oval, tapered at the base, long-pointed, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide (terminal one often larger, obovate, up to $3\frac{1}{2}$ ins. long), the upper part bluntly and unevenly toothed, edged with fine hairs; dull greyish green. Common stalk with an open groove on the upper side; leaflets usually stalkless, the basal pair and terminal one occasionally stalked. Flowers and fruit not seen.

Native of S.W. United States; introduced in 1891 to Kew, where it makes a neat, elegant, very leafy tree, distinct because of the grey down with which all the young parts are covered, combined with stalkless leaflets. *F. holotricha* and *F. oregona* have the same combination of characters, but in the former the leaflets are up to thirteen in number, and in *oregona* they are much larger.

FREMONTIA CALIFORNICA, *Torrey*. STERCULIACEÆ.

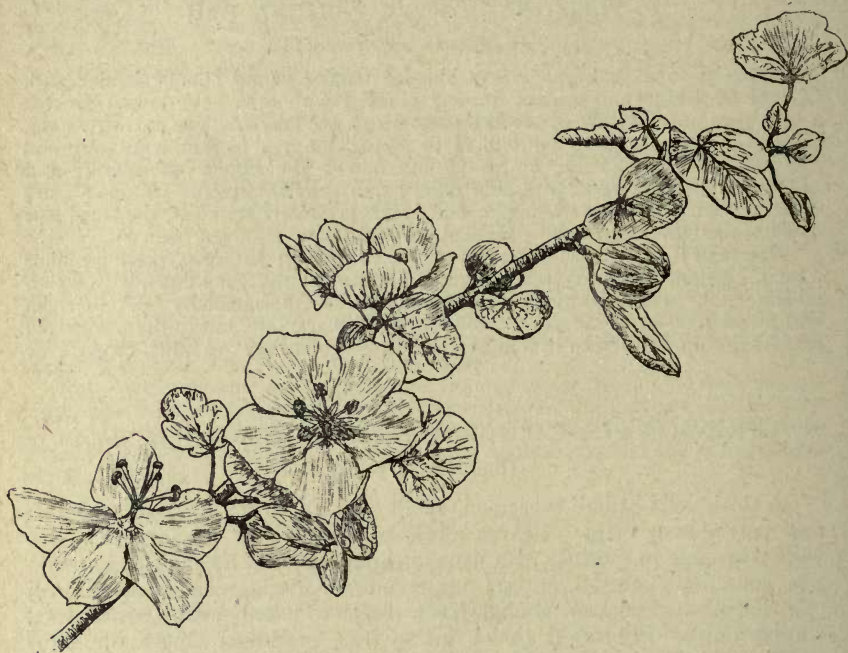
(*Bot. Mag.*, t. 5991.)

A deciduous or half-evergreen, small tree, 15 to 30 ft. high, with soft and very downy twigs. Leaves alternate, 2 to 4 ins. long, $1\frac{1}{2}$ to 3 ins. wide; variable in outline, with usually three to seven lobes or large teeth, but sometimes almost entire; upper surface dull green, specked with star-shaped hairs when young, lower surface felted with brown-white, similar hairs. Flowers 2 to $2\frac{1}{2}$ ins. across, produced singly on short stalks. There are no petals, the bright golden calyx being the conspicuous part of the flower; it is at first widely cup-shaped, has five roundish divisions, and is densely downy outside and very hairy in the centre inside. Stamens united in a short column, dividing at the top into five radiating arms $\frac{3}{8}$ in. long. Ovary conical, with a slender style.

Discovered in California by Col. Frémont, after whom it is named, in 1846; this plant first flowered in England, at Chiswick, in 1854. It was again introduced from the Sierra Nevada by William Lobb in 1853, since when it has existed in numerous gardens in the milder parts of the kingdom. It is not hardy in the open at Kew, but a fine plant 10 ft. high grew in one of the bays outside the Temperate House, and flowered finely for several years. It was not trained, and took the form of a small tree. Although it survived the winter of 1908-9, and blossomed well the summer following, it has since died. The tree, in fact, is not long-lived, and although plants occasionally survive twenty or twenty-five years,

growing and flowering admirably to the very last season, they are always liable to sudden collapse and death. Usually the plant is given a place on a wall, which would scarcely appear to be necessary in the milder parts. It flowers from May to July.

The Fremontia produces plenty of its black seeds, which furnish the best and simplest means of increase. So averse is it to root disturbance, that young plants should be grown in pots until planted in their permanent places. It likes a well-drained, sandy loam.



FREMONTIA CALIFORNICA.

FUCHSIA. ONAGRACEÆ.

In the milder parts of the British Isles like Cornwall, S.W. Ireland, Isle of Wight, Isle of Man, etc., fuchsias make some of the most brilliant features of the late summer and autumn garden, growing into trees 10 ft. or more high, with trunks 6 ins. or more through. In colder, more northerly, and inland localities, they may still be grown in the open air, although they can scarcely be termed hardy shrubs, seeing that they are killed to the ground almost invariably. Yet even at Kew, groups of several sorts of fuchsias make very pleasing displays of colour from July onwards. Shoots spring up freely from the old stools, and attain a length of 3 to 5 ft. during the growing season, continuing to flower as they lengthen until the frosts come. The flower-buds add much to the beauty

of the plants. A little brushwood or rough litter may be laid over the stools in very severe frost. Fuchsias like a well-drained, loamy soil, and can be increased with the greatest ease by means of soft-wood cuttings struck in heat.

As to the leading features of the genus, the leaves are opposite or whorled (rarely alternate), and deciduous; the flowers are pendulous, and produced singly on their stalks from the leaf-axils, or crowded in a terminal cluster; the calyx is tubular at the base, separating into four-pointed segments; the petals are four, springing from the end of the calyx-tube; the stamens eight; the fruit a juicy, four-sided berry, with rounded corners. Natives of S. America, Mexico, and New Zealand.

The following descriptive list of a few sorts is by no means exhaustive, but will serve to draw attention to the outdoor possibilities of a genus of shrubs which must, on the whole, be regarded as greenhouse rather than hardy:—

F. CONICA, *Lindley*.—A stiff-habited shrub with short-jointed, red shoots. Leaves broadly ovate or oval, mostly 1 to $1\frac{1}{2}$ ins. long. Flowers slender, red and purple; calyx $\frac{1}{2}$ in. long, with sepals $\frac{7}{8}$ in. long and $\frac{1}{8}$ in. wide; petals narrowly obovate. Distinct in the combination of small leaves and long flowers. Native of Chile.

F. CORALLINA, *Hort.* (syn. *F. exoniensis*).—Branches reddish purple when young. Leaves often in threes, $1\frac{1}{2}$ to 4 ins. long, $\frac{1}{2}$ to 2 ins. wide; dark green suffused with red-purple, especially the stalk, midrib, and veins. Calyx $1\frac{1}{4}$ to $1\frac{1}{2}$ ins. long, with rich scarlet-red sepals $\frac{1}{4}$ in. wide; petals purple, obovate; stamens red, standing out $\frac{3}{4}$ in. beyond the petals. A selected form or hybrid of *F. macrostemma*.

F. GLOBOSA, *Lindley*, (*Bot. Reg.*, t. 1556).—A sturdy bush with ovate leaves 1 to 2 ins. long, glossy beneath. Calyx 1 in. long, rich red, with a short tube and sepals $\frac{3}{4}$ in. long, $\frac{1}{4}$ in. wide; petals rich purple, broadly obovate, $\frac{3}{8}$ in. wide. This is distinguished by its stout buds and the comparative broadness and shortness of the floral parts.

F. GRACILIS, *Hort.* (*Bot. Reg.*, t. 847).—A form of the *macrostemma* group, with smaller leaves proportionately longer-stalked than those of *corallina*. Flowers red and purple; calyx $\frac{3}{4}$ in. long, sepals $\frac{1}{2}$ in. wide; stalk very slender, $1\frac{1}{2}$ to 2 ins. long. A very elegant shrub, of which several minor forms with colloquial names are grown.

F. MACROSTEMMA, *Ruiz and Pavon*.—A South American species, introduced early in the nineteenth century. It probably includes all the foregoing sorts, being distinguished by a rich scarlet calyx, purple petals, much protruded stamens, and still more protruded style. Leaves mostly in threes at each joint. Figured in *Bot. Mag.*, t. 97, as *coccinea* (not of *Aiton*).

F. PUMILA, *Hort.*—A dainty little shrub of dwarf, compact, rounded habit; leaves $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide, lanceolate; stalks, midrib, and veins red (like the young wood). Flowers on slender red stalks 1 in. long; calyx red, petals purple, the whole flower $\frac{3}{4}$ in. long.

F. RICCARONI, *Hort.*—Considered to be one of the hardiest of fuchsias. It has the same colouring as the preceding, but the flower-buds are unusually stout, and the floral parts short and broad. Sepals $\frac{1}{2}$ in. long, $\frac{1}{4}$ in. wide; calyx-tube scarcely $\frac{1}{4}$ in. long. Leaves ovate-lanceolate, with a purplish tinge.

GARRYA. CORNACEÆ.

A genus of evergreen, unisexual shrubs or small trees, with opposite leaves and flowers produced in greyish catkins. With the exception of

G. elliptica, they have not much value in the majority of gardens, being more or less tender, and with little flower beauty. In the colder parts of our islands all the following will need protection, but in the south of England *G. elliptica* and *G. Thureti* are hardy in selected positions. Increased by cuttings of half-woody twigs in gentle heat. The genus was named by Douglas, in honour of Mr Garry of the Hudson's Bay Co., who helped him in his plant-collecting expeditions in Western N. America. *Garrya* is a somewhat anomalous genus usually placed with the cornels, but by some authorities kept apart in a separate natural order—*Garryaceæ*.

G. ELLIPTICA, Douglas.

(Bot. Reg., t. 1886.)

An evergreen shrub, or even a small tree, of vigorous, rapid growth and bushy habit, growing 6 to 12 ft. high in this country (16 ft. in the milder parts); young wood downy. Leaves oval to roundish; $1\frac{1}{2}$ to 3 ins. long, half, or more than half, as wide; more or less rounded at each end, the apex terminating in a short, abrupt tip; dark shining green above, grey-woolly beneath; margins wavy, but not toothed; stalk stout, woolly, $\frac{1}{4}$ in. long. Flowers densely crowded on slender pendent catkins 3 to 6 ins. long in cold districts, but 1 ft. or more long in warm ones, produced in a cluster towards the end of the shoot and in the leaf-axils near. Bracts silky in the male plant, cup-shaped, enclosing the base of the stamens; in the female plant longer and narrower. Fruit globular-ovoid, silky, with a thin, brittle shell, enclosing two seeds embedded in a dark red juice.

Native of California and Oregon; introduced by Douglas in 1828. For *Garrya elliptica* to be seen at its best, one must visit the gardens of Cornwall, Devon, and similar places. It becomes there 16 ft. high, and as much through, and bears male catkins up to 12 ins. long. It is at its best from November to February, and at that season no evergreen shrub, perhaps, is so attractive as is this when laden with a great crop of silvery grey catkins. Near London, although not so satisfactory as in the south-west, it is an excellent evergreen if a suitable spot be chosen. It does not need a rich soil nor abundant moisture, and the best possible position for it is a sunny, rather dry bank sloping south or west, and protected by other vegetation on the north and east sides. It is a bad shrub to transplant, and should be grown in a pot until given a permanent place. The male plant, which we figure, is much the more ornamental, the catkins of the female being only $1\frac{1}{2}$ to 4 ins. long. Cuttings of both strike root freely if taken in late summer and given a little heat. In cold districts this *Garrya* will need wall protection.

G. FREMONTI, Torrey.

(Gardeners' Chronicle, 1881, i, fig. 83.)

An evergreen shrub up to 12 ft. in height. Leaves leathery, dark glossy green, obovate or oval, $1\frac{1}{2}$ to 3 ins. long, tapering at both ends, with appressed hairs on both surfaces when young, afterwards smooth. Catkins in a terminal cluster, each catkin 2 to 4 ins. long, with grey woolly bracts. Fruits globose, at first hairy, ultimately smooth, $\frac{1}{4}$ in. wide.

Native of California, Oregon, etc. A flowering spray is figured in the place cited above, taken from a plant grown in the gardens of Gordon Castle, N.B. From the accompanying note it would appear to have proved hardier there

than *G. elliptica*, both species being grown on the same wall. Some years ago I saw it in Messrs Dickson's nursery at Chester, but it is very rare in cultivation. It has not the fine qualities of *G. elliptica*, from which it may be distinguished by its differently shaped leaves and the ultimate smoothness of its foliage and fruit.



GARRYA ELLIPTICA (male plant).

G. MACROPHYLLA, *Benth.*

A very robust evergreen shrub, forming naturally a small tree ; young wood covered with a pale grey down. Leaves oblong, 5 to 8 ins. long, 2 to 4 ins. wide ; rounded or tapering at both ends ; apex ending in a short tip ; dark glossy green and smooth above, felted beneath with grey down ; stalk $\frac{1}{2}$ to 1 in. long. Male catkins 1 to 3 ins. long, axillary, often branched ; female flowers produced in the axils of leaflike bracts on lateral shoots 3 to 5 ins. long.

Introduced from Mexico in 1846. This species can be grown on a wall near London, but in Guernsey it makes a small tree of very striking aspect. It is one of the largest leaved evergreens that can be grown in the open air. Flowers in May and June, but has no attractions apart from its striking foliage. This shrub is frequently met with as *G. Fadyeni*, a quite different species with much smaller leaves, found in the West Indies, and not hardy.

G. THURETI, Carrière.

A quick-growing, robust evergreen up to 15 ft. high; branchlets stout, downy. Leaves narrow-oblong; $2\frac{1}{2}$ to 4 ins. long, 1 to $1\frac{1}{4}$ ins. wide; tapering equally to both ends, the apex ending in a short, abrupt tip; upper surface becoming smooth and glossy, lower one covered with a greyish down; stalk $\frac{1}{2}$ in. long. Catkins more or less erect, greyish, terminal and axillary, $1\frac{1}{2}$ to 3 ins. long, with the bracts in pairs at $\frac{1}{3}$ in. apart, ovate-lanceolate, pointed, and very hairy.

A hybrid raised about 1862 at Antibes by M. Gustave Thuret, who crossed *G. Fadyeni* with the pollen of *G. elliptica*. This shrub is interesting, but of little ornament. At Kew it is 12 ft. high, and as hardy as the pollen parent. Where the winters are not severe it forms a large, vigorous bush, but is disfigured by exceptionally severe frost. It blossoms in June.

GAULTHERIA. ERICACEÆ.

An extensive genus of evergreen shrubs, most abundant in America; found also in the Himalaya, China, Malay Archipelago, and Australasia, but absent from Europe. The few species cultivated out-of-doors in Britain are shrubs of tufted habit, spreading by means of underground suckers. Leaves alternate. Corolla of the pitcher- or bell-shape characteristic of the heaths and their allies; calyx five-lobed or toothed, persistent, becoming in many species fleshy and coloured like the fruit to which it adheres. Stamens ten. Fruit consisting of five cells, many-seeded, juicy.

The Gaultherias are peat, moisture, and often shade loving plants. The best of them in gardens is *G. Shallon*, which, planted in shady spots and not disturbed, will make very luxuriant and handsome low thickets of great density. It will grow quite well in ordinary soil. The generic name commemorates Dr Gaulthier, an eighteenth-century botanist and physician of Canada.

G. NUMMULARIOIDES, G. Don.

A dwarf evergreen shrub, 4 to 6 ins. high, forming dense tufts, and spreading by underground shoots; stems slender and wiry, covered with bristles, and bearing over their whole length leaves $\frac{1}{2}$ in. apart in two opposite rows. Leaves leathery, heart-shaped, becoming smaller towards the tip of the shoot; $\frac{1}{4}$ to $\frac{5}{8}$ in. long, about the same wide; the lower surface and the margins are bristly; the upper side is dark dull green and wrinkled, the lower one very pale polished green; stalk $\frac{1}{8}$ in. or less long. Flowers produced singly in the leaf-axils from the under-side during August; corolla egg-shaped, white or tinged with pink, scarcely $\frac{1}{4}$ in. long.

Native of the Himalaya; long cultivated, but still rare in gardens. It makes charming dense tufts of foliage and stems, but needs some shelter. At

Kew it thrives well in a damp bed of peat in one of the recesses of the rock garden, where it has not suffered from cold since the frosts of February 1895. Its roundish leaves, closely and regularly set in two rows, and gradually decreasing in size towards the end of the shoot, with the slender, conspicuously bristly stems, render it quite distinct from any other plant in cultivation. Increased by cuttings.

G. PROCUMBENS, *Linnaeus*. CREEPING WINTERGREEN.

(Bot. Mag., t. 1966.)

A low, tufted evergreen shrub, growing 2 to 6 ins. high, spreading by creeping roots, from which it sends up slender stems naked except at the top, where they carry a cluster of about four leaves; stems at first downy, afterwards smooth and glossy. Leaves dark glossy green, thick and leathery, quite smooth, obovate or oval, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{8}$ in. wide; faintly toothed, the teeth often bristle-tipped; they have a strong aromatic odour and taste like that of birch, and turn reddish as winter approaches; stalk $\frac{1}{6}$ in. long. Flowers produced in July and August, singly in the leaf-axils and at the top of the stem. Corolla ovate-cylindrical, $\frac{1}{4}$ in. long, nodding, pinkish white; calyx-lobes broadly ovate, edged with tiny hairs; flower-stalk downy, $\frac{1}{4}$ in. long, decurved. Fruit bright red, globose, $\frac{1}{3}$ in. wide, with a pleasant, rather insipid taste.

Native of Eastern N. America; introduced in 1762. It has there a variety of popular names such as "box-berry," "creeping wintergreen," and, because of the fondness of partridges for the berries, "partridge-berry." An oil is extracted from it which possesses stimulating and tonic properties, but is now largely adulterated with birch-oil. As a garden plant it is very pleasing for the cheerful dark green of its lustrous leaves, forming neat close tufts. It makes a pleasing undergrowth or furnishing beneath thin deciduous shrubs. Owing to the leaves in a great measure hiding the drooping flowers and fruit, its attractiveness is almost wholly in the habit and foliage.

G. SHALLON, *Pursh*. SALAL, SHALLON.

(Bot. Mag., t. 2843.)

An evergreen shrub, 2 to 6 ft. high, forming a dense thicket of stems, and spreading by means of underground suckers; young branches reddish and bristly, becoming rough with age. Leaves leathery, broadly ovate, the base rounded or heart-shaped, the apex always sharply pointed; evenly and finely bristle-toothed; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide; stalk reddish, hairy, $\frac{1}{2}$ to $\frac{1}{4}$ in. long. Flowers produced during May and June in viscid, glandular racemes $1\frac{1}{2}$ to 4 ins. long, at the end of the previous year's shoots, and in the axils of several terminal leaves; each flower produced from the axil of a hooded, ovate bract, $\frac{1}{4}$ in. long. Corolla pinkish white, egg-shaped, downy, $\frac{3}{8}$ in. long, five-toothed at the mouth; calyx white, its lobes triangular, downy, pressed to the corolla. Fruit a juicy, top-shaped, hairy berry, dark purple, $\frac{3}{8}$ in. wide, carrying many tiny seeds, and pleasantly flavoured; the calyx adheres at the base.

Native of Western N. America; introduced by Douglas in 1826. This useful and handsome shrub is one of the best we have for forming a dense evergreen thicket in moist, shady spots. It can be propagated by seeds, which it ripens in great numbers, also by division of the old plants, but to do the latter advantageously it is necessary to plant the pieces in a few inches of sandy soil on a hot-bed. Broken up and planted in the open ground the pieces take long to recover. It may be recommended as cover for game.

G. TRICHOPHYLLA, Royle.

A low evergreen shrub of densely tufted habit, 3 to 6 ins. high, spreading by means of underground shoots; stems wiry and slender, bristly, furnished with twelve or more leaves to the inch. Leaves stalkless, narrow-oblong; $\frac{1}{4}$ in. long, $\frac{1}{10}$ to $\frac{1}{8}$ in. wide; smooth on both surfaces, but bristly on the margins, glossy dark green above, pale beneath. Flowers solitary in the leaf-axils; corolla pink, $\frac{1}{8}$ in. long and wide, bell-shaped. Fruit blue-black.

Native of Himalaya up to 13,000 ft.; introduced to Kew in 1897, where it has, up to the present, proved fairly hardy in ordinarily sheltered places. It is a dainty plant suitable for the rock garden, and pleasing for the bright green of its foliage and neat habit. Propagated by cuttings and division.

G. VEITCHIANA, Craib.

A low evergreen shrub forming a dense, rounded tuft, and spreading by underground stems; branchlets clothed with minute down, with which are



GAULTHERIA VEITCHIANA.

intermixed long bristles. Leaves of hard texture, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, half as wide; oblong or slightly obovate, rounded or broadly tapered at the base, abruptly narrowed at the apex to a short glandular tip; shallowly toothed, the teeth often bristle-tipped; upper surface much wrinkled, dark glossy green, conspicuously net-veined, without down; lower surface at first furnished with bristles which partially fall away, leaving it harsh to the touch; stalk $\frac{1}{2}$ to $\frac{3}{8}$ in. long. Flowers densely packed in axillary racemes, 1 in. or more long, white. Corolla $\frac{1}{8}$ in. long, nodding, narrowed from the base to the mouth; calyx-lobes lanceolate; main-stalk downy, each flower produced in the axil of an ovate, membranous, more or less ciliated bract $\frac{1}{4}$ in. long; the short smooth flower-stalk is also furnished with bracts partially hiding the flower. Fruit indigo-blue, about the size of a small pea.

Native of Hupeh, China; introduced by Wilson about 1907, and a very distinct, neat little evergreen, thriving well in peat and much moisture. Allied to the Himalayan *G. Hookeri*.

GAYLUSSACIA. HUCKLEBERRY. VACCINIACEÆ.

This genus contains some forty to fifty species which belong exclusively to the New World, the greater proportion being found in S. America. About half a dozen species are in cultivation, all from Eastern N. America, and, with the exception of *G. brachycera*, deciduous shrubs. The leaves are alternate, not toothed except in *brachycera*, and often resin-dotted. The corolla resembles that of *Vaccinium*, to which genus *Gaylussacia* is closely allied. The fruit is berry-like, outwardly similar to that of *Vaccinium*, but markedly different in containing ten cells and ten nutlets, instead of the four or five cells and numerous minute seeds of *Vaccinium*. The genus commemorates Gay-Lussac, the French chemist (1778-1850). Cultivation the same as for *Vaccinium*; but these shrubs have obtained little attention in gardens. Some of the species yield in a wild state large crops of edible fruits in N. America, but have no value in that respect with us.

G. BRACHYCERA, *A. Gray*. BOX HUCKLEBERRY.

(*Vaccinium buxifolium*, *Salisbury*, Bot. Mag., t. 928.)

A dwarf evergreen shrub, 6 to 12 ins. high; young stems angled, minutely downy. Leaves thick, leathery, oval to ovate, toothed, $\frac{1}{2}$ to 1 in. long, about half as wide, dark glossy green above, paler below, smooth, very shortly stalked. Flowers produced in May and June in short axillary racemes near the end of the shoot, each flower on a very short stalk. Corolla cylindrical, but contracted at the mouth, $\frac{1}{4}$ in. long, white, faintly striped with red. Berries not seen; described as blue.

Native of the eastern United States, on the mountains and hills from Virginia northwards to Pennsylvania; originally introduced in 1796. It was subsequently quite lost to cultivation, but through the agency of the Arnold Arboretum, Mass., has been restored to gardens. It is still a very rare plant, but one of the daintiest of evergreens, forming low, neat patches, resembling to some extent *Vaccinium Vitis-idaea* var. *minor*.

G. DUMOSA, *Torrey and Gray*. DWARF HUCKLEBERRY.

(*Vaccinium dumosum*, *Andrews*, Bot. Mag., t. 1106.)

A deciduous shrub, 1 to 2 ft., or sometimes twice as much high, spreading by underground stems, the young twigs furnished with gland-tipped hairs. Leaves narrowly oval or obovate, pointed, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide; deep shining green, more or less glandular downy on both surfaces and at the edges, not toothed; stalk very short. Flowers produced in June on short downy racemes furnished with oval, persistent, leaf-like bracts $\frac{1}{4}$ in. or more long, from the axils of which the flowers spring. Corolla bell-shaped, $\frac{1}{3}$ in. long and wide, pure waxy white, nodding; calyx with downy triangular lobes. Berries globose, black, $\frac{1}{4}$ to $\frac{1}{3}$ in. wide, downy; not much valued for eating.

Native of Eastern N. America from Newfoundland to Florida, never far from the coast, and said to prefer sandy soil; introduced in 1774. It is a handsome shrub both in flower and fruit, and differs from the other deciduous species in cultivation by the large, white, open bell-shaped flowers. (Fig. p. 584.)

G. FRONDOSA, *Torrey*. DANGLEBERRY.(Vaccinium frondosum, *Linnaeus*; *V. venustum*, *Aiton.*)

A deciduous shrub, 3 to 6 ft. high, with slender, divergent branches; young wood smooth or nearly so. Leaves obovate or oval, rounded or notched at the apex; 1 to 2½ ins. long, ½ to 1¼ ins. wide; bright green and smooth above, rather glaucous, downy, and sprinkled with resin-dots beneath. Flowers produced in June and July on loose, slender racemes 1½ to 3 ins. long,



GAYLUSSACIA DUMOSA.

each flower on a threadlike, pendulous stalk ⅓ to 1 in. long. Corolla roundish bell-shaped, scarcely ⅓ in. long, purplish green; calyx-lobes smooth, triangular. Berry blue, ⅓ in. or more wide, globose, very palatable.

Native of the eastern United States; introduced in 1761. This is one of the handsomest of the Gaylussacias, and is distinct in the long-stalked flowers and lax racemes, and the bluntish leaves. The popular name refers to the loosely hanging berries; they are not freely developed in this country.

G. RESINOSA, *Torrey*. BLACK HUCKLEBERRY.

A deciduous, much-branched shrub, 1 to 3 ft. high, the young wood minutely downy and viscid. Leaves obovate or oval, mostly bluntish at the apex; 1 to 2¼ ins. long, ½ to ¾ in. wide; deep green above, paler yellowish and clammy with numerous resin-dots beneath. Flowers produced in May in drooping racemes 1 in. or less long, carrying

six to eight flowers, each on a thin stalk ½ to ¾ in. long. Corolla conical, ⅓ in. long, narrowed towards the mouth, dull red. Berry ¼ to ⅓ in. diameter, globose, shining black, without bloom.

Native of Eastern N. America; introduced in 1772. In the United States it is considered the best of the huckleberries for eating, although said to vary very much in quality in different localities. It is distinguishable from the other deciduous huckleberries by the abundant resinous secretion on twig, leaf, flower-stalk, etc.

Var. LEUCOCARPA.—Fruits whitish.

G. URSINA, *Torrey*. BEAR HUCKLEBERRY.(Vaccinium ursinum, *Curtis*.)

A deciduous shrub of loose branching habit, 2 to 5 ft. high; young twigs slightly downy. Leaves obovate or oval, pointed, tapering or rounded at the base; $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; green and more or less downy on both sides, thin. Flowers produced during June in racemes 1 to 2 ins. long, each of the six to ten flowers being borne on a slender stalk about $\frac{1}{2}$ in. long. Corolla roundish, bell-shaped, dull white or reddish, $\frac{1}{2}$ in. long, lobes recurved. Berry shining black, globose, $\frac{1}{8}$ to $\frac{1}{2}$ in. diameter.

Native of the south-eastern United States, and especially on the mountains of N. Carolina, whence it was introduced to Kew in 1891. It is most nearly allied to *G. frondosa*, differing in the pointed, thinner leaves, green on both sides, and in having a black fruit, but resembling that species in the loose sparsely flowered racemes. The fruit is described as insipid.

GENISTA. BROOM. LEGUMINOSÆ.

A large genus of shrubs, mostly deciduous, but sometimes acquiring the character of an evergreen from the colour of the young branches. They vary from dwarf and prostrate plants a few inches high to tall ones with a stature of over 20 ft. In a wild state they are found almost exclusively in Europe, but a few reach the western borders of Asia and the southern shores of the Mediterranean. With but one exception among cultivated hardy species (*G. monosperma*, with white flowers), the blossom is of some shade of yellow, and all have the pea-flower (or papilionaceous) form. The leaves are simple or trifoliolate, often so small and few as to be negligible; in these cases the work usually done by leaves is performed by green branches.

As garden shrubs some of the Genistas, such as *ætnensis*, *hispanica*, *cinerea*, *glabrescens*, *pilosa*, and *virgata*, are in the very front rank, and are all worth growing. They are easily accommodated and do not require a rich or manured soil. A sunny position (for most of them are essentially sun-lovers) and a well-drained, light loam suits them best. Whenever possible, Genistas should be raised from seed, as plants so obtained are usually healthier and longer-lived than cuttings. Still cuttings are frequently employed. They are taken in late July or August, and dibbled in very sandy soil in frames, usually pushing roots the following spring. The taller species are all improved by shortening back several times in the young state to induce a bushy habit. They transplant badly after a few years, and should be given permanent quarters early, or else grown in pots. (See also *CYTISUS*.)

A considerable number of tender or half-hardy species have been, and continue to be, introduced from the south of Europe and the islands of the Mediterranean. Many of them can be cultivated in the Scilly Isles, but they are of no use for the ordinary climate of Great Britain. The species dealt with in the following pages include all in cultivation

that are hardy. As a rough guide to their identification they may be arranged as follows:—

1. LEAVES AND BRANCHES OPPOSITE.
Horrida, radiata.
2. LEAVES ALTERNATE, SIMPLE.
Ætensis, anxantica, cinerea, monosperma (flowers white), ovata, pilosa, tinctoria, virgata.
3. LEAVES ALTERNATE, TRIFOLIOLATE.
Glabrescens, nyssana.
4. LEAVES ALTERNATE; BRANCHES SPINY.
Anglica, dalmatica, germanica, hispanica.
5. BRANCHES WINGED.
Sagittalis.

G. ÆTENSIS, *De Candolle*. ETNA BROOM.

(Garden, March 4, 1893; *Spartium ætense*, *Bivona*, Bot. Mag., t. 2674.)

A tall shrub up to 15 or 20 ft. high, occasionally even more, with a main stem 6 to 12 ins. thick, and assuming the form of a small tree of erect, sparse habit, with very little foliage, but numerous slender, bright green, rushlike branches, which are pendulous when young. Leaves very few and scarcely noticeable, being narrow, linear, and $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers produced in July, scattered singly on the shoots of the year towards the end, each $\frac{1}{2}$ in. or so across, the petals golden yellow, the calyx green, angular-toothed, bell-shaped. Seed-pod $\frac{1}{2}$ in. long, ending in a sharp, decurved point and carrying two or three seeds.

Native of Sardinia and Sicily, and found on the slopes of Mount Etna at altitudes of 3000 to 6000 ft. It flowers during July and early August, when few hardy shrubs are in bloom; being of great beauty then, this broom is one of the most valuable of all its kind. Its tall habit makes it useful for planting at the back of shrubberies, where it can overtop without unduly shading other things. Although practically devoid of foliage, the bright green young branchlets give the plant almost the quality of an evergreen. It always makes a conspicuous feature in the grounds at Kew in July. It is a very hardy shrub, one of the largest and oldest specimens in the country, being in the gardens at Howick in Northumberland.

G. ANGLICA, *Linnaeus*. NEEDLE FURZE, PETTY WHIN.

A deciduous, more or less prostrate shrub, 1 to 2 ft. high. Branches slender, interlaced, very spiny; spines numerous, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Leaves simple, glabrous, ovate-lanceolate, pointed, about $\frac{1}{2}$ in. long. Flowers yellow, $\frac{1}{2}$ in. long, crowded on short racemes terminating leafy twigs. Seed-pod $\frac{1}{2}$ in. long.

Widely distributed over Western Europe, and frequent on moors and wild places in Great Britain. Although pretty when in flower, it is not one of the most attractive of Genistas. The spines are really modified branches, and may often be seen bearing leaves. The species resembles *G. germanica*, but is distinguished by its smooth leaves and branchlets.

Var. SUBINERMIS, *Legrande*.—A form nearly or quite without spines. It has recently been found in the Lake district.

G. ANXANTICA, *Tenore*. NEAPOLITAN BROOM.

(*G. tinctoria* var. *anxantica Fiori*.)

A dwarf deciduous shrub of diffuse habit, very nearly allied to *G. tinctoria*, and of a similar type of growth. Leaves oval, sometimes broadly so. Racemes terminal; flowers yellow, $\frac{2}{3}$ in. long; pods quite smooth.

Native of the country round Naples. It is one of the group of which *G. tinctoria* is the central and typical species, and is scarcely specifically distinct from it. It differs chiefly in being wholly free from down, and in its considerably larger flowers. It is appropriate for the rockery. It should be mentioned that the name "*anxantica*" is given to other *Genistas*, and even to species of *Cytisus*, especially to *C. purgans*, to which, of course, the true plant bears no resemblance.

G. CINEREA, *De Candolle*.

(Bot. Mag., t. 8086.)

A deciduous shrub, 8 to 10 ft. high, with long, slender, scourge-like branches, grooved and clothed with fine silky hairs when young. Leaves grey green, simple, stalkless, narrowly lanceolate, pointed, about $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide, covered with silky hairs beneath. Flowers in short clusters, usually two to four in each, bright yellow, $\frac{1}{2}$ in. long; standard petal roundish with a notch at the top, about $\frac{1}{2}$ in. long. Calyx $\frac{1}{6}$ in. long, silky. Pod very silky, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, containing two to five seeds. Blossoms June and July.

Native of S.W. Europe, especially of Spain, where it grows on the Sierra Nevada up to an altitude of 6000 ft. It is one of the showiest and most desirable of *Genistas*, and although cultivated at Kew for over sixty years is still quite rare in gardens. It is useful in flowering after the majority of the brooms are past. Very similar in leaf and flower to *G. virgata*, it may be distinguished by longer, more slender branchlets and less twiggy habit when old, and in its flowers being mostly produced in small lateral clusters instead of racemes.

G. DALMATICA, *Bartling*. DALMATIAN BROOM.

(Bot. Mag., t. 8075.)

A dwarf deciduous shrub, forming a neat dense tuft, 4 to 6 ins. high, ultimately 1 ft. or more through; branches thin, angular, very hairy and spiny. Spines stiff and sharp, being really the terminations of curious pinnately divided branchlets. Leaves simple, mostly confined to the base of the shoot; thin, linear, pointed, about $\frac{1}{2}$ in. long, hairy. Racemes terminal, 1 to 1 $\frac{1}{2}$ ins. long, erect, densely set with golden yellow flowers. Flowers $\frac{1}{2}$ in. long; standard petal broadly ovate; calyx with five slender awl-shaped lobes, hairy. Pod round and flat, $\frac{1}{2}$ in. long, ripening usually but one seed. Blossoms in June and July. The plant in general suggests a miniature *G. hispanica*.

Native of Dalmatia, Herzegovina, etc., where it forms part of the underwood of pine forests, and generally affects dry situations. Introduced to Kew in 1893, it has proved a delightful plant. It may be used for furnishing shelves in the rock garden, and it provides a pleasing undergrowth for groups of thinly planted taller shrubs, provided the shade is not too dense. At flowering time the tufts are entirely hidden by the closely packed, golden yellow racemes. The flowering shoots die back considerably during winter, springing up from the base in spring. Propagation is best effected by means of cuttings placed under a bell-glass in an unheated frame in August.

G. GERMANICA, *Linnaeus*.

A deciduous shrub about 2 ft. high, with spiny, hairy shoots; spines mostly branched, $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Leaves ovate-lanceolate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide, hairy especially about the margins, dark green. Racemes 1 to 2 ins. long, terminating leafy, spineless shoots. Flowers yellow, $\frac{1}{2}$ to $\frac{1}{2}$ in. long; standard petal reflexed. Pod $\frac{1}{2}$ in. long, hairy. Blossoms in June.

Native of Central and W. Europe, where it is widely distributed. Its nearest ally is *G. anglica*, but it is well distinguished by its hairy shoots and leaves and sturdier habit. It is apt to grow rank, and become rather ragged in rich garden soil; a sunny, rather dry position suits it best.

G. GLABRESCENS, *Briquet*.

(Bot. Mag., t. 8201; *Cytisus glabrescens*, *Sartorelli*.)

A low, deciduous shrub of dense habit, up to 3 ft. high, with angled branchlets. Leaves trifoliolate, with leaf-stalks $\frac{1}{2}$ to 1 in. long; leaflets stalkless or nearly so, obovate or oblong, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, clothed with silky hairs beneath. Flowers produced from the joints of the previous year's shoots, one to four, or occasionally more, at each joint; yellow. Each flower is about $\frac{1}{2}$ in. long, on a hairy stalk of equal length. Pods 1 to 1½ ins. long, $\frac{1}{4}$ in. wide, smooth.



GENISTA GLABRESCENS.

Native of Central Europe, on the Lepontine Alps at considerable altitudes. This delightful shrub, which forms a neat, compact mass of branches, was introduced to Kew in 1896, and the original plant is still under 2 ft. high. It flowers in May, when the plant is almost hidden by blossom. It is worth a place in the rock garden, or wherever dainty plants can be accommodated without danger of being smothered by stronger-growing neighbours. It has usually been grown under the name of *Cytisus glabrescens*, but Mr John Briquet, a close student of this group, puts it in this genus.

G. HISPANICA, *Linnaeus*.
SPANISH GORSE.

(Bot. Mag., t. 8528.)

A deciduous shrub, usually from 1 to 1½ ft. (sometimes 2 ft.) high, forming dense, cushion-like masses; branches interlacing, spiny and hairy, the spines much branched, $\frac{2}{3}$ to 1 in. long, each subdivision needle-pointed. Leaves confined to the flowering twigs, linear-lanceolate, about $\frac{1}{2}$ in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; hairy beneath. Flowers as many as twelve in a rounded head or cluster 1 in. or so across, terminating short, erect, leafy, hairy shoots; each flower is $\frac{1}{2}$ in. long, rich golden yellow. Pod flattish oval, carrying one to four seeds.

Native of S.W. Europe; introduced in 1759. It flowers in the latter half of May and in June, and produces at that time a more gorgeous display of golden yellow blossom than any other dwarf shrub. Healthy plants are completely covered with bloom, and when they have been planted to cover a breadth of 10 ft. or so, produce a most brilliant colour effect. On shelves or small plateaux of the rock garden single plants are very charming. Although its leaves are deciduous, this shrub gives an evergreen effect

through the deep green of its crowded twigs and spines. As with others of the spiny group of Genistas, it is not advisable to give it rich or manured soil, otherwise it is apt to grow rank and soft, and during winter the younger parts are apt to die in patches and spoil the next crop of flowers. A soil of moderate quality, and especially a well-drained, sunny position, suits it best. It can be propagated by seeds and by August cuttings. One of the most indispensable shrubs in the south of England.

G. HORRIDA,
De Candolle.

A dwarf, flat-topped, very spiny shrub of close, tufted habit; stems grooved, opposite, rigid, ending in a sharp spine, and more or less clothed with short silky hairs. Leaves opposite, minute, trifoliate, composed of three linear leaflets $\frac{1}{4}$ in. or so long, covered with silky hairs. Flowers $\frac{1}{4}$ in. long, produced in small terminal heads, three to eight together, standing just clear of the branches; yellow. Calyx, flower-stalk, and pod hairy.

Native of S. W. Europe; introduced in 1821. Although hardy enough, it does not always flower freely, and is not much grown. Our climate apparently is not sunny enough to develop its full beauty. On the mountains of Central Spain, at elevations of 3000 to 5000 ft., it is crowded with its short heads of yellow blossom every July. It is one of the interesting group of Genistas with opposite leaves and branches, and does not appear likely to become more than $1\frac{1}{2}$ to $2\frac{1}{2}$ ft. high. The whole plant has a silvery grey hue, and forms a dense, cushion-like mass.



GENISTA HISPANICA.

G. MONOSPERMA, *Lamarck.*

(*Retama monosperma*, *Boissier.*)

A straggling, unarmed shrub, 2 to 4 ft. high in this country, but more than twice as high in its native state: branches very slender, pendent, and rush-

like, grooved, covered with short, silky hairs when young. Leaves few and inconspicuous, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, linear. Racemes short, silky, distributed along the branches; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, carrying from five to fifteen blossoms. Flowers milky white and delightfully fragrant, $\frac{1}{2}$ in. long; the petals covered with silky hairs, the calyx dark, and contrasting with the petals. Pod oval, $\frac{1}{2}$ in. long, containing mostly one (but sometimes two) black-brown seeds.

Native of S. Europe and N. Africa; introduced, according to Aiton, in 1690, but always very rare because of its tenderness. In the Scilly Isles it thrives admirably, but near London it needs the protection of a sunny, sheltered wall, such as that outside a hothouse. The soil must be lightish and well drained. In its native country the thin flexible branches are used for tying—in the same way as willows are here.

G. NYSSANA, *Petrovic*. NISSA BROOM.

A deciduous, erect shrub of sparse habit, thickly covered with soft hairs in all its parts—branches, leaves, flowers, and pods. Branches leafy, but little forked, slender, erect, slightly furrowed. Leaves trifoliolate; leaflets linear, pointed, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ in. or less wide, margins slightly decurved. Flowers yellow, $\frac{1}{2}$ in. long, in slender terminal racemes 4 to 6 ins. long, each flower produced in the axil of a trifoliolate, leaflike bract, which becomes smaller towards the apex of the inflorescence. The growth of the year, including branch and raceme, will measure from 12 to 18 ins. in length. Pod short, thick, ovate, pointed, carrying one or two seeds.

Native of Servia, Albania, Macedonia, etc.; introduced to Kew in 1899. It has proved quite hardy, and is most distinct in its dense covering of short soft hairs. The specific name refers to Nissa in Servia, one of its habitats.

G. OVATA, *Waldstein*.

(*G. tinctoria* var. *ovata*, *Schultze*.)

A deciduous shrub, 2 to 4 ft. high, with erect, slightly grooved, shaggy young shoots. Leaves ovate or narrow oblong, the largest $1\frac{1}{2}$ ins. long and 1 in. wide, hairy at the margins and beneath. Flowers borne in short, dense racemes $1\frac{1}{2}$ to 2 ins. long; yellow, each flower $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Pod hairy.

Native of Central and S. Europe. Usually regarded as a species, this is closely allied to *G. tinctoria*, differing chiefly in its much broader leaves, and its conspicuously hairy stems, pods, etc. The true plant is rarely seen, the one commonly grown under the name being one of the numerous forms of *G. tinctoria* var. *elatior*.

G. PILOSA, *Linnaeus*.

A deciduous shrub growing 1 to $1\frac{1}{2}$ ft. high, procumbent when young, afterwards forming a low, tangled mass of slender, twiggy shoots. Leaves distributed along the branchlets of the year, but gathered in clusters on the year-old shoots; they are simple, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, narrowly obovate, the margins folded upwards, and the lower surface covered with closely pressed, silvery hairs. Flowers bright yellow, produced singly or in pairs (but each on its own short stalk) from the leaf-axils, the whole forming a crowded raceme 2 to 6 ins. long. When in blossom the whole plant becomes a mass of bright yellow. Pods $\frac{3}{4}$ to 1 in. long, narrow, silky on the surface, two- to six-seeded.

This pretty broom is spread widely over the southern half of Europe, and is also a native of gravelly heaths, etc., in the south and south-west of Britain. It is valuable for forming a dense covering for the ground, even for plots planted with groups of taller shrubs or trees, provided of course it is not

unduly shaded. It is also useful for the rock garden, and for covering dry, sunny banks.

G. RADIATA, *Scopoli*.

(*Cytisus radiatus*, *Koch*; *Enantiosparton radiatum*, *Koch*.)

A rounded, bushy shrub, 3 ft. high, with deciduous leaves, but evergreen from the colour of the shoots. Branches opposite, distinctly grooved, slender, occasionally spine-tipped, very distinctly jointed. Leaves opposite, trifoliate, stalkless, consisting of three narrowly linear leaflets $\frac{1}{4}$ to $\frac{1}{2}$ in. long, silky. The flowers are in a terminal head of about six blossoms and about 1 in. across; each flower is $\frac{1}{2}$ in. long, deep yellow; petals and calyx silky. Pods silky, ovate, tapering at the end to a sharp curved point, usually one-seeded.

Native of Central and S. Europe; introduced from Italy in 1758. This interesting and distinct shrub, peculiar for its thicket of slender branchlets, mostly thinner than a knitting needle, is not very common, but sometimes makes a good display of bloom in June. It is of interest botanically in being one of the few *Genistas* with opposite branches and leaves. In general appearance it bears some resemblance to the shrubby horsetails (*Ephedra*).

G. SAGITTALIS, *Linnaeus*.

A prostrate shrub, under 1 ft. in height, and evergreen from the character of its green, foliaceous, winged branches. Stems with a slender, woody core, but edged on each side with a membranous wing, sometimes continuous up the stem, sometimes interrupted at the joints, the stem thus becoming flat and nearly $\frac{1}{4}$ in. wide. Leaves few and scattered, oval or ovate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, hairy. Raceme erect, terminal, cylindrical, 1 to 1½ ins. long, hairy. Flowers closely packed, each $\frac{1}{2}$ in. long, yellow, the petals expanding but little; calyx hairy. Pods $\frac{3}{4}$ in. long, silky, four- to six-seeded. Blossoms in June.

Native of Central and S.E. Europe, frequently inhabiting upland pastures. It is very hardy, and thrives well in gardens, where it attracts notice for its pretty flowers and unusual stems. It may be used as an edging for borders, or grown in patches in the front of shrubberies.

G. TINCTORIA, *Linnaeus*. DYER'S GREENWEED.

In its modern acceptation, this name may be taken to cover a group of allied forms put under one variable species. Plants have been received at Kew under perhaps a score of different specific names; they differ in certain characters of more or less importance, but still bear a striking resemblance to each other. It has been found impossible to fix on permanent characters that would clearly differentiate them, and they have, in consequence, been all included under *G. tinctoria*. Many are minor forms of the tall, erect dyer's greenweed (*G. elatior*, *Koch*). Others are distinguished by characters defined below.

G. TINCTORIA (type).—A low, often semi-prostrate shrub with creeping roots, usually only a few inches high in a wild state, but up to 2 ft. under cultivation. Stems more or less grooved, clothed with simple, dark green leaves that are linear-lanceolate, $\frac{1}{2}$ to 1 in. long, hairy on the margins. Racemes erect, terminal, each 1 to 3 ins. long, produced on the shoots of the year from June to September. Owing to the branching of the stems near the top under cultivation, a crowd of racemes is often produced, forming one large panicle. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. long, yellow, without hairs; pod $\frac{1}{2}$ to $\frac{3}{4}$ in. long, smooth, carrying eight to twelve seeds.

This typical form is very common in the British Isles, especially in poor

grassland, and dry gravelly soils. It is also spread over Europe, and reaches Siberia. Under cultivation it is a pretty plant and flowers freely, but is not so attractive as its variety FLORE PLENO, which is also a dwarf, semi-prostrate shrub, but owing to the more numerous petals more brilliant in colour. This is, indeed, one of the best of all dwarf yellow-flowered shrubs. Seeds and cuttings can be employed to increase the typical form, but the double-flowered one, being sterile, can only be propagated by cuttings. In former times this Genista was of some value as the source of a yellow dye.

Although known as "greenweed," the colour derived from it was a bright yellow, and it was only by afterwards dipping the yellow yarn or cloth into a blue solution of woad (*Isatis*) that the green tint was obtained. This was the process by which was obtained the once celebrated "Kendal green," so-called from the town of Kendal in Westmoreland, in the vicinity of which the plant was abundant, and where also the process was first introduced by Flemish emigrants in the reign of Edward III.—*Treasury of Botany*, vol. i., p. 526.

Var. ELATIOR, *Schultze* (G. elatior, *W. D. Koch*).—In its morphological characters this resembles ordinary G. tinctoria, but is an altogether, stronger-growing, bigger shrub. It is of quite erect habit, 3 to 5 ft. high; leaves up to $1\frac{1}{2}$ ins. or more long, and $\frac{1}{4}$ to $\frac{1}{2}$ in. wide. Flowers individually no larger than in the cultivated type, but they are borne in large panicles sometimes 12 to 18 ins. high. Several minor forms, varying in size and shape of leaf, are included under this.

Var. HIRSUTA, *De Candolle*.—Habit approaching the type, but with twigs and leaves hairy.

Var. MANTICA, *Fiori* (G. mantica, *Pollini*).—Of medium height, with downy leaves, stems, and pods; young wood purplish; calyx reddish. This distinct variety flowers earlier than the ordinary tinctoria.

(Var. OVATA, *Schultze*, see G. ovata.)

G. VIRGATA, *De Candolle*. MADEIRA BROOM.

(Bot. Reg., vol. 30, t. 11.)

A deciduous shrub of bushy habit when old, up to 12 ft. high, and as much or more through; young branches grooved. Leaves simple, grey-green, with little or no stalk, about $\frac{1}{2}$ in. long, $\frac{1}{8}$ in. wide; silky beneath, edges slightly decurved. Racemes 1 to 2 ins. long, terminating short shoots of the year, very abundant. Flowers bright yellow, $\frac{1}{2}$ in. long, standard petal roundish, about $\frac{1}{2}$ in. across. Calyx clothed with silky hairs. Pod 1 in. long, very silky, carrying three to five seeds. Flowers in June and July, and intermittently until October.

Native of Madeira, and one of the few shrubs from that island that are really hardy with us. It was brought home from Madeira by Francis Masson in 1777, on his return from the Cape of Good Hope, where he had for five years been collecting plants for Kew. It has naturalised itself in several parts of the Kew woods, and is never injured in the least by frost, but until quite recently it was scarcely known in gardens. Flowering in June and July when shrubs generally are going out of flower, and thriving quite well in semi-shaded positions in thin woodland, it is an exceptionally valuable broom, especially as it will thrive in rough grass which gets no more attention than an annual mowing. It resembles G. cinerea previously described (*g.v.*), and the two probably are geographical forms of one species. (Fig. p. 593.)

GINKGO BILOBA, *Linnaeus*. MAIDENHAIR TREE. TAXACEÆ.

(*Salisburia adiantifolia*, *Smith*.)

A deciduous tree, over 100 ft. high, unisexual, not resinous, usually of somewhat pyramidal habit (the male at least); trunk often branching



MAIDENHAIR TREE, *Ginkgo biloba*.

low, and forming several erect main branches; secondary branches spreading, pendulous at the ends. Branchlets of two kinds: (1) short, stout spurs, which increase very slowly in length and bear the leaves at the tip; (2) long, free-growing shoots with the leaves alternate. Trees in a stunted or unhealthy state produce only the first type of shoot, and will remain practically stationary for many years. Leaves long-stalked, fan-shaped, tapering from the irregularly jagged, often notched apex to the wedge-shaped base; 1 to $2\frac{3}{4}$ ins. deep, about $1\frac{1}{2}$ ins. wide; not downy, yellowish dull green, the veins all running lengthwise, and repeatedly forking as the leaf broadens towards the end; stalk slender, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long. Flowers borne on the short shoots, the males in cylindrical, short-stalked catkins about 1 in. long, consisting of green stamens only; the females on a stalk $1\frac{1}{2}$ to 2 ins. long, ultimately developing a yellowish green plum-like fruit 1 to $1\frac{1}{2}$ ins. long, surrounded by a malodorous, fleshy layer.

The Ginkgo is probably a native of W. China, but it does not appear to have been found indubitably wild. It is certainly not indigenous to Japan, as is often stated, although it was introduced from there to Europe about 1730, and to England

twenty years later. It is undoubtedly one of the most distinct and beautiful of all deciduous trees, the leaves being quite unlike those of any other. The popular name refers to their similarity in shape to the pinnules of the maidenhair fern (*Adiantum*).

Most of the large trees in the British Isles are males, and from 60 to 70 ft. high. I have not seen fruits produced in this country, but it bears them freely in S. Europe, especially in Italy. The female tree is gener-



GENISTA VIRGATA.

ally supposed to be less erect in habit than the male, or to have even pendulous branches. Two fine female trees in the botanic garden at Vienna, which I saw in 1908, have that character. Whilst the fleshy part of the fruit has a rancid, evil odour, the kernel of the nut is well flavoured, and esteemed by the Japanese. The Ginkgo is best raised from seed, and it requires a deep good soil; when young it is often extremely slow of growth, and although very hardy, is no doubt better suited in climates with a hotter summer than ours. Good seeds are now produced by S. European trees, and offer the best means of propagation.

This tree is the only species of its genus, and stands well apart from all the rest of the Coniferæ. It has usually been regarded as a very distinct member of the Yew family (Taxaceæ), but recent investigators place it in a separate natural order (Ginkgoaceæ). It is well represented in a fossil state, and is the last representative of a race of trees that in earlier stages of the world's history filled an important place in its vegetation.

GLEDITSCHIA. HONEY LOCUST. LEGUMINOSÆ.

(Sometimes spelt Gleditsia.)

A small group of pod-bearing, deciduous trees named in honour of Gottlieb Gleditsch, a German professor of botany, who flourished in the eighteenth century, and was a friend of Linnæus. They are natives of Eastern N. America, China, Japan, and Persia. The leaves are beautifully subdivided into numerous leaflets, pinnately or bipinnately arranged, and the trunks and branches of most species are more or less formidably armed with simple or branched spines. These characters of leaf and stem combined distinguish Gleditschia as a genus from all other hardy trees. No Gleditschia has any beauty of blossom, the flowers being small, green, and borne in racemes a few inches long. They are sometimes perfect, sometimes unisexual, and differ from most of the Leguminosæ we are familiar with in the open air in the petals being uniform, and with no resemblance to the pea-shaped blossom so characteristic of the family. The seeds are produced in pods, varying in length from 1 to 2 ins. (in *G. aquatica*) to 18 ins. long (in *G. triacanthos*). In all except *G. aquatica* and *G. texana* the pods contain pulp and numerous seeds, which, however, they do not release, as most of the family do, by splitting. They often become spirally twisted before falling. The species best worth growing are *G. triacanthos* and *G. caspica*, both striking and ornamental-foliaged trees, very interesting on account of their huge spines.

Gleditschias should be raised from seed. They are rather tender in a young state, owing to the habit of growing late in the season, so that the succulent tips are cut back in winter. After a few years the hardier species lose this defect. They like a good loamy soil and a sunny position, thriving better in the south of England, where the summers are hotter, than in the north; still better in France and Italy. Besides

the species to which notice is given below, the two following are in cultivation.

G. DELAVAYI, Franchet.—Introduced by Wilson from Yunnan, China, in 1900, this appears to be more tender, at least when young, than any other species in cultivation. It is well distinguished even in a young state by its downy shoots, all the others being smooth. In the young state the leaflets are small, and as many as three dozen to a simply pinnate leaf, but in adult trees they become much reduced in number. Pods up to 20 ins. long.

G. TEXANA, Sargent.—Found only in a single grove on the Bottom Lands of the Brazos River in Texas. Sargent sent seeds to Kew in 1900, from which plants were raised that grow luxuriantly during the summer, but are usually badly cut in winter. In foliage it is like *G. triacanthos*, but the pods are only 4 to 5 ins. long, 1 in. wide, and without pulp. The young plants at Kew have slender, branched spines.

G. AQUATICA, Marshall. WATER LOCUST.

(*G. inermis, Miller*; *G. monosperma, Walter.*)

A tree described by Sargent as 50 to 60 ft. high, with a trunk 2 to 2½ ft. in diameter, but in this country inclined to be shrubby, and to form several stems; spines ultimately about 4 ins. long, branched; young shoots not downy, but marked with conspicuous lenticels. Leaves up to 8 ins. long, simply or doubly pinnate; leaflets of the pinnate leaf (or of each division of the bipinnate ones) twelve to twenty-four. Each leaflet is lanceolate-oblong; 1 to 1½ ins. long, ¼ to ½ in. wide; rounded, bluntish, or somewhat pointed at the apex; margins wavy; glossy and smooth except for the down on the short stalk of the leaflet, on the upper side of the main-stalk, and scattered hairs on the margins of the leaflets. Flowers borne on slender racemes 3 or 4 ins. long. Pod obliquely diamond-shaped, 1½ ins. long, nearly 1 in. wide, not pulpy inside; seeds solitary (rarely two).

Native of the south-eastern United States; introduced in 1723, according to Aiton, but now extremely rare. It is hardy at Kew, but grows slowly. Its small, one-seeded pod well distinguishes it, but I do not know that this has been borne in cultivation here.

G. CASPICA, Desfontaines. CASPIAN LOCUST.

A tree 30 to 40 ft. high, its trunk excessively armed with formidable, branching, slightly flattened spines, 6 ins. or more long; young shoots smooth. Leaves 6 to 10 ins. long, simply or doubly pinnate. Leaflets up to twenty on the pinnate leaves, or on each division of the doubly pinnate ones; ovate to oval, 1 to 2 ins. long, ⅔ to ¾ in. wide; rounded and with a minute bristle-like tip at the apex, very shallowly round-toothed. The midribs and main leaf-stalk on the upper side, as well as the very short stalk of the leaflet, are downy; the leaf otherwise is smooth and shining green. Flowers green, almost stalkless, densely arranged on downy racemes 2 to 4 ins. long. Fruit scimitar-shaped, usually about 8 ins. long, 1 to 1½ ins. wide.

Native of N. Persia, in the neighbourhood of the Caspian Sea; introduced, according to Loudon, in 1822. It is a sturdy tree with much larger leaflets than *G. triacanthos*, and is remarkable for the size and number of spines on the trunk, which is, indeed, the most formidably armed among cultivated trees. The species is well worth growing on that account. The leaflets are

not so large in this country as on trees grown on the Continent. At Vienna I have seen them as much as $2\frac{1}{2}$ ins. long, by over 1 in. wide. It is much confused with, and usually grown as *G. sinensis*, a confusion which apparently existed in Loudon's time. According to Henry the true *G. SINENSIS*, *Lamarck*, is not in cultivation in this country. It is distinguished from *G. caspica* by never apparently having more than fourteen leaflets to each simply pinnate leaf. It is found on the mountains near Pekin, as a tree 40 ft. high. Cultivated on the Continent in Paris, Montpellier, Florence, etc.

Closely allied to *G. sinensis* is *G. MACRANTHA*, *Desfontaines*. It does not appear to be in cultivation in England. In the Jardin des Plantes at Paris, its largest leaflets are 3 ins. long by $1\frac{1}{2}$ ins. wide, usually, however, much smaller. As in *G. sinensis*, the leaves of adult trees rarely carry more than twelve leaflets.

G. JAPONICA, *Miquel*. JAPANESE LOCUST.

A tree 60 to 70 ft. high, the trunk and branches very formidably armed with branched spines; young shoots on plants at Kew dark purplish brown, smooth and shining. Leaves simply or doubly pinnate, 8 to 12 ins. long, each leaf or leaf-section carrying fourteen to twenty-four leaflets. Leaflets ovate to lanceolate, often unequal at each side the midrib, blunt to pointed at the apex, margins entire; main-stalk, midrib, and stalk of leaflets downy. In Japanese fruit-bearing specimens the leaflets are $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, but in small cultivated trees they are only $\frac{1}{3}$ to $\frac{5}{8}$ in. long. Pod 8 to 10 ins. long, 1 to $1\frac{1}{2}$ ins. wide; scimitar-shaped, ultimately twisted.

Native of Japan; introduced to Kew in 1894, where young trees raised from seed supplied by Boehmer are quite hardy, although slow-growing. In their present state (12 ft. high), the small leaflets give them a very different aspect to native specimens, but they are unsurpassed among hardy trees in their fern-like elegance. The species appears to be allied to *G. caspica*, under which by one authority it has been placed. The pulp in the pods, as in *G. sinensis*, is saponaceous, and is used by the Japanese for washing cloth.

G. TRIACANTHOS, *Linnaeus*. HONEY LOCUST.

A tree reaching in a wild state 140 ft. in height, with a trunk up to 5 or 6 ft. in diameter, both it and the branches more or less armed with stout, sharp spines 3 to 12 ins. long, and branched. Young shoots slightly downy at the base only; spines when present on them simple or three-forked. Leaves 4 to 8 ins. long, either simply or doubly pinnate, the latter confined to vigorous leading shoots; the leaves of the short, flowering twigs are invariably simply pinnate. Leaflets on each pinnate leaf (or section of bipinnate one) fourteen to thirty-two; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide; oblong-lanceolate, mostly rounded at the apex, wavy or shallowly toothed at the margin, glossy dark green; both surfaces at first downy. Male flowers green, crowded on downy, often clustered racemes about 2 ins. long; female racemes few-flowered. Fruit more or less scimitar-shaped, 1 to $1\frac{1}{2}$ ft. long, 1 to $1\frac{1}{2}$ ins. wide, dark shining brown.

Native of Central N. America; introduced in 1700. The honey locust is the best of the genus in this country, and deserves to be more commonly planted than it is, not only for its interest, but for the beautiful fern-like foliage, which turns a clear bright yellow in autumn. The spines are not so formidably developed in this country as on the Continent, nor do they develop in woods or shady spots like they do in places fully exposed. It only occasionally bears fruit with us, never with the freedom and regularity seen in more sunny climates like the south of France. A tree well-laden

with dry pods rattling at every fitful movement of the air, makes rather a weird sound in the dusk. Perhaps the finest tree in the country is at Kew, now 60 ft. high and 5 ft. 10 ins. in girth of trunk. The popular name refers to the likeness of the tree in foliage to the locust (*Robinia*), and to the thick, succulent, sweetish pulp in which the seeds are set.

Var. *BUJOTII*, *Rehder*.—A very elegant, pendulous tree; branches and branchlets very slender; leaflets narrower than in the type, often mottled with white. There is a fine tree of this variety at the entrance to the park at Segrez in France.

Var. *INERMIS*.—Some trees appear never to bear thorns, and have been distinguished by this name; but unarmed plants are said to occur among batches of seedlings raised from thorn-bearing trees.

Var. *NANA*.—A dwarf, sturdy bush or small tree; leaflets comparatively short and broad.

GORDONIA PUBESCENS, *L'Héritier*. TERNSTROMIACEÆ.

(*Gordonia Altamaha*, *Sargent*; *Franklinia Altamaha*, *Marshall*.)

A deciduous tree, 15 to 20 ft. high; branchlets covered with a close down. Leaves alternate, obovate-oblong, 4 to 6 ins. long, $1\frac{1}{2}$ to 2 ins. wide; tapering gradually at the base to a short stalk, toothed towards the apex; dark shining green above, paler, and covered with a close down beneath. Flowers 2 to 3 ins. or more across, white, on stout, very short stalks, produced singly from the leaf-axils near the end of the shoots; sepals roundish, $\frac{1}{2}$ in. across, downy on the outside; petals obovate, round-toothed at the end, downy on the outside. Fruit globular.

Originally found in 1770 by John Bartram, on the banks of the Altamaha River, in Georgia, U.S.A., and introduced to England four years later, this rare and beautiful tree has not, according to Sargent, been seen in a wild state since 1790, and is now only known as a cultivated plant. It appears to be too tender to thrive anywhere except in our mildest counties. It has on more than one occasion been tried at Kew out-of-doors, but has only survived a few years. It is well worth trying where the conditions are more favourable, both for the beauty of its flowers during late summer and for the fine scarlet of its dying foliage. The soil and conditions that suit the Himalayan *Rhododendrons* ought to suit it.

G. LASIANTHUS, *Ellis*, the Loblolly bay, is an allied species of great beauty also, but even more tender than the above. It is an evergreen tree sometimes 70 ft. high, with white flowers $2\frac{1}{2}$ to 3 ins. across, on stalks about as much long. Found in moist situations in the south-eastern United States (Georgia, Florida, etc.). It should be grown as advised for *G. pubescens*, but with even more regard to shelter and warmth. At Kew it is grown in a cold house.

The generic name commemorates Alexander Gordon, a nurseryman at Mile End at the time of its introduction.

GRABOWSKIA BOERHAAVIFOLIA, *Schlechtendal*. SOLANACEÆ.

(*Bot. Reg.*, t. 1985; *Lycium boerhaavifolia*, *Linnaeus*.)

A deciduous shrub, 6 to 10 ft. high, of loose, spreading habit; young branches smooth, armed with sharp spines which are $\frac{1}{4}$ in. long the first

year, but grow longer. Leaves alternate, grey, fleshy; roundish, widely ovate or obovate; 1 to $1\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; wavy at the margin, tapering at the base, smooth; stalk $\frac{1}{4}$ in. or less long. Flowers $\frac{2}{5}$ in. long and wide, produced in May, sometimes singly on a short stalk in the leaf-axils, sometimes in terminal or axillary racemes 1 in. long; corolla pale blue, tubular at the base, spreading to five reflexed lobes; calyx $\frac{1}{8}$ in. long, bell-shaped, with five angular teeth.

Native of Brazil and Peru; introduced in 1780, but rarely seen. Near London it requires the protection of a south wall. The foliage resembles that of *Atriplex Halimus*, and the flowers are like those of *Lycium chinense*. It has been associated with the *Lyciums*, but differs in the fruit, which we rarely or never see. Named in honour of Dr Grabowski, a Silesian botanist of the eighteenth century. It has little more than botanical interest.

GREVILLEA. PROTEACEÆ.

The two species described below are the hardiest members of the remarkable order of plants to which they belong, and which, in a wild state, is confined to the southern hemisphere. In *Grevillea*, the flowers have no petals, the calyx is more or less deeply four-divided, bearing the anthers at the concave apex of each division. Both the species are somewhat tender. Propagated by half-ripened shoots taken about July, and placed in a frame with a little bottom heat. They enjoy a proportion of peat in the soil.

G. ROSMARINIFOLIA, *A. Cunningham*.

(Bot. Mag., t. 5971.)

An evergreen shrub of loose, graceful habit, 6 or 7 ft. high, with slender, downy branches. Leaves alternate, closely set on the branches, very like those of rosemary; 1 to 2 ins. long, averaging $\frac{1}{2}$ in. wide; stalkless, pointed, dark grey-green and rough above, covered beneath with closely pressed silvery hairs. Flowers deep rosy red, densely arranged in terminal racemes, each flower 1 in. or less long, on a smooth stalk $\frac{1}{4}$ in. long. Calyx silky inside, scarcely $\frac{1}{2}$ in. long, with hooked divisions, two long and two short, in the apex of each of which is enclosed an anther; styles about $\frac{3}{4}$ in. long, red.

Native of N.S. Wales; discovered by Allan Cunningham in 1822. Near London this shrub will only survive mild winters, but it succeeds and flowers well in the Grayswood Hill garden, Haslemere. In Cornwall it is quite at home, and makes fine bushes 6 or 7 ft. high, and as much or more through.

G. SULPHUREA, *A. Cunningham*.

(*G. juniperina* var. *sulphurea*, *Benth.*)

An evergreen bush of sturdy habit, probably 6 ft. high ultimately; young shoots very downy. Leaves linear or needle-like; $\frac{1}{2}$ to 1 in. long, $\frac{1}{16}$ to $\frac{1}{12}$ in. wide, made narrower by the curling back of the margins; prickly pointed, pale beneath, smooth except for a few appressed hairs beneath when young; produced in alternate, closely set tufts. Flowers pale yellow, produced during May and

June at the end of short lateral twigs in a short raceme (almost an umbel) of a dozen or more blossoms. The calyx is a slender tube $\frac{1}{2}$ in. long, covered with silky hairs, and slit deeply on one side; the inch-long style protrudes through the slit, and the concave, dilated ends of the four divisions of the calyx are curled back, each enclosing a stalkless anther. Seed-vessel a dry, spindle-shaped pod $\frac{1}{2}$ in. long, with the erect style still attached at the end.



GREVILLEA SULPHUREA.

Native of N.S. Wales. This interesting and pretty shrub is the hardiest of Grevilleas, but is not really hardy except against a warm, sheltered wall in the London district. It is admirably adapted for Cornwall and other mild counties, and I have seen it growing and flowering well at Haslemere.

GREWIA PARVIFLORA, *Bunge*. TILIACEÆ.

A deciduous shrub, 6 to 8 ft. high, with the young shoots and leaves furnished with starlike down. Leaves alternate, ovate, or sometimes three-lobed; rounded, slightly heart-shaped, or tapered at the base, pointed at the apex, 2 to 5 ins. long, half to two-thirds as wide; rough to the touch above, downy beneath. Flowers creamy yellow, with numerous yellow stamens; about $\frac{1}{2}$ in. across; produced during July and August, in small axillary umbels of about six flowers on the shoots of the year.

Native of China and Corea; introduced in 1888. It is of little value in gardens, and not very hardy with us, probably needing a hotter summer than ours. The finest specimen I have seen in Europe is in the collection of Mr de Vilmorin, at Les Barres in France. When I saw it, it was 7 ft. high and 10 ft. through, flowering freely in July. It flowers a month later in England.

The genus was named by Linnæus in honour of Dr Nathaniel Grew, who wrote works on the anatomy of plants, and died in London in 1712. It is allied to the limes, but is confined to Asia and Africa, containing numerous species. The inner bark has the tough fibrous nature characteristic of the family.

Another species, *G. OPPOSITIFOLIA*, *Roxburgh*, is sometimes seen in cultivation. It is from the North-West Himalaya, and is not so hardy as the above. It is very distinct from it, in bearing the flowers in a short inflorescence on the opposite side of the shoot to that where the leaf-stalk is attached. Flowers yellowish; fruit black.

GRISELINIA. CORNACEÆ.

A small genus of trees and shrubs, native of New Zealand and Chile. Two species are found in the former country, both of which are cultivated out-of-doors in the milder parts of the British Isles. They are somewhat tender, especially *G. lucida*, but where they thrive make handsome evergreens. Male and female flowers are produced on different plants; they are quite small, dull coloured, and of no ornament. The attractions of both species are in their shapely habit and shining foliage.

G. LITTORALIS, *Raoul*.

A large evergreen shrub or small tree, of rounded habit, at present up to 10 or 25 ft. high in Britain, but twice as high in a wild state. Leaves leathery, oval or ovate, 1 to 3 ins. long, half to two-thirds as wide, of a shining yellowish green, smooth, the apex blunt, the base unequal-sided; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers yellowish green, small, produced during May in axillary racemes or panicles 1 to 2 ins. long. The female plant produces panicles of green oblong fruits, $\frac{1}{4}$ in. long.

Native of New Zealand up to 3500 ft. altitude; cultivated in Kew since the middle of last century, but only hardy there in mild winters. All the plants outside were killed in the winter of 1908-9. In milder and especially

maritime localities this shrub makes an excellent evergreen, and has been strongly recommended for forming hedges. It is rarely seen in fruit in this country, owing probably to the male plant being more propagated than the female. But in the garden of Mr Charles Hamilton at Hamwood, Co. Meath, where a tree of each sex is grown, the female bears abundant crops of berries containing fertile seeds which spring up about the grounds. It strikes very readily from cuttings of half-ripened wood placed in gentle heat, or of somewhat harder wood under handlights. There is a tree over 20 ft. high at Kilmacurragh, Co. Wicklow.

G. LUCIDA, Forster.

A robust evergreen shrub or small tree, up to 8 or 10 ft. high in Britain. Leaves leathery, thick, glossy, rather pale green, oblong or broadly ovate, 4 to 7 ins. long, 2 to 3½ ins. wide; smooth on both sides, markedly unequal at the base, stalk 1 to 1½ ins. long. Flowers small, green, in axillary panicles; female ones without petals. Fruit ½ in. long, purple.

Native of New Zealand, and only hardy in Cornwall and similar localities. At Kew it will not survive permanently even against a wall. It is, therefore, not so useful a shrub as *G. littoralis*, although from the larger size of its leaves it is a more striking one. Propagated by grafting on *littoralis*.

Var. *MACROPHYLLA, Hooker fil.* (*G. macrophylla* of gardens), is a larger leaved, more robust form.

GYMNOCLADUS. LEGUMINOSÆ.

A genus consisting of two deciduous, pod-bearing trees, one native of N. America, the other of China, and most nearly related among hardy trees to *Gleditschia*. They have doubly pinnate leaves, flowers in racemes or panicles, and large thick pods; the flowers are regular, being composed of five equal-sized petals, and a tubular, five-lobed calyx, with no indication of the pea-flower shape so common in this family. The American species is perfectly hardy in the south of England, but grows extremely slowly, and rarely flowers. It likes a rich loamy soil. The Chinese tree, *G. CHINENSIS, Baillon*, is 40 ft. high, with leaves 1 to 3 ft. long, each of the pinnæ consisting of twenty to twenty-four oblong leaflets, ¾ to 1½ ins. long, silky beneath. Flowers both perfect and unisexual, borne on the same tree, in downy racemes. Pod 4 ins. long, 1½ ins. wide. Native of China, and said by Henry to be rather rare. Introduced to Kew in 1888, but not hardy there, and only likely to succeed in the mildest parts of the kingdom.

In both species propagation must be effected by means of imported seeds.

G. CANADENSIS, Lamarck. KENTUCKY COFFEE.

(*G. dioica, Koch.*)

A deciduous tree up to 110 ft. high, with a trunk 6 to 10 ft. in girth, usually branching low down, and forming a narrow, rounded head. Branchlets downy when young, light grey, marked by numerous small scars. Leaves up to 3 ft. long and 2 ft. wide; bipinnate, the two lowest pairs of pinnæ being simple leaflets, but the upper ones composed of four to seven pairs of leaflets. The leaflets are ovate, 1½ to 2½ ins. long (the two lowest pairs considerably larger);

grey-green and hairy beneath, principally on the veins and midrib. The tree is diœcious, the panicles of the female tree being 8 to 12 ins. long, 3 to 4 ins. wide, narrowly pyramidal; flowers downy, $\frac{3}{4}$ to 1 in. long; petals greenish white, calyx not quite so long as the flower, tubular at the base, with five linear teeth. In the male tree the inflorescence is about one-third the length of the females. Pod 6 to 10 ins. long, $1\frac{1}{2}$ to 2 ins. wide.

Native of the eastern and Central United States; cultivated in England before the middle of the eighteenth century. In its foliage it is perhaps the most beautiful of all hardy trees. It evidently needs more summer heat than it gets here, for there are fine specimens both in France and Germany suggesting in their leafless state the habit and branching of the horse chestnut. In autumn a curious effect is produced by the leaflets falling off and leaving the common stalk on the branches for some time. In winter, young trees have a very distinct and rather gaunt appearance, the branches being few, thick, and rough. The finest tree in England appears to be at Claremont, which is 60 ft. high and 7 ft. in girth of trunk, and flowers frequently. The common name is said to have originated through the people of Kentucky and Tennessee at one time roasting and grinding the seeds to make a beverage like coffee.

Var. VARIEGATA.—Leaves slightly marked with white spots; apparently of little value in this country.

HALESIA. SNOWDROP TREES. STYRACEÆ.

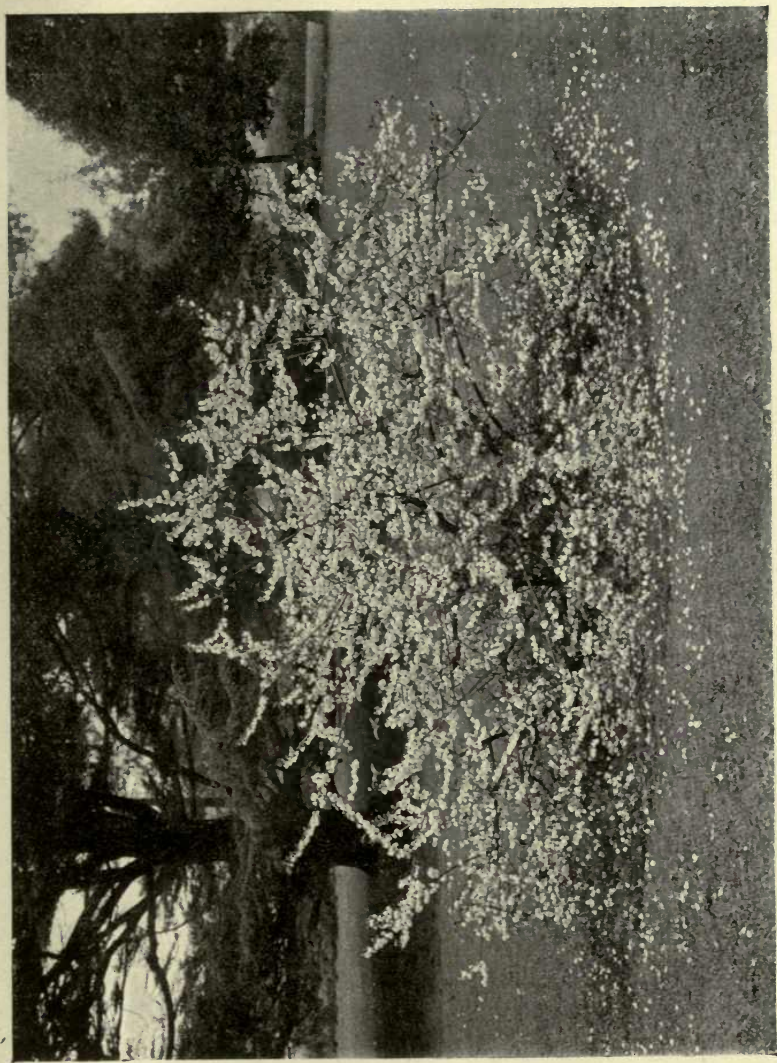
In British gardens the snowdrop trees are almost exclusively represented by the beautiful *H. carolina*; but a second species, *H. diptera*, is sometimes seen; whilst a third, *H. parviflora*, *Michaux*, a native of S. Georgia and Florida, is not known in cultivation, and but little in a wild state. The leading characteristics of the genus are the pendulous snowdrop-like flowers, produced in clusters on the previous year's wood, and the winged fruits. Leaves alternate, deciduous, the down with which they and other young parts are more or less furnished being stellate. The genus was named in honour of Dr Stephen Hales, a learned author, who was born at Bekebourne, in Kent, in 1671, and died at Teddington in 1761. The Halesias like a moist, well-drained, loamy soil, and thrive best in a sheltered, sunny position. Propagation is by seeds and layers. All three species are native of the south-eastern United States.

Pterostyrax (*g.v.*) is a small group of North Asiatic trees and shrubs, sometimes united with *Halesia*, but very well marked by differences pointed out in the notes on the genus. From the also nearly allied *Styrax*, *Halesia* differs in the winged fruits and inferior ovary.

H. CAROLINA, *Linnaeus*. SNOWDROP or SILVER-BELL TREE.

(*H. tetraptera*, *Ellis*.)

A deciduous tree, 20 to 30 ft. high in this country; said to be occasionally twice as high in its native places, with a trunk 3 ft. in thickness. With us it is of spreading habit, often a shrub; young shoots at first clothed with stellate down. Leaves oval to obovate, wedge-shaped or rounded at the base, abruptly taper-pointed, minutely toothed; 2 to 5 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide, thickly covered beneath with grey stellate down, less so above; stalk $\frac{1}{4}$ to $\frac{3}{8}$ in. long, downy. Flowers produced in May on slender, downy, pendulous stalks $\frac{1}{2}$ to 1 in. long, in clusters of three to five from the joints of the naked, year-old wood.



SNOWDROP TREE, *Halesia carolina*.

[Face p. 002.

Corolla white, bell-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ in. long and wide, shallowly four-lobed. Fruit somewhat pear-shaped, but with four prominent wings running lengthwise and an awl-shaped termination; altogether about $1\frac{1}{2}$ ins. long.

Native of the south-eastern United States; introduced by Mr J. E. Ellis in 1756. It is undoubtedly one of the most beautiful flowering trees introduced to this country from N. America; yet it is by no means abundantly planted.

Var. *GLABRESCENS*, *Perkins* (*H. parviflora*, *Hort.*, not *Michaux*), differs from the type in the oblong oval leaves proportionately narrower (three or four times as long as wide), soon quite smooth beneath. Flowers smaller, fruits more narrowly four-winged; the whole plant less downy.

Var. *MEEHANI*, *Perkins*, was raised from seed in Meehan's nursery, Germantown, Philadelphia. It differs from ordinary *H. carolina* in its smaller, shorter-stalked flowers; the corolla is more cup-shaped; leaves thicker and more coarsely wrinkled.

Var. *STENOCARPA*, *Koch.*—A fine form or hybrid with deeply lobed corolla. Perhaps a hybrid between this species and *H. diptera*.



HALESIA CAROLINA.

H. DIPTERA, *Ellis*.

A deciduous shrub, 8 to 15 ft. high (occasionally a small tree twice as high in a wild state); young branches stellately downy at first. Leaves oval or obovate, 3 to $5\frac{1}{2}$ ins. long, $1\frac{1}{2}$ to 3 ins. wide; minutely and rather distantly toothed, abruptly pointed, wedge-shaped or rounded at the base; downy on both sides on first opening, but soon almost smooth except on the midrib and veins; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers pendulous, produced in May in clusters or short racemes from the joints of the year-old wood; stalks $\frac{1}{2}$ to $\frac{3}{4}$ in. long, slender, downy. Corolla bell-shaped, $\frac{3}{4}$ in. long, deeply four-lobed, white; calyx very downy; stamens hairy. Fruit oblong, $1\frac{1}{2}$ to 2 ins. long, $\frac{3}{4}$ in. wide, with two longitudinal wings $\frac{1}{4}$ to $\frac{3}{8}$ in. wide, ending in a short spike.

Native of the south-eastern United States; introduced in 1758. This is far from being as good a garden shrub as *H. carolina*; it is less hardy and is shy-flowering. It grows well, and is over 12 ft. high at Kew, but never flowers as it does in France, especially south of Paris. Easily distinguished from *H. carolina* by the two-winged fruit, and larger broader leaves.

HALIMODENDRON ARGENTEUM, *De Candolle*. SALT TREE. LEGUMINOSÆ.

A deciduous shrub, naturally 4 to 6 ft. high, with very spiny, spreading, somewhat angular branches, greyish, and covered with a fine down when young. Leaves pinnate, composed usually of two pairs of leaflets, the common stalk ending in a stiff spine, which remains after the fall of the

leaflets. The latter are $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; oblanceolate, stalkless, tapering to the base, and covered with a minute, grey down. Flowers two to four together on racemes 2 ins. long, produced from short leafy spurs on the old wood; each flower $\frac{5}{8}$ in. long, with pale purplish pink petals and a bell-shaped, five-toothed, downy calyx. Pod $\frac{1}{2}$ to 1 in. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, inflated, produced on a stalk protruding beyond the persistent calyx.

Native of Siberia; introduced by Dr Wm. Pitcairn in 1779. Owing to its susceptibility to damp when grown on its own roots (which makes it difficult to raise from seed in this country), this shrub should be grafted on *Caragana arborescens*, to which it is nearly allied. Standards 4 to 5 ft. high should be chosen so as to display the very graceful habit of the plant. In this way it forms a small round-headed tree whose lower branches are pendent. It flowers in June and July, and very freely on well-ripened wood. At such times its elegance of growth, its abundant flowers, and handsome grey foliage render it very attractive.

Var. *PURPUREUM*, *Zabel*, has deeper rosy purple flowers.

HAMAMELIS. WITCH-HAZELS. HAMAMELIDACEÆ.

A remarkable and beautiful genus of small trees and shrubs, consisting of four species, all very hardy in Britain. They are distinguished very readily from all other hardy shrubs by the thin, narrow, yellow petals, sometimes $\frac{3}{4}$ in. long, and only $\frac{1}{16}$ to $\frac{1}{12}$ in. wide. The leaves are alternate, and much resemble those of our native hazel. This resemblance led the early settlers in N. America to use branches of *H. virginiana* as divining-rods—as hazel twigs were (and still are) at home; to its supposed magic property it owes its popular name. The parts of the flower are in four.

The witch-hazels like a good, but not very heavy loam, and are benefited in a young or not well-rooted state if peat and leaf-soil are added. When established this is not necessary. The quaint habit of the species is one of their charms, but without interfering with this it is worth while to train up a leading shoot to obtain height, especially if the plants, as they often do, assume and retain a low, sprawling mode of growth. The Asiatic species graft easily on *H. virginiana*. It is best to establish a quantity of seedlings of the latter in pots, and put on the scions about the beginning of April, they should then be placed in gentle heat. Seeds, it must be remembered, frequently take two years to germinate.

H. JAPONICA, *Siebold*. JAPANESE WITCH-HAZEL.

(Bot. Mag., t. 6659.)

A deciduous, spreading shrub or small tree, often sparsely branched; the quite young twigs furnished with stellate hairs. Leaves oval, ovate or obovate, 2 to $3\frac{1}{2}$ ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide, with wavy margins, base unequal and sometimes slightly heart-shaped; the five to eight pairs of parallel veins run forward at an acute angle from the midrib; lower surface densely covered

when young with down which mostly falls away by autumn; stalk $\frac{1}{4}$ to $\frac{3}{4}$ in. long, downy. Flowers yellow, slightly scented, produced a few together in globose heads during January and February on the then leafless twigs made the previous summer; petals $\frac{3}{8}$ in. long, very narrow, strap-shaped, and much crumpled; bracts reddish, downy outside.

Native of China and Japan. This is one of the most beautiful of winter or early spring-flowering shrubs. It flowers freely, and its thin wrinkled petals make a very pretty picture at the inclement season when they appear, especially if the shrub has a dark background of evergreens. The species is a somewhat variable one, the shrub grown in gardens as *H. japonica* is a flattish, wide-spreading shrub, and the plants called "*arborea*" and "*Zuccariniana*" in gardens are only forms of it.

Var. *ARBOREA* (*H. arborea*, *Masters*) differs from ordinary *japonica* in being of more gaunt, treelike form, and 15 to 20 ft. high, in the deeper yellow of the petals, and in the calyx having a deep claret shade. It perhaps flowers at an earlier date. Introduced from Japan by Siebold in 1862.

Var. *ZUCCARINIANA* is also treelike, but its flowers, instead of being of the golden yellow of *H. arborea*, are of a pale lemon yellow, and the calyx is green. But both are mere seminal variations, and both, to be obtained true, must be propagated by grafting on seedlings of either themselves or *H. virginiana*. Seeds cannot be relied on to come true, those of *arborea* will often produce *H. japonica*; as a large experimenter in the raising of the Japanese witch-hazels has expressed it to me, "you sow seeds and may get anything." The flower-buds of these witch-hazels are already formed on short stalks in the leaf-axils by July, six or perhaps eight months before they expand.



HAMAMELIS MOLLIS.

H. MOLLIS, *Oliver*. CHINESE WITCH-HAZEL.

(Bot. Mag., t. 7884.)

A deciduous shrub or small tree, with stout, zigzag, spreading branches, very downy when young. Leaves roundish or very broadly obovate, shortly and abruptly pointed, heart-shaped, but unequal-sided at the base, 3 to 5 ins. long, three-fourths as broad, widely and shallowly toothed, covered beneath with clustered (stellate) hairs; stalk $\frac{1}{4}$ in. long, stout and downy. Flowers rich golden yellow, very fragrant, produced in stalkless, crowded clusters from December to February on the twigs of the previous summer's growth; petals strap-shaped, about $\frac{3}{8}$ in. long, not wavy as in *japonica*; calyx-lobes rich red-brown, hairy outside, smooth within.

Native of China; first discovered and introduced about 1879, by Maries, from the district of Kiu-kiang, near the Yangtze-kiang River. Afterwards it was found much farther west by Henry and Wilson. This is undoubtedly the finest of all known witch-hazels, both as regards flower and foliage;

and because of the early date at which it flowers (it is often in full bloom on New Year's Day), it has made a very precious addition to the garden flora. It is rather curious that it remained in the Coombe Wood nursery for twenty years, regarded merely as a superior form of japonica. It can be propagated easily by grafting on the Virginian witch-hazel.

H. VERNALIS, *Sargent*.

Professor Sargent has recently (*Trees and Shrubs*, t. 156) figured and described a new species under this name. It is closely allied to *H. virginiana*, but is a native of Missouri, Arkansas, and Louisiana, and resembles the Asiatic species in flowering on the leafless wood from January to March. It differs from *H. virginiana* also in the following respects: the inner surface of the calyx-lobes is red, and it has the habit of spreading by suckers or underground stems. The leaves are of a paler duller green. A plant introduced to Kew in 1910 bore a few flowers in January 1912. It grows naturally on gravelly, often inundated banks of streams, and was collected by Engelmann in Missouri as long ago as 1845. The flowers have a pungent, not very agreeable odour.

H. VIRGINIANA, *Linnaeus*. VIRGINIAN WITCH-HAZEL.

(Bot. Mag., t. 6684.)

A small deciduous tree, 20 or even 30 ft. high in a wild state, often a shrub of bushy habit; with a short thick trunk and crooked, wide-spreading branches; young shoots at first downy. Leaves broadly ovate to obovate, 3 to 5 ins. long, 2 to $3\frac{1}{2}$ ins. wide; unequal at the base, unevenly and coarsely round-toothed, especially on the upper part; smooth or nearly so above, downy with stellate hairs on the midrib and veins beneath; stalk downy, $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Flowers golden yellow, opening in September and continuing until November, produced two to four together in a cluster at the end of a stalk $\frac{1}{4}$ in. long; petals $\frac{1}{2}$ to $\frac{3}{4}$ in. long, narrowly strap-shaped, crumpled; calyx with four short, broadly ovate, hairy lobes, yellowish brown inside.

Native of Eastern N. America from Nova Scotia to the mountains of the Carolinas and Tennessee; introduced in 1736. This interesting shrub or tree, although so long an inhabitant of our gardens, is not very common nowadays, being eclipsed by the newer, winter-flowering, Asiatic species. The effectiveness of this witch-hazel is spoilt by its being in full leaf at flowering time, so that the blossoms, closely tucked to the twigs, have little chance to show themselves, especially as the leaves turn yellow also before falling. The fruits—woody, nutlike bodies $\frac{1}{2}$ in. long, bursting at the top—do not ripen and discharge their seeds until twelve months after the time of flowering. Various popular remedies are made from extracts and decoctions of the bark and leaves.

HEDERA HELIX, *Linnaeus*. COMMON IVY. ARALIACEÆ.

An evergreen climber, with a strong, rather acrid odour when crushed, attaching itself to trees, buildings, etc., by means of rootlike growths from the stem, or, where such support is absent, creeping over the ground; young shoots clothed with minute stellate hairs. Leaves alternate, thick, leathery, very dark glossy green, broadly ovate or somewhat triangular, those of the climbing shoots with three or five deep or shallow lobes and stalks of varying length. The starry hairs in typical

H. Helix have five to eight "rays." The ivy never flowers on the creeping or climbing shoots, but produces bushy branches, mostly when it has reached the top of its support ; these have no aerial roots, and their leaves are never lobed, but are wavy in outline or entire at the margin, and more narrowly ovate. Flowers produced in October, in a terminal cluster of globose umbels, yellowish green. Berries dull inky black, globose, about $\frac{1}{4}$ in. across, containing two to five seeds.

Native of Europe, found almost everywhere in Britain, especially in shady spots, its natural habitat being the forest, where it can climb trees. The ivy, however, is very adaptable, and can be grown in almost any situation. No introduced evergreen climber can rival it for covering old trees, buildings, etc. Many think that serious damage is done to trees by allowing ivy to climb over them, but this, in my belief, only occurs when the ivy has reached the leafy shoots ; so long as the ivy is confined to the trunk and larger branches no harm, I think, is done. At any rate, I know trees in perfect health which have supported ivy for forty years. An ivy-laden tree is one of the most beautiful objects of the winter landscape. On buildings ivy is rather beneficial than otherwise, keeping them dry and warm.

Ivy is propagated with the greatest ease by means of cuttings which may be given gentle heat if it is desirable to get them to root quickly, or dibbled thickly under handlights or even in the open air. The more delicate highly coloured varieties are sometimes grafted on the common ivy, but need constant watching to prevent the stock over-running the scion. One of the most useful purposes to which ivy can be put, is as a ground-covering under trees where no grass will grow. It is also very useful for covering iron-rail fencing, or posts and chains. As regards its use on buildings it is capable of attaining at least 100 ft. in height. Leaves of ivy are eaten by horses, cattle, and sheep apparently with relish and without evil results.

The number of varieties into which the common ivy has sported is legion ; a great number have been given Latin names, cumbersome and unnecessary, for they often differ from each other but little, and are very apt with age (the coloured ones especially) to revert to the green type. The older botanists made all the hardy ivies varieties of *H. Helix*, but for garden purposes at least this is an undesirable arrangement, necessitating an unwieldy nomenclature. The following is a representative selection of what may be regarded as forms of *H. Helix* ; others are treated here as species. It may be mentioned that when cuttings of the bushy, flowering state of the ivy are rooted, the plants retain that adult habit, and become sturdy, rounded bushes that flower freely. The varietal name "*arborescens*" is then added to the specific name, or to that of any of the following varieties, to distinguish them from the climbing condition. They are commonly termed "tree" ivies.

Var. ARBORESCENS. Common Tree Ivy.—The flowering shoots of common ivy grown from cuttings, as just described ; there are both silver and golden variegated forms of it.

Var. CAVENDISHII.—A striking variety, whose rather small, angularly lobed leaves are edged with creamy white.

Var. *CHRYSOPHYLLA*.—Leaves variegated with patches of yellow, or wholly yellow, or wholly green. Rather handsome when seen in good condition.

Var. *CONGLOMERATA*.—A dwarfed, very slow-growing form, the leaves small and crowded.

Var. *DELTOIDEA*.—Leaves very distinct in shape, triangular in main outline, with rounded corners and two deep basal lobes, the inner edges of which overlap. Of stiff habit, and assuming a bronzy tint in autumn.

Var. *LOBATA MAJOR*.—Leaves five-lobed, chiefly distinguished by the very large, narrowly ovate, pointed middle lobe.

Var. *MARGINATA*.—This name has been given to a set of small-leaved forms, all of which have white or creamy white margins, except *MARG. RUBRA*, in which the margins become red in autumn.

Var. *MIMINA*.—The smallest of all ivies. Leaves closely set on the shoot ; $\frac{1}{2}$ to 1 in. across, three-lobed, the lobes triangular.

Var. *OVATA*.—A very distinct form, the leaves ovate, pointed, rounded at the base, rich green and entire, or very slightly lobed even in the climbing state.

Var. *PEDATA*.—Leaves small, very deeply three- or five-lobed, the lobes narrow-lanceolate, and usually from $\frac{1}{8}$ to $\frac{1}{4}$ in. wide ; dark green with whitish veins.

Var. *SAGITTIFOLIA*.—Leaves arrow-head shaped ; in the way of *deltoidea*, but with sharp instead of rounded points, the basal lobes very deep.

H. CANARIENSIS, *Willdenow.*

(*H. algeriensis*, *Hort.* ; *H. maderensis*, *Hort.*)

Leaf large, leathery, somewhat shallowly three- or five-lobed in the climbing state, 2 to 6 (or even 8) ins. across, heart-shaped at the base ; in the flowering state entire and rounded or tapered at the base. Fruit black, as in *H. Helix*, from which species this differs among other respects in the starry, composite hairs of the young shoots and inflorescence, having thirteen to fifteen rays instead of five to eight, as in *H. Helix*. The true *canariensis* is quite distinct from *H. hibernica*, with which it has been associated ; it is sometimes known in gardens as "*canariensis nova*." Native of Canary Islands and N. Africa.

Var. *AZORICA*.—A vigorous variety, with leaves 3 to 6 ins. across, vivid green, five- or seven-lobed ; lobes ovate, blunt-pointed. The quite young wood and leaves are covered with a thick tawny felt. Introduced from St Michael, in the Azores, by the late firm of Osborn of Fulham.

H. CHRYSOCARPA, *Walsh.*

(*H. poetarum*, *Bertolini.*)

Fruits yellow. Leaves of the climbing state triangular or broadly ovate with a heart-shaped base, shallowly lobed or entire ; those of the fruiting state small, often diamond-shaped, and not lobed.

Native of S. Europe from Italy to Greece.

H. CINEREA, *Hibberd.* HIMALAYAN IVY.

(*H. Helix* var. *himalaica.*)

A well-marked species found in various parts of the Himalaya. Leaves triangular-ovate to ovate-lanceolate, taper-pointed, 2 to $4\frac{1}{2}$ ins. long, 1 to $2\frac{1}{2}$ ins. wide ; often with two lobes near the base, and several large bluntish teeth

upwards. This ivy has a distinct grey tinge, the veins still paler grey, and the leaves are longer in proportion to their breadth than other ivies. Fruit yellow or red. Rather more tender than *H. Helix*, but does well on a wall. In the fruiting state the leaves are entire, ovate-lanceolate, half to two-thirds as wide as they are long, tapered at the base ; sometimes unequal-sided.

H. COLCHICA, *Koch.* PERSIAN IVY.

(*H. Rœgneriana*, *Hort.* ; *H. amurensis*, *Hort.*)

Leaves ovate or heart-shaped, entire or slightly lobed, 3 to 7 ins. across, as much as 10 ins. long ; younger parts sometimes purplish tinted. Young shoots clothed with yellowish, scalelike, starry down. This ivy is extremely distinct from our native species, and is a native of the south side of the Caucasus range and of N. Persia. In none of its forms does it ever become so deeply lobed as *H. Helix* does, although in var. *DENTATA* the margins have frequently a few distant teeth. The finest form of *H. colchica* is commonly known as "*H. amurensis*," but I can find no authority for the name. There is no ivy from the Amoor region in the Kew Herbarium. *H. colchica* is the most striking of all ivies, and climbs rapidly when once established. The "tree" form makes a striking evergreen bush with uniformly ovate leaves.

H. HIBERNICA, *Kirchner.* IRISH IVY.

Leaves black green, 3 to 6 ins. across, with usually five triangular lobes. A strong-growing vigorous ivy useful for ground-cover beneath trees, etc. It is often called *canariensis* in gardens, but that species has a paler green, more leathery leaf. The "tree" form makes a handsome bush. There are both yellow and white variegated forms of this species, which is not quite so hardy as *H. Helix* ; said to be found wild in Ireland and the west of Scotland.

Var. *MACULATA* (*H. latimaculata*).—A form of *hibernica* with leaves three- or five-lobed, blotched and streaked with creamy white.

H. RHOMBEA, *Siebold.* JAPANESE IVY.

A Japanese ivy of rather delicate growth, but quite hardy ; the leaves are triangular to ovate, often heart-shaped at the base, usually slightly three-lobed ; very dark green. One form, known in gardens as *H. japonica* variegata, has a thin marginal line of white.

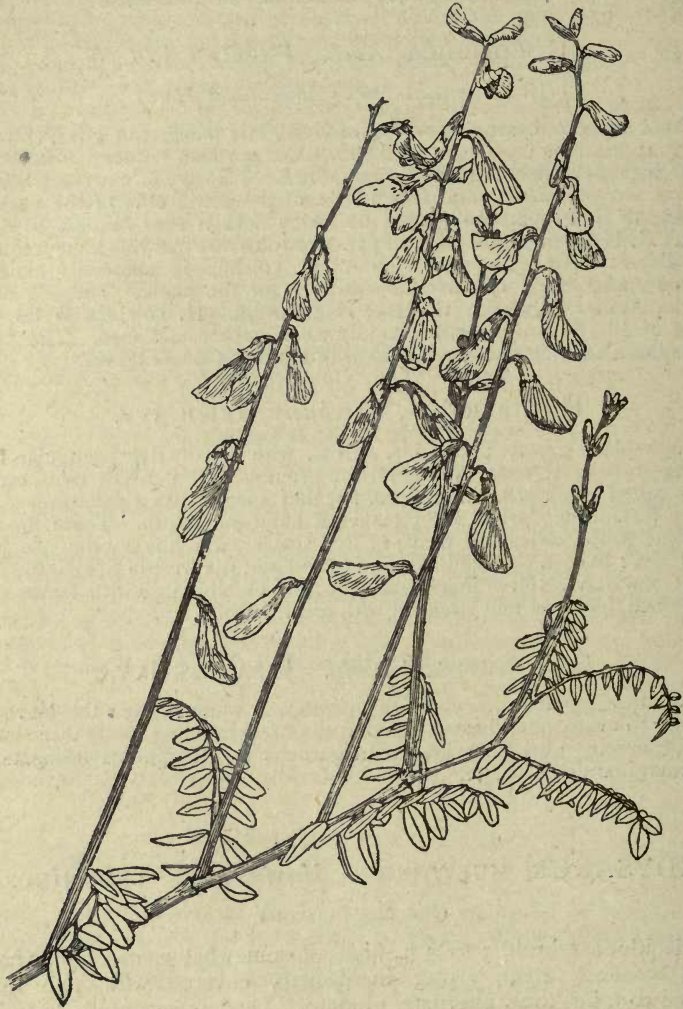
HEDYSARUM MULTIJUGUM, *Maximowicz.* LEGUMINOSÆ.

(*Bot. Mag.*, t. 8091.)

A deciduous shrub, 3 to 5 ft. high, of somewhat sparse, gaunt habit ; young branches erect, zigzag in growth, covered with fine down. Leaves 4 to 6 ins. long, alternate, pinnate. Leaflets seventeen to twenty-nine, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide ; ovate, oblong, oval or obovate, pointed ; smooth above, minutely downy beneath. Racemes axillary, erect, long-stalked, 6 to 12 ins. long, produced from the axil of each leaf as the shoot develops. Flowers pea-shaped, rosy magenta, $\frac{3}{4}$ in. long, arranged on the upper two-thirds of the raceme on very short stalks ; standard petal $\frac{1}{2}$ in. or a little more across, with a patch of yellow at the

base. Calyx $\frac{1}{4}$ in. long, split either above or below. Pod flat, almost circular, rough, containing usually one seed.

Native of Mongolia, where it is said to inhabit dry regions. It thrives



HEDYSARUM MULTIJUGUM.

very well in a sunny position planted in sandy loam, and flowers on the shoots of the year from June to September. Seeds are produced in sunny seasons, but they are uncertain. It is usually propagated by layering, also by cuttings. To correct the rather ungainly habit of this shrub after

a few years, we find it a good plan to peg down the branches; this causes them to break into new growth at the base. The magenta shade in the flower is objectionable to some people, but the shrub is useful in being late flowering and showy.

HELIANTHEMUM. SUN ROSE. CISTACEÆ.

Only a small proportion of the total number of species of sun roses are hardy, and of these, three shrubby or sub-shrubby ones, and another of only annual duration, occur in Britain. Besides them, there are about half a dozen species in cultivation which survive all but our very hardest winters. They are of low, often spreading and procumbent habit; the leaves opposite, evergreen, entire. Flowers rose-like, terminal, solitary to many-flowered in the inflorescence. Petals five; sepals three or five, when of the latter number the two outer ones are much smaller than the three inner ones. Seed-vessel a capsule opening in three valves. (Herein is the chief distinction from the nearly allied *Cistus*, which has a capsule with five or ten valves.) Natives of Europe and Asia Minor. The genus is also represented in N. America, but I have not seen any of the species in cultivation here.

Helianthemums need above all things a sunny spot. They are best on some slope fully exposed to the south. Essentially sun-lovers, their flowers open sluggishly or not at all in dull weather, and their time of greatest beauty is in the forenoon. The flowers never last longer than a day, and in the *H. vulgare* group they mostly close up at noon. The flowers appear in extraordinary profusion, but each day's crop is succeeded by an entirely different one the next. They flower from May onwards. Any soil of an open, loamy nature suits them; in nature they often occur on limestone. All are of easy propagation by cuttings. If a mild bottom heat is available, it is preferable to take cuttings in quite a soft condition; but if they are to be rooted under a handlight they must be left to get moderately firm, and put in about August. For those species that ripen them, seeds are preferable even to cuttings.

The standard work on these plants in this country is *Sweet's Cistineæ*, a book containing 112 coloured plates of *Helianthemum* and allied genera, published between 1825 and 1830. The value of Sweet's work is impaired by his method of treating all the mere garden forms as species. Many of these have since disappeared. In fact, the great frosts of the winter of 1837-8 destroyed a considerable number of species and varieties of *Helianthemum* and *Cistus* which have not again secured a place in our gardens.

H. ALPESTRE, *Dunal*. ALPINE SUN ROSE.

(Sweet's *Cistineæ*, t. 2.)

A dainty little shrub, 3 to 5 ins. high, forming a tuft of dense spreading branches covered thickly with pale, minute hairs. Leaves green on both sides, oval-lanceolate to obovate or narrowly oblong, often more tapered at the base

than at the apex; $\frac{1}{4}$ to $\frac{1}{2}$ in. long, $\frac{1}{12}$ to $\frac{1}{6}$ in. wide, furnished with a few comparatively long hairs, especially on the margins. Flowers produced in June and July in a loose terminal raceme, three to five together; each flower $\frac{1}{3}$ to $\frac{1}{2}$ in. diameter, bright yellow, unblotched, borne on a slender, downy stalk. Sepals five, hairy; the three inner ones oval and about half as long as the petals, the two outer ones linear, much smaller. Stipules absent.

Native of the mountains of Central Europe at 6000 to 7000 ft. altitude, of the Caucasus, and Asia Minor; introduced in 1818. This pretty little plant, although now rare, has existed at Kew and in Canon Ellacombe's garden at Bitton for many years. It is quite hardy, and admirable for the rock garden.

H. ALYSSOIDES, *Ventenat.*

A shrub about 2 ft. high, but twice as much in diameter, forming a low mound of tangled, slender, spreading branches, densely clothed with grey, partly starry down. Leaves narrowly obovate or oblong to ovate-lanceolate, mostly tapered at the base, rounded or blunt at the apex; $\frac{1}{3}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{5}$ to $\frac{1}{2}$ in. wide; grey with a dense down. Flowers in a branched, terminal hairy corymb; each flower $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. diameter, bright yellow, unblotched. Sepals three, ovate, pointed, very hairy, $\frac{1}{3}$ in. long; flower-stalk thickening upwards.

Native of Spain and Portugal; flowering from May onwards. It is allied to *H. formosum*, but differs in not having the long silky hairs characteristic of that species mixed with the short close down, also by the unspotted petals.

H. APENNINUM, *De Candolle.*

(Sweet's *Cistineæ*, t. 62; *H. polifolium*, *Persoon.*)

A low, spreading, much-branched shrub up to 18 ins. high, the stems and leaves thickly clothed above and below with a close, white, stellate down, giving the whole plant a mealy appearance. Leaves linear-oblong or linear, the margins much recurved, $\frac{1}{2}$ to 1 in. long, $\frac{1}{5}$ to $\frac{1}{2}$ in. wide; bluntish or pointed. Racemes terminal, producing numerous flowers in succession. Flowers pure white, 1 in. or rather more across, nodding in the bud state, but becoming erect at expansion. Petals obovate, slightly toothed at the end. Sepals five, the two outer ones linear, very small; the three inner ones ovate, twice as long as the others, all white with down.

Native of Europe and Asia Minor; found in a few places in S.W. England, such as the Brent Downs in Somersetshire, and at Torquay and Babbicombe in Devonshire, usually on limestone. It is, of course, quite hardy, and so nearly allied to *H. vulgare* that some botanists regard it as a variety. It is distinct enough, however, for garden purposes, in its less spreading habit, its white foliage and flowers, and by the smaller, bodkin-shaped stipules. There are hybrids between the two, e.g. *H. CONFUSUM* (Sweet's *Cistineæ*, t. 91), with white flowers, but broader leaves and longer stipules than ordinary *polifolium*.

Var. *RHODANTHUM* (Sweet's *Cistineæ*, t. 7).—Flowers reddish; leaves not so much recurved as in the type.

H. FORMOSUM, *Dunal.*

(Sweet's *Cistineæ*, t. 50; *Cistus formosus*, *Hort.*)

A low shrub with wide-spreading branches, growing 2 to 3 ft. high, but more in width, the young shoots erect, the whole plant grey with short down intermixed with which are numerous whitish, stellate or long simple hairs. Leaves oblong, oval or obovate; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide; three-nerved

at the narrowed base, the apex rounded or abruptly pointed. Flowers borne at the end of short side twigs, clustered, but appearing successively; each flower $1\frac{1}{2}$ ins. in diameter, bright rich yellow, each petal with a conspicuous brownish purple blotch near, but not reaching to the base. Sepals three, ovate, taper-pointed, very hairy.

Native of Central and S. Portugal; introduced in 1780; perhaps the most beautiful of all the sun roses we cultivate. It is perfectly hardy, and I



HELIANTHEMUM FORMOSUM

have never seen it permanently injured by frost—even 30° to 32° . It is admirable for covering a dry sunny bank, and remains well furnished with foliage through the winter. It commences to flower in May.

H. GLAUCUM, Persoon.

Closely allied to *H. VULGARE* is a group of sun roses with shorter and comparatively broader leaves, light grey with down above, white beneath.

They are distinguished from *H. vulgare* in having stellate down on both surfaces of the leaves. To this group the sun rose known in gardens as *H. CROCEUM* belongs (Sweet's *Cistineæ*, t. 53). The habit is the same as that of *H. vulgare*, but it is very distinct in summer in the almost white foliage, with which the rich yellow flowers are in admirable contrast. Its proper name is *H. glaucum* var. *croceum*, *Boissier*. Native of S. and S.W. Europe. Many of the garden varieties (see under *vulgare*) are hybrids, or perhaps forms of this species, more especially those whitish on the upper surface.

H. HALIMIFOLIUM, Persoon.

(Sweet's *Cistineæ*, t. 4.)

A shrub 2 to 3 ft. high in the open, twice as high against a wall; branches erect, scaly, downy and white when young, becoming smoother afterwards. Leaves narrowly obovate or oblong, the lower ones only short-stalked, $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide; tapered and three-nerved at the base; they are white with scaly down when young, becoming dull grey-green with age. Flowers bright yellow, $1\frac{1}{2}$ ins. across, with a small spot at the base of each petal; produced in erect, comparatively few-flowered panicles 6 ins. or more high; petals inversely heart-shaped; sepals three to five, the two outer small ones often missing, the inner ones ovate. In wild specimens the sepals are densely covered with scales as well as somewhat downy, but in cultivated plants they are frequently almost smooth.

Native of Portugal, Spain, and the Mediterranean region, some of its forms being found in N. Africa; cultivated in England since the middle of the seventeenth century. Belonging to the same group as *H. formosum*, it is distinguished by its tall, slender flower-stems, and its scaly or glabrous, never densely silky calyx.

H. OCYMOIDES, Persoon.

(Sweet's *Cistineæ*, tt. 40, 13; *H. algarvense, Dunal.*)

An erect shrub, 2 to 3 ft. high; young shoots clothed with a dense white down, with which are mixed long silky hairs. Leaves narrowly obovate or oblong, three-nerved, and tapered at the base, mostly pointed at the apex; $\frac{1}{2}$ to 1 in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; covered with a close, white down when young, becoming green with age. Panicles erect, but loose and comparatively few-flowered, 3 to 9 ins. high, sparsely hairy; flower-stalks slender. Flowers rich yellow, 1 to $1\frac{1}{4}$ ins. across, petals triangular, with a black and purple blotch at the base of each. Sepals three, oval-lanceolate, sparsely hairy, or smooth and glossy.

Native of Portugal and Spain; introduced in 1880. It is a very pretty species, noteworthy for the golden yellow of its flowers and the deeply coloured blotch. It is hardy except in severe winters. It most resembles *H. alyssoides* and *H. halimifolium*, but from the former differs in the blotched petals, and smooth or nearly smooth sepals. It is never scaly, as in *H. halimifolium*, and the petal blotch is much deeper; both, however, have the same marked difference in colour between the young and old leaves.

H. UMBELLATUM, Miller.

(Sweet's *Cistineæ*, t. 5.)

An evergreen bush of erect, open habit, about 18 ins. high, with the general aspect of a small rosemary; young branches viscid and downy. Leaves linear, viscid when young; stalkless, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{12}$ to $\frac{1}{8}$ in.

wide; dark glossy green above, white with down beneath. Racemes erect, 4 to 6 ins. high, with the flowers arranged at intervals in whorls, and terminating in a six- or eight-flowered umbel at the top. Flowers white,



HELIANTHEMUM UMBELLATUM.

$\frac{3}{4}$ in. across, the petals inversely heart-shaped, with a yellow stain near the base. Sepals three, ovate, more or less hairy.

Native of the Mediterranean region; introduced in 1731. This is a distinct and very pretty shrub, more resembling a rosemary in foliage than the common run of sun roses.

Var. SYRIACUM, *Willkomm* (H. syriacum, *Boissier*), is a curious dwarf, semi-prostrate variety, rising only a few inches from the ground. Flowers usually two or three in an inflorescence, pale yellow or yellowish white.

Nearly allied to H. umbellatum is H. LIBANOTIS, *Willdenow* (H. rosmarinifolium, *Hort.*), with very similar foliage, but its flowers are yellow, solitary, sometimes in pairs or in threes, at the end of short lateral twigs. Sepals smooth.

H. VINEALE, *Persoon*.

(Sweet's Cistineæ, t. 77 ; H. canum, *Dunal*.)

A dwarf shrub, forming a compact tuft rarely more than 6 ins. high, but 1 ft. or more in diameter ; young stems and leaves covered with a short down and a few hairs. Leaves hairy and green above, grey beneath with down, ovate-oblong, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers in terminal racemes, sometimes a panicle, usually of three to six blooms, each $\frac{1}{2}$ in. across, bright yellow, unblotched. Sepals five, hairy, the two outer ones very small ; stipules absent. Seed-vessel thickly hairy.

Native of Europe, and found in a few stations in the British Isles, mostly on limestone, in the west of England and the west of Ireland. It is hardy, and makes a pleasing little tuft for the rock garden when covered with its brightly coloured flowers. From the other British species it is not only distinct in its small, compact habit ; it differs also in having no stipules. With the species cultivated in gardens it is only likely to be confused with H. alpestre, which has also no stipules, but whose leaves are green on both surfaces. Botanists also rely on the longer, oval and pointed flower-buds of H. alpestre as a distinction from the globose ones of the present species.

H. VULGARE, *Gaertner*.

(H. Chamæcistus, *Miller* ; H. variable, *Spach*.)

A low semi-shrubby plant, covering ground over 2 or 3 ft. across, but scarcely rising more than 1 ft. above it ; the older stems prostrate, the young flowering ones erect, somewhat hairy. Leaves flat, variable in size and shape, usually oblong, sometimes approaching ovate or lanceolate ; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{2}$ in. wide, sometimes green on both sides, but usually grey or white with stellate down beneath, and more or less bristly hairy above ; stalk $\frac{1}{8}$ to $\frac{3}{16}$ in. long ; stipules lance-shaped, longer than the leaf-stalk. Racemes terminal, with many but successively developed flowers. Flower-stalks decurved, erect only when the flower is expanded. Flowers yellow, about 1 in. across. Sepals five, the two outer ones small, fringed with hairs ; three inner ones ovate, with three or four prominent hairy ribs.

Native of Europe, where it is widely spread, including the British Isles. This is probably the hardest of all the sun roses, and is well known in gardens by the numerous, highly coloured, sometimes double-flowered varieties which have sprung from it, making brilliant displays from May to July. It is sometimes found with rosy flowers in a wild state. Some of the best cultivated forms are unnamed, and have been raised in the ordinary way from seed. Others have been given popular names ; two of the best being "Fireball," bright scarlet-red, and "the Bride," pure white. Robert Sweet, in his book on the Cistus family, published 1825-1830, figured and described numerous varieties under Latin names. Some of these have been lost, but of those that survive a selection is here given. It is, however, in the power of anyone to obtain as good or better forms by raising seedlings themselves. In all its forms H. vulgare is only a morning bloomer, the flowers closing soon after midday—the bright red "Fireball" is one of the latest to keep open. In

spite of this defect they are worthy of more extended cultivation, for they bear an amazing profusion of blossom lasting over several weeks.

Var. *CROCATUM* (Sweet's *Cistineæ*, t. 92).—Leaves green and hairy both sides ; flowers saffron coloured.

Var. *CUPREUM* (Sweet's *Cistineæ*, t. 58).—Leaves green both sides ; flowers copper coloured ; there is a double-flowered form of this.

Var. *DIVERSIFOLIUM MULTIPLEX* (Sweet's *Cistineæ*, t. 98).—Leaves green above, whitish below ; flowers double, dark red.

Var. *MUTABILE* (Sweet's *Cistineæ*, t. 106).—Leaves green above, grey beneath ; flowers pale rose.

Var. *ROSEUM* (Sweet's *Cistineæ*, t. 55).—Leaves green above, grey-white beneath ; flowers rather paler rose than in var. *mutabile*.

Var. *STRAMINEUM* (Sweet's *Cistineæ*, t. 93).—Leaves green above, whitish beneath. Flowers sulphur-yellow with a darker yellow patch at the base of each petal.

Var. *SURREJANUM* (*H. surrejanum*, *Miller*; Sweet's *Cistineæ*, t. 28).—This curious variety is said to have first been found near Croydon, in Surrey. It is distinguished from the type by the narrow petals deeply notched at the end ; they are linear-lanceolate, about $\frac{1}{8}$ in. wide, $\frac{3}{8}$ in. long, yellow. This variety has little beauty, and is really a deformity.

Var. *VENUSTUM* (Sweet's *Cistineæ*, t. 10).—Leaves lustrous green above, whitish beneath ; flowers rich crimson, with a yellow spot at the base. Some of these varieties are probably hybrids with *H. glaucum* (*q.v.*).

HELICHRYSUM ROSMARINIFOLIUM, *De Candolle*. COMPOSITÆ.

(*Ozothamnus rosmarinifolius*, *De Candolle*.)

An evergreen shrub, 6 to 9 ft. high, with ribbed, glutinous young branches. Leaves alternate, closely set on the branches ; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{12}$ in. or less wide ; linear, smooth, dark green and rather glutinous above, pale beneath ; margins recurved. Flower-heads snow-white, crowded, about $\frac{1}{8}$ in. diameter, produced in June at the end of short shoots in rounded corymbs $\frac{1}{2}$ to $\frac{3}{4}$ in. across.

Native of Tasmania and Victoria, and hardy only in the warmer counties. At Kew it needs the protection of a wall. Where it thrives, this is undoubtedly one of the most beautiful shrubs introduced from Tasmania. About midsummer every little twig is terminated by its cluster of blossoms, which as a whole almost hide the plant in a snow-white sheet. It is popularly known as "snow in summer." The flowers are practically everlasting ; I have specimens collected, dried, and pressed over thirty years ago, which are still pure white. For room decoration long sprays should be cut, hung upside down in a place as free as possible from dust, and allowed to become dry and rigid. After a few weeks they may be taken down and arranged in the ordinary way in vases, where the flowers will remain white and beautiful for many months, no water of course being needed.

Of other species in cultivation, *H. GLOMERATUM*, *Hooker* *fu.*, is a curious evergreen shrub up to 8 ft. high, with long, slender, thong-like shoots covered with white down, and sparse roundish leaves $\frac{1}{4}$ to $1\frac{1}{4}$ ins. long, also covered with white down beneath. Flower-heads in small, short-stalked, axillary or terminal, globose clusters, $\frac{1}{2}$ in. diameter.

Scarcely so hardy as *H. rosmarinifolium*, and of little merit. Native of New Zealand.

H. ANTENNARIUM, *F. Mueller.*—An evergreen shrub of bushy, densely leafy habit. Leaves narrowly obovate, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, smooth, deep green. Flower-heads whitish, $\frac{1}{4}$ in. across, produced in June in terminal corymbs 1 to 2 ins. wide. Native of Australia. Only hardy near the sea in the south and south-western counties and similar places. It thrives in the gardens of Osborne, Isle of Wight.

HELWINGIA RUSCIFLORA, *Willdenow.* CORNACEÆ.

(*H. japonica*, *Dietrich.*)

A deciduous shrub, 3 or 4 ft. high, with smooth twigs. Leaves simple, alternate, ovate, tapering at both ends, long-pointed, $1\frac{1}{2}$ to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. wide; with fine, rather bristle-like teeth on the margins, quite smooth on both surfaces; stalk $\frac{1}{2}$ to 1 in. long; stipules hair-like. Flowers unisexual, very small, pale green or greenish white; females produced singly or in threes on the midrib about the centre of the upper surface of the leaf; males more numerous; they are stalkless, and of no beauty. Fruit $\frac{1}{4}$ in. long, roundish oval.

Native of Japan; introduced to Europe by Siebold in 1830. It has not the least merit as an ornamental shrub, although the foliage in a milder climate is larger and perhaps more striking than as here described; but it is a plant of singular botanical interest. The morphological explanation of the anomalous position of the flowers in the middle of the leaf (for no true leaf ever produces flowers) is that the flower-stalk in reality originates in the axil of the leaf, but is united from end to end with the stalk and midrib. This shrub is hardy at Kew, and is propagated by cuttings of young wood.

HETEROMELES ARBUTIFOLIA, *Roemer.* TOLLON. ROSACEÆ

(*Photinia arbutifolia*, *Lindley*; *Bot. Reg.*, t. 491.)

An evergreen tree, occasionally 30 ft. high, or in cultivation more often a shrub, with downy young bark. Leaves stiff and leathery, 2 to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; oblong, lanceolate or obovate, tapering at the base to a thick downy stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long; the margins set with stiff teeth, each tipped with a small black gland. Flowers produced very numerous in a large, flattish panicle, composed of corymbose clusters terminating the shoot, and in the axils of the uppermost leaves. Each flower is from $\frac{1}{4}$ to $\frac{3}{8}$ in. diameter; petals pure white; calyx with short, smooth, triangular lobes. Fruit about the size of holly berries, bright red, tasting like common haws.

Native of California; introduced by Menzies in 1796. It is a handsome evergreen, unfortunately not hardy at Kew, but thrives well in the Grayswood Hill garden at Haslemere, where I have seen it in flower in August; also in Lord Annesley's garden at Castlewellan, Co. Down.

Sargent states that the fruit-covered branches are gathered in large quantities in California, and used as we use holly for Christmas decorations. It may be grown on a wall, but is, of course, at its best in the open where the climate is suitable. It is the only species of the genus, and is very closely allied to *Photinia*, but differs in having only ten stamens to each flower.

HIBISCUS SYRIACUS, *Linnaeus*. MALVACEÆ.

(Bot. Mag., t. 83; *Althæa frutex*, *Hort.*)

A deciduous shrub, with rather erect branches but bushy habit, up to 10 ft. high. Leaves variable in size, ordinarily from 2 to 4 ins. long, with stalks $\frac{1}{4}$ to 1 in. long; of ovate outline, more or less distinctly three-lobed and coarsely toothed, smooth except for an occasional bristle on the veins. Flowers produced singly on short stalks from the leaf-axils towards the end of the branch. Each flower is from $2\frac{1}{2}$ to 4 ins. across, with five free petals forming a trumpet mouth. The colour is exceedingly variable in the numerous forms of this shrub, some being white, others red, blue, purple, or striped; whilst others again have double or semi-double flowers. Commences to bloom in August.

The date of the introduction of this shrub to Britain is not known, but as it was included by Gerard among the garden shrubs of his time, it has been cultivated here for more than 310 years. In early times it was known as the "Syrian Ketmie," and in the specific name *Linnaeus* suggested that it was from Syria, but it has never been found truly wild except in India and China. In Syria, as in more western countries, it exists as a cultivated plant only. It is perfectly hardy in most parts of Britain, but owing to its late-flowering habit, it is often necessary in the north to treat it as a wall plant in order that its flowers may develop under more favourable conditions. In the south, where the cold rains do not come so early, it can be grown quite in the open, and there is no shrub more beautiful during September, especially if that month be hot and sunny. In selecting a place for it, shady and ill-drained spots should be avoided. Any soil of moderate or good quality suits it. It can be propagated by cuttings or by layers, and rare sorts may be grafted on common ones. Plants growing too large for their places may be pruned back in early April. One of the common features of the gardens at Versailles are large bushes of this *Hibiscus*, cut hard back annually into formal shape. Both in France and in Italy it flowers with greater profusion and regularity than under our uncertain skies. There is a tree in the Padua Botanic Gardens 20 ft. high. A great number of varieties have been raised and named, and the following list must only be regarded as a selection of a representative few of approved merit. On the whole, single-flowered ones are to be preferred.

Admiral Dewey.—Pure white; double.

Cæleste.—Purplish blue; single.

Grandiflorus superbus.—Rosy; single.

Hamabo.—Pale bluish, with a large crimson blotch at the base of each petal; single, one of the best. (The plant cultivated under this name is not the *H. Hamabo* of Siebold, *Flora Japonica*, t. 93.)

La Reine.—Rose coloured ; single.

Monstrosus.—White with dark purple centre ; single.

Pulcherrimus.—Pink and white ; double.

Puniceus.—Red ; double.

Rubis.—Ruby-coloured ; single.

Souvenir de Chas. Lebreton.—Lilac purple ; double.

Totus albus.—Pure and wholly white ; single.

Variegatus.—Foliage white, variegated ; flowers double, purple.

HIPPOPHAE. ELÆAGNACEÆ.

Two species of deciduous, willow-like trees and shrubs found in Europe and the temperate regions of Asia. Flowers unisexual, the sexes on different trees, inconspicuous and of no beauty. Leaves alternate, scaly beneath. Fruit an orange-coloured or yellow, roundish, juicy berry. The genus is allied only to *Elæagnus* and *Shepherdia* ; *Elæagnus* differs in its bisexual flowers and scaly, silvery fruits ; and *Shepherdia* has opposite leaves. (For cultivation, see *H. rhamnoides*.)

H. RHAMNOIDES, *Linnaeus*. SEA BUCKTHORN.

(Bot. Mag., t. 8016.)

A deciduous shrub, sometimes a tree 30 to 40 ft. high, the whole of the younger parts of the plant covered with silvery grey scales ; twigs stiff, frequently spine-tipped. Leaves scarcely stalked, linear, 1 to 3 ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide ; tapered at both ends, upper surface dark greyish green, and not so scaly as the silvery grey under-surface. Flowers very small, produced in April along the twigs of the previous year in short axillary clusters ; each flower solitary in the axil of a deciduous bract. Fruit an orange-coloured berry, between globose and egg-shaped, $\frac{1}{4}$ to $\frac{3}{8}$ in. long, shortly stalked ; in colour by September.

Native of Europe (including Britain) and temperate Asia. With its narrow, silvery leaves and brightly coloured berries clustered thickly on the branches from autumn until February, the sea buckthorn stands out remarkably distinct from all others in our gardens. Its beauty is so striking that it ought to be indispensable to every garden where winter effects are desired. Whilst it is, as the popular name suggests, frequently found on sea-shores, it thrives perfectly well in inland districts. At Kew it succeeds admirably at the margin of water, and in the ordinary soil of the gardens. It is not generally known that the plants are unisexual, so that the female one alone bears fruit, and then only if a male plant be growing near enough for the flowers to become pollinated. It is best grown in groups of about six females to one male. The pollen is carried by wind. Solitary female plants can be fertilised by hand, which is best done by waiting until the pollen of the male plant is ripe—shown by the little shower of yellow dust when the branch is tapped—and then cutting off a branch and shaking it over the female plant. It would be a useful thing if nurserymen who stock this shrub would graft a piece of male on female plants. Perhaps no other fruiting shrub is so attractive as this for so long a time. However pressed by hunger, birds will not eat the berries, which are filled with an intensely acid, yellowish juice.

Propagation may be effected by seeds or by layers. The latter is the simpler way of obtaining plants whose sex is known. There appears to be no way of distinguishing seedlings until they flower.

H. SALICIFOLIA, Don.

A deciduous, somewhat spiny tree, 30 to 40 ft. high, with a coarse bark cut into longitudinal flakes; young shoots covered with brownish down as well as scales. Leaves linear-oblong, 1 to 3 ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, dull green (not silvery) above, the lower surface covered with a greyish white felt; midrib brown; stalk $\frac{1}{8}$ to $\frac{1}{4}$ in. long. Flowers as in *H. rhamnoides*. Berries pale yellow.

Native of the Himalaya up to 10,000 ft. altitude, and perfectly hardy at Kew, where there is a tree 40 ft. high, with the head of branches 30 ft. through and the trunk 4 ft. 9 ins. in girth; the twigs pendulous. This tree bears fruit, but does not compare with *H. rhamnoides* in beauty. It is easily distinguished by its broader, not silvery leaves, felted rather than scaly beneath, and by the paler, less brilliantly coloured fruit. Introduced in 1822.

HOHERIA POPULNEA, *Cunningham.* MALVACEÆ.

(Gardeners' Chronicle, Nov. 23, 1901.)

An evergreen shrub or small tree, 10 to 30 ft. high, glabrous except on the young shoots, flower-stalks, and calyx, which are more or less pubescent. According to Cheeseman's *Flora of New Zealand*, it is a most variable species. He distinguishes three varieties, viz., *vulgaris*, *lanceolata*, and *angustifolia*, the first of which is the one cultivated here, and apparently the most handsome. Its leaves are 3 to 5 ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; ovate, firm in texture, edged with large, sharply pointed, unequal teeth. Flowers very abundant, pure white, produced in clusters from the leaf-axils, each flower $\frac{3}{4}$ to 1 in. across, with spreading, narrowly oblong petals and numerous stamens.

Native of New Zealand. Although this beautiful tree may have been in cultivation much earlier, it only sprang into notice about the beginning of this century, when it flowered at the Trinity College Botanic Garden, Dublin, and was figured in the place above quoted. It is grown out-of-doors in Cornwall, but is not really hardy near London. It likes a rich loamy soil, and is increased by cuttings. *Hoheria* is closely allied to *Plagianthus*, but differs in having its carpels winged at the back, and keeping closed when ripe. A demulcent drink is obtained from the bark, and its fibre is made into cordage.

Vars. *ANGUSTIFOLIA* and *LANCEOLATA* are distinguished by their smaller, narrower leaves; those of the former are usually only 1 to 2 ins. long.

HOLBOELLIA LATIFOLIA, *Wallich.* BERBERIDACEÆ.

(*Stauntonia latifolia, Wallich.*)

A member of the *Lardizabala* section of the Berberids, and closely allied to *Stauntonia*. It differs in its large corymbose clusters of flowers having petals and free stamens. The genus commemorates F. L. Holboll, a Danish botanist. This is an evergreen twining shrub with compound leaves, consisting of three or more radiating leaflets, which are glabrous, obovate, acuminate, of leathery texture, dark glossy green, 2 to 7 ins.

long, one-third as wide, borne on a main-stalk 2 to 6 ins. long, themselves with stalks 1 in. or more long. Flowers borne on short corymbs in the leaf-axils, very fragrant, unisexual, with both sexes often on the same corymb. Sepals six, greenish white in the male, narrow-oblong, about $\frac{1}{2}$ in. long; in the females larger, purplish; petals six, minute. Fruit irregular-oblong, sausage-shaped, 2 to 3 ins. long, containing numerous seeds.

Native of the Himalaya, where the fruits are eaten by the natives. A luxuriant climber, which thrives exceedingly well in the south-western counties, but in cold localities requires greenhouse protection to be seen at its best. The flower should be fertilised by hand.

HOVENIA DULCIS, *Thunberg.* RHAMNACEÆ.

(Bot. Mag., t. 2360.)

A deciduous tree 30 ft. high (much more in a wild state); twigs downy when young. Leaves alternate, oval or heart-shaped; from 4 to 7 ins. long, 3 to 6 ins. wide; taper-pointed, coarsely and unequally toothed, downy beneath, especially on the veins. Flowers in terminal and axillary forked clusters 2 to 3 ins. across; the individual flower $\frac{1}{4}$ in. or so wide, yellow. Flower-stalks swelling unevenly after the decay of the flower into a fleshy, contorted mass, red, and sweet to the taste. They are chewed by the Japanese and Chinese. Fruit about the size of a pea, containing three seeds, and often partially embedded in the fleshy stalks.

Native of China, but now cultivated extensively in Japan and N. India. This curious tree is fairly hardy at Kew, where it forms a rather ungainly shrub with erect branches, growing very vigorously in the summer, but cut back more or less in winter.

HUDSONIA ERICOIDES, *Linnæus.* BEACH HEATHER.

CISTACEÆ.

Hudsonia is a genus of three species exclusively North American, and allied to Cistus and Helianthemum, which it resembles in the fleeting nature of its blossom. Its always yellow flowers and three-valved seed-vessel distinguishes it from Cistus, and from both it differs markedly in the heathlike habit. Named in honour of Wm. Hudson, an English botanist of the eighteenth century.

H. ericoides is a low, bushy, evergreen shrub of heathlike aspect, rarely more than 6 or 8 ins. high. Leaves grey-green, awl-shaped; $\frac{1}{4}$ to $\frac{1}{2}$ in. long, erect and overlapping but not pressed to the stem, hairy. Flowers bright yellow, $\frac{1}{2}$ in. across, produced during May singly on very slender, silky stalks about $\frac{1}{2}$ in. long, crowded at the upper parts of the branches; petals five, soon falling; sepals three, silky.

Native of Eastern N. America, in dry sandy soil near the coast, from Newfoundland to N. Carolina; introduced in 1805, but always rare owing to the difficulty in cultivation. Sir John Ross of Bladensburg, who, so far as I know, is the only one who has had any success with it, tells me

that it did best planted in a made bed consisting of peat at the bottom, and about 6 ins. of sand at the top. So far as winter cold is concerned, it must be hardy anywhere in Britain, considering the high latitudes it reaches in a wild state. But even in American gardens it is not easy to establish. It may be recommended to those knight-errants in gardening who delight in mastering difficult subjects. It probably needs a sandy, well-drained, slightly saline soil, with full sunshine.

HYDRANGÆA. SAXIFRAGACEÆ.

A group of Asiatic and North American deciduous shrubs, sometimes treelike, sometimes climbing, with the leaves opposite or in threes, and large terminal corymbs or panicles of flowers. A peculiarity of Hydrangæa, shared among hardy shrubs by Viburnum and the rare Schizophragma, is the production in most of the species of large, showy, sterile flowers and small fertile ones on the same inflorescence. The sterile flower has no stamens or seed-bearing parts, but consists merely of three to six flat, spreading sepals with some remnants of petals in the centre. The functions of these flowers are no doubt advertisement and the attraction of insects for purposes of fertilisation. The perfect or fertile flowers are quite small and very numerous, the sepals and petals four or five, the stamens eight or ten. Seed-vessel a small capsule, with the styles and calyx adhering, many-seeded. The sterile flowers are usually confined to the margin of the inflorescence, but some species have nothing but fertile flowers. In gardens the most popular of Hydrangæas are those culture-forms with nothing but sterile flowers.

The stronger-growing species like *paniculata* and *Bretschneideri* require a rich loamy soil to bring out their best qualities. The *hortensis* section do not appear to be very particular as to soil or position. Most of the genus are easily increased by cuttings made of moderately ripe summer wood, placed in gentle heat. *H. quercifolia* is better layered. The following species should be pruned back every spring:—*arborescens*, *cinerea*, *paniculata*, *radiata*. The question of blue-flowered Hydrangæas is alluded to under *H. hortensis*; several Asiatic species vary from blue to pink.

Among the species not given detailed mention below are:—

H. HIRTA, *Siebold*.—A low shrub with very coarsely toothed leaves somewhat bristly on both sides, and corymbs 2 to 3 ins. across, of none but small fertile flowers. Native of Japan. I have seen it from Mr T. Smith's nursery at Newry, but it has little garden value.

H. VIRFENS, *Siebold*.—Branches slender, pendulous, bearing small lanceolate or oval leaves, and, at the end of short axillary shoots, small corymbs 1 to 3 ins. across, with often only one to three large sterile blossoms, which are whitish and $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide. Native of Japan, and of elegant habit, but only suitable for the milder parts of these islands. Cultivated by Sir John Ross of Bladensburg, at Rostrevor, Co. Down.

H. ALTISSIMA, *Wallich*.

A deciduous climber, up to 40 ft. or more high, attaching itself to tree trunks by aerial roots in a wild state; young shoots either hairy or smooth;

the bark of the older branches peeling off in large, thin, brown flakes. Leaves ovate or oval, 3 to 5 ins. long (more in mild climates), half to three-fourths as wide; rounded at the base, pointed, regularly triangular- or roundish-toothed; smooth on both sides except for tufts of down in the vein-axils beneath; stalk at first hairy, 1 to 3 ins. long. Corymbs 6 to 8 ins. across, with a few white sterile flowers at the margins, each $\frac{2}{3}$ to $1\frac{1}{2}$ ins. in diameter; the small perfect flowers are yellowish white; stamens ten (often more). Blossoms in June.

Native of the Himalaya; introduced in 1839. It is very nearly allied to *H. petiolaris*, but differs in having fewer stamens, not so flat an inflorescence, and usually more coarsely toothed leaves. It is not so hardy probably as *H. petiolaris*, although it grows well outside on a wall at Kew. Both these species are distinguished by the petals of the fertile flowers cohering into, and falling away in, one caplike piece.

H. ARBORESCENS, *Linnaeus*.

A deciduous shrub of somewhat loose habit, 4 ft. or more high; young shoots rather downy at first, becoming smooth. Leaves broadly ovate, oval or roundish; 3 to 7 ins. long, 2 to 6 ins. wide; pointed at the apex, rounded or heart-shaped at the base, coarsely toothed; upper surface bright dark green, lower one paler; both smooth, or with down only on the veins or in the vein-axils beneath; stalk 1 to 3 ins. long. Corymbs flattish, much branched, usually 4 to 6 ins. across, with few or no large sterile flowers. Fertile flowers dull white, very small and crowded; flower-stalks downy. Seed-vessels eight-ribbed, with calyx adhering at the top.

Native of the eastern United States, from the State of New York southwards; introduced by Peter Collinson in 1736. A vigorous and hardy species, which flowers freely in July and August, but is not particularly attractive. It is allied to *H. radiata*, differing chiefly in the nearly smooth leaves.

Var. *GRANDIFLORA*, *Hort.*—A very beautiful form, in which all the flowers are of the large sterile type and pure white. It appeared in this country in 1907, but I have been informed by Prof. Sargent that it was found wild in the mountains of Pennsylvania fifty or more years ago. It is quite hardy, and showy enough to be regarded as an admirable substitute for *H. hortensis* in the colder parts of the country. It blooms from July to September, and is probably the best *Hydrangea* to cultivate out-of-doors near London and in places with a similar climate. Its one defect is that its flower-heads are often so heavy that the stalk is not stout enough to hold them upright.

H. BRETSCHNEIDERI, *Dippel*.

(*H. pekinensis*, *Hort.*; *H. vestita* var. *pubescens*, *Maximowicz*.)

A deciduous shrub, 8 to 10 ft. high, forming a sturdy bush, old bark peeling; young branches smooth. Leaves oblong to ovate, 3 to 5 ins. long, 1 to $2\frac{1}{2}$ ins. wide; rounded or wedge-shaped at the base, slender pointed, regularly toothed; dull and smooth above, hairy on the veins and sometimes over the whole surface beneath. Corymbs flattened, 4 to 6 ins. across, with a considerable number of large sterile flowers at the margins; these are $\frac{3}{4}$ to $1\frac{1}{2}$ ins. across, the three or four sepals rounded or obovate, white, afterwards rosy. The small, perfect flowers are dull white; flower-stalks clothed with erect bristly down. The seed-vessels are egg-shaped, the persistent calyx forming a raised band round the middle.

Native of China; introduced from the mountains about Peking in 1882,



HYDRANGÆA BRETSCHNEIDERI.

[Face p. 624.

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by Dr Bretschneider. Planted in a sunny position in good soil, this makes a really handsome shrub, flowering in June and July, perfectly hardy and always vigorous.

H. CINEREA, *Small*.

A species intermediate between *H. arborescens*, whose leaves are almost smooth, and *H. radiata*, which has them clothed beneath with a close, snowy-white felt. In *H. cinerea* the leaves are covered beneath with a dense greyish down. The corymbs have few large sterile flowers or none.

Found wild in mountainous parts of the south-eastern United States. A variety, *STERILIS*, *Rehder*, in which nearly all the flowers are of the large sterile type, is described as having originated in Ohio, U.S.A., and was introduced in 1910, but I have not seen it flower in cultivation. There has long been in cultivation a *Hydrangea* intermediate between *H. radiata* and *H. arborescens*, which has been regarded as a hybrid between the two. It is known as *H. canescens*, *Koch*, and *H. arborescens* var. *canescens*, *Nicholson*, but I do not know how it differs from the species named as above by Dr Small.

H. HORTENSIS, *Smith*.

(*Bot. Mag.*, t., 438 ; *H. Hortensia*, *Siebold* ; *Hortensia opuloides*, *Lamarck*.)

A deciduous shrub up to 8 ft. high and 12 ft. or more in diameter, forming a dense, leafy, hemispherical bush furnished to the ground ; smooth in almost every part except the flower-stalks and vein-axils beneath the leaves. Leaves ovate or oval, tapered at the base, pointed at the apex, toothed ; varying much in size, often 6 to 8 ins. long, on vigorous branches ; strongly ribbed, pale bright green ; stalk $\frac{1}{2}$ to 1 in. long. Corymbs usually about 6 ins. across, but considerably more in specimens subjected to special cultivation, rounded and with all or nearly all the flowers sterile, pink or blue.

Introduced from China to Kew, in 1789, by Sir Joseph Banks. This shrub has for centuries been a popular garden plant in China and Japan. It is probably only truly wild in China, and in that state of course the larger proportion of the flowers are of the small, fertile kind, as in other wild species, but I do not know that the genuine wild type is in gardens. Near London, the common *Hydrangea* has no claim to be regarded as a hardy shrub. It can only flower when the terminal bud formed in autumn survives the winter, and that happens rarely. As a rule, in open ground the shoots are killed back to the ground. But farther south, and especially in Devon and Cornwall, it is one of the most gorgeous of outdoor shrubs, brightening the gardens of rich and poor alike in the late summer and autumn more than any other.

Var. *MARIESII*, introduced from Japan in 1879, has the marginal flowers only sterile ; they are remarkably large, often over 3 ins. across and of a delicate mauve-pink (see *The Garden*, 1898, p. 390, plate 1196).

Var. *NIGRA*, *Nicholson* (syns. *H. cyanoclada*, *Hort.* ; *H. mandschurica*, *Hort.*)—Young stems dark purple, almost black ; flowers bright rose-coloured, and all or nearly all sterile.

These two varieties are similar to the common *Hydrangea* in leaf and habit, and neither is any hardier ; but the three following, although commonly placed under *H. hortensis* as varieties, are very distinct and hardier. They also flower from side buds of the previous year's growths, and the crop of flowers is not therefore dependent on the fate of the terminal bud. As the type from which they spring is spontaneous in Japan, it appears to deserve specific distinction from *H. hortensis*. They can be recognised out of flower by the dull leaves.

H. ACUMINATA, *Siebold* (*H. hortensis* var. *acuminata*, *A. Gray*).—Leaves ovate, long pointed, dull green, with appressed, bristly hairs on both sides.

especially beneath. Flowers sterile only on the margin of the corymb, their sepals ovate to oval, 1 to $1\frac{1}{2}$ ins. long, blue or pink.

H. JAPONICA, *Siebold* (H. hortensis var. Lindleyi).—Of the same type as acuminata, of which it is no doubt a form, having dull dark green, ovate, oval or slightly obovate, coarsely toothed leaves, tapered at the points and with curly hairs on the midrib and chief veins below; more or less downy beneath. Flowers sterile only at the margin of the corymb, white and rosy pink; the small central ones deeper mauve-pink.

H. STELLATA, *Siebold*.—Leaves smaller than in the two preceding, but also dull green, hairy on both sides, coarsely toothed, especially towards the apex. Flowers pinkish, rosy or white, with numerous small, narrowly oval sepals; sometimes called “flore pleno” on that account. There are numerous other varieties, but they belong to the greenhouse rather than the outdoor garden.

A curious circumstance in connection with the flowering of *Hydrangea hortensis* is the changing of the colour from pink to blue and *vice versa*, although pink is, apparently, the normal colour. In some places the flowers are uniformly and regularly blue, in others they never become that colour, and plants that have for years borne blue flowers will produce pink ones when they are removed to places where the flowers usually come pink. No satisfactory explanation has been yet offered for this peculiarity, although it appears almost certain that it is due to the presence in the soil of some ingredient of a ferruginous nature. But alum applied as a weak solution to plants in pots is also said to induce blueness. Iron filings mixed with the soil are also relied on for the same purpose. A preparation called “Cyanol” is successfully used. It is difficult to explain why, as sometimes happens, pink and blue flowers are borne on the same plant at the same time.

The name of this shrub has caused some confusion owing to its having been called now *H. hortensis*, now *H. Hortensia*; the older and proper name is no doubt “hortensis,” given to the plant in 1792 by Sir James E. Smith (*Icon. Pict.*, t. 12). “Hortensia” was originally applied to this shrub as a generic name (*H. opuloides*, *Lamarck*) in 1789. With regard to the supposed connection between this shrub and Queen Hortense, the following extract from *L'Inventaire des Cultures de Trianon*, p. 29, a book by Le Comte Jaubert, published in Paris in 1876, will be of interest:—

It is generally believed that the Hortensia bears the name of Queen Hortense, daughter of the Empress Josephine, and for this reason it was used sometimes under the Second Empire as a political emblem. This is a serious error. This plant was dedicated to Madame Hortense Lepante, wife of a celebrated clockmaker of Paris, and a friend of the botanist [*Lamarck*].

H. INVOLUCRATA, *Siebold*.

A low, deciduous, semi-shrubby plant, usually less than $1\frac{1}{2}$ ft. high, but perhaps higher in milder climates; young shoots, leaves, flower-stalks, and ovary covered with bristly, pale down. Leaves ovate-oblong, rounded or tapered at the base, slender-pointed, margined with numerous fine, bristle-like teeth; 3 to 6 ins. long, 1 to $2\frac{1}{2}$ ins. wide; roughened, especially above; stalk $\frac{1}{4}$ to 1 in. long. Corymb 3 to 5 ins. across, enclosed in the bud state by about six large broadly ovate bracts, the largest about 1 in. long, covered with a felt of appressed whitish down. Sterile flowers at the margin of the corymb, $\frac{3}{4}$ to 1 in. across, the three to five sepals white or blue-white, slightly downy. Small fertile flowers blue. Blossoms from August to October.

Native of Japan. The distinguishing feature of this species is the whorl of bracts (involucre) at the base of the inflorescence, which persists through the flowering. It is very pretty when in bloom, the blue (sometimes rosy lilac) fertile flowers making an effective contrast with the large sterile whitish ones.

Unfortunately it is not very hardy, and is often killed back more or less in winter, the flowers being borne on the new shoots which spring from the base. It thrives well in the west country.

H. LONGIPES, *Franchet*.

A shrub of low, spreading habit, 2 to 3 ft. high; young shoots more or less covered at first with loose down. Leaves rough to the touch, roundish ovate, with a heart-shaped or rounded base, and an abrupt, slender point; 3 to 7 ins. long, one-half as much or more wide; sharply and prominently toothed, both surfaces, but especially the lower one, covered with short flattened bristles; stalks slender, bristly when young, and from half to fully as long as the blade. Corymbs flattish, 4 to 6 ins. across, the sterile flowers $\frac{3}{4}$ to $1\frac{1}{2}$ ins. across, white. Fertile flowers small, white; flower-stalks bristly. Seed-vessel roundish, smooth, with the calyx at the top.

Native of Central and W. China; introduced by Wilson for Messrs Veitch in 1901. It is a lax-habited shrub, with remarkably long-stalked leaves like those of *petiolaris*. It was first described by Franchet in 1885, and by a curious coincidence Mr Hemsley described it again as a new species two years later, adopting the same name.

H. PANICULATA, *Siebold*.

(*Flora Japonica*, t. 61.)

A deciduous shrub, sometimes tree-like, and 12 or 15 ft. high; young shoots at first downy, becoming smooth. Leaves mostly in threes, oval or ovate, tapered at both ends, or rounded at the base, toothed; 3 to 6 ins. long, $1\frac{1}{2}$ to 3 ins. wide; with scattered, flat, bristly hairs above, and pale bristles on the veins beneath; stalk $\frac{1}{2}$ to 1 in. long. Panicles pyramidal, varying in size according to the strength of the shoot, usually 6 to 8 ins. long, two-thirds as wide at the base. Outermost flowers sterile, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide, white changing to purple-pink; the small fertile flowers yellowish white; flower-stalks downy. Blooms in August and September.

Native of Japan, where it is sometimes a tree 25 ft. high, also of China. From all other cultivated *Hydrangeas* except *H. quercifolia* this is distinguished by the shape of its inflorescence. It is a hardy and very ornamental shrub.

Var. *GRANDIFLORA*, *Siebold*.—A form introduced from Japan about 1870, in which all, or nearly all, the flowers are sterile and large, forming a closely packed pyramid of blossom at first white then purplish pink, finally brown. This variety is undoubtedly the most showy of *Hydrangeas* in localities where *H. hortensis* cannot be grown. To obtain it at its best it should be planted in good loamy soil, rich, but not too stiff. The shoots should be pruned back in spring before growth recommences, and after the young shoots are a few inches long the weakest should be removed. If very large panicles are desired the shoots may be reduced to six or ten on plants 1 to 2 ft. high—more for larger plants. A mulching of rotted manure should be given when growth is well started. Such treatment will produce panicles 18 ins. high, and 12 ins. through at the base. The typical form may be treated in the same way. To many people's taste these monstrous panicles may be objectionable, and to my mind a bush moderately thinned, or not at all, is more elegant and pleasing. Hard pruning and thinning tends to shorten the life of these plants.

Var. *PRÆCOX*, *Rehder*.—This flowers six weeks in advance of the type, at least in the United States, where I have seen it in bloom in the second week in July.

H. PETIOLARIS, Siebold.(Bot. Mag., t. 6788 ; *H. scandens, Maximowicz.*)

A deciduous climber, reaching in Japan to the tops of trees 60 to 80 ft. high, and attaching itself closely to the trunks and limbs by means of aerial roots ; young stems smooth or hairy, older ones with peeling brown bark. Leaves roundish ovate, straight or heart-shaped at the base, and with short, tapered points ; regularly, sharply, and finely toothed ; $1\frac{1}{2}$ to $4\frac{1}{2}$ ins. long, two-thirds to nearly as wide ; dark bright green and smooth above, paler and often with tufts of down in the vein-axils beneath ; stalk varying in length from $\frac{1}{4}$ to 4 ins. Corymbs expanding in June, flat, from 6 to 10 ins. across, with large white sterile flowers on the margins, 1 to $1\frac{3}{4}$ ins. across, and on stalks 1 to $1\frac{1}{2}$ ins.



HYDRANGEA PETIOLARIS.

long ; the small fertile ones with which the centre is filled being a duller white ; stamens fifteen to twenty-two ; flower-stalks downy.

Native of Japan ; introduced in 1878. This climber ascends trees, walls, or whatever support it has, in much the same way as ivy does. It grows vigorously, and flowers well on a wall, but a more effective way of growing it is as a bush in the open, for it is very hardy. A few plants may be put round the base of an upturned tree-stump, boulder, or even a mound, which they will soon climb over and cover. After that, the mass assumes a low, spreading, bushlike form, light and elegant in appearance, and very striking when in flower. This *Hydrangea* is in gardens often called "*Schizophragma*



HYDRANGEA PETIOLARIS.

[Face p. 628.]

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hydrangeoides," a name that belongs to an allied but quite distinct climber. In place of the three- to six-parted sterile blossom of the present species, the sterile flower of the *Schizophragma* consists of a single ovate sepal, 1 to 1½ ins. long.

H. QUERCIFOLIA, *Bartram.*

A deciduous shrub, up to 6 or more ft. high in a wild state, rarely seen more than half as high in this country; young shoots thick and stout, woolly. Leaves broadly oval or broadly ovate, sometimes roundish in general outline, but five- or seven-lobed, after the fashion of the large-leaved American red oaks like *Quercus rubra*; minutely toothed, 3 to 8 ins. long, two-thirds to fully as wide; dark dull green and smooth above, downy beneath; stalk 1 to 2½ ins. long. Panicle erect, 4 to 8 ins. high, round-topped, pyramidal. Outer flowers sterile, 1 to 1½ ins. diameter, white, changing with age to a purplish shade. Fertile flowers very numerous, crowded, ⅛ in. diameter; petals five, oblong. Flower-stalks furnished with loose hairs. Blossoms from June to September.

Native of the south-eastern United States; introduced in 1803. From all the cultivated *Hydrangeas* this is readily distinguished by its large scalloped leaves. It is very handsome both in foliage and flower, but is unfortunately rather tender. It suffers at Kew, but in such gardens as that of Canon Ellacombe at Bitton, or Mrs Chambers' at Haslemere, where the conditions are rather more favourable, it thrives remarkably well. It is quite uncommon, and deserves a sheltered position. Propagated by layering. A broader-leaved form is sometimes distinguished as "*H. platanifolia*."

H. RADIATA, *Walter.*

(*H. nivea*, *Michx.*)

A deciduous shrub, 3 to 5 ft. high; young branches soon becoming smooth. Leaves ovate or oval, 2 to 6 ins. long, 1 to 3 ins. wide; tapered or rounded at the base, taper-pointed, toothed; upper surface dark green, downy along the veins; lower one covered with a close snow-white felt; stalk 1 to 2 ins. long. Corymbs rounded, 4 to 8 ins. across, always with a few large, sterile, long-stalked flowers at the margin, which are 1 to 1½ ins. across, and white. Fertile flowers very small and numerous, white. Seed-vessels shaped like those of a poppy, with the calyx adhering at the top. Blossoms in July.

Native of N. and S. Carolina; introduced in 1786. The vividly white under-surface of the leaf distinguishes this *Hydrangea* from all others in cultivation, and gives it a peculiar interest. It is allied to *H. arborescens*, with which *H. cinerea* forms a connecting link.

H. SARGENTIANA, *Rehder.*

(*Bot. Mag.*, t. 8447.)

A deciduous shrub of bushy habit, up to 6 ft. high; young shoots very stout, ribbed, and thickly clothed with stiff transparent bristles and small erect hairs, giving the shoot a remarkable, somewhat mossy aspect. Leaves ovate, with a rounded base, 4 to 5 ins. long, 2 to 3 ins. wide on the flowering shoots; broadly ovate, with a heart-shaped base, 6 to 10 ins. long by 4 to 7 ins. wide on the sterile shoots, deep dull green, and covered with minute hairs above; pale, bristly, and prominently net-veined beneath; stalk 1 to 4½ ins. long, bristly and downy. Flowers produced in July and August

in a flattish corymb 6 to 9 ins. across, with sterile flowers $1\frac{1}{4}$ ins. across, pinkish white, confined to the outside; fertile flowers deep rosy lilac; flower-stalks downy, the main ones bristly also.

Native of China (W. Hupeh); discovered by Wilson, and introduced for Harvard University by him in 1908. Very distinct on account of its bristly character. It is rather tender. First flowered at Kew in July 1911.



HYDRANGEA SARGENTIANA.

H. THUNBERGII, Siebold.

(*H. serrata*, De Candolle; *H. cyanea*, Hort.)

This is probably no more than a distinct variety belonging to the group of dull, green-leaved Hydrangeas to which *H. acuminata* and *H. stellata* belong, which are usually placed as varieties of *H. hortensis* (*q.v.*). As represented in gardens it is a small, neat, deciduous shrub, usually 2 ft. in height, the young stems smooth and very dark, ultimately almost black. Leaves oval or ovate-oblong, tapered about equally towards both ends, toothed at the terminal part

only; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{8}$ to $1\frac{1}{2}$ ins. wide; dull green and with appressed hairs above, paler and smooth beneath except for occasional tufts of down in the vein-axils. Corymbs 2 to 4 ins. across, the sterile flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. across, the sepals overlapping, broader than long, blue or pink, often with a shallow notch at the apex; flower-stalks downy. Native of Japan and hardier than *H. hortensis*, but liable to be injured in hard winters. A dainty shrub, flowering in July and August.

H. VESTITA, Wallich.

(*H. heteromalla, Don.*)

A deciduous shrub, often a small tree in its native places. Leaves oval to narrowly ovate-lanceolate; 3 to 8 ins. long, $1\frac{1}{2}$ to 3 ins. wide; tapered at both ends or sometimes rounded at the base, finely toothed; smooth except for some appressed hairs above, covered with a close white down beneath; stalk $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long. Corymbs 4 to 7 ins. across, somewhat thin; the large, white, sterile flowers at the margin $\frac{3}{4}$ to $1\frac{1}{4}$ ins. diameter; flower-stalks with erect, bristly down. Seed-vessels surmounted by the thickened bases of the two or three styles, and with the calyx persisting as a ring about the middle. Flowers in July and August.

Native of the Himalaya and China; introduced in 1821. The distinguishing characters of this species are the very downy, whitish under-surface of the leaves, the thickened bases of the persistent styles at the top of the fruit, and the position of the calyx about the middle. It has been much confused with *H. Bretschneideri*, which is never so downy beneath the leaf, and has a more tapered apex to the fruit. It is also allied to

H. ASPERA, Don, a Himalayan and Chinese species having oblong, finely toothed leaves covered beneath with a dense coat of pale down. But the fruit of *H. aspera* is cup-shaped, the bases of the styles persisting at the top are not thickened, and the calyx band is quite at the top. Also, the bluish sepals of the sterile flowers are frequently toothed, which they never appear to be in *H. vestita*.

Neither *H. vestita* nor *H. aspera* is so hardy and useful a shrub in gardens as *H. Bretschneideri*; they are now rarely seen. Forms of both have been introduced by Wilson from Central and Western China in recent years, which will probably be hardier than the Himalayan types previously known. I have lately seen *H. aspera* very ornamental at Coombe Wood, the corymbs 4 to 6 ins. across, the sterile flowers of a beautiful blue or lavender shade. Wilson also found a completely sterile form of *H. aspera* (var. *STERILIS*), with a ball of pinkish flowers 4 to 5 ins. across—very handsome (Wilson, 1473A, Packang, C. China).

H. XANTHONEURA, Diels.

A deciduous shrub, 8 ft. or perhaps more high, of loose, thin habit, sending out long slender branches, which are furnished with a few bristly hairs when quite young, and slightly warted. Leaves in threes, ovate or oval, with a short, slender point and rounded base, sharply toothed, 3 to 5 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide, dark green and smooth above, pale beneath with whitish appressed hairs on the midrib and chief veins; stalk $\frac{1}{2}$ to $1\frac{3}{4}$ ins. long, slightly bristly. Inflorescence a flattish, corymbose panicle, 5 or 6 ins. across, margined with creamy white, sterile flowers $1\frac{1}{4}$ ins. across. Perfect flowers $\frac{1}{4}$ in. across, dull white; calyx-lobes broadly triangular.

Native of Central China; introduced for Messrs Veitch by Wilson about 1904. It is a shrub of elegant and distinct habit, and with considerable beauty in flower. It has, perhaps, some affinity with *H. Bretschneideri* but is, as yet, imperfectly known in gardens. This description was made from a plant that flowered at Coombe Wood in June 1911.

HYMENANTHERA CRASSIFOLIA, *Hooker fil.* VIOLACEÆ.

(Gardeners' Chronicle, 1875, i., fig. 42.)

A low, semi-evergreen shrub of dense, rounded habit, 3 to 6 ft. high, twice as much in diameter in this country, with stiff, flat-growing branches, covered when young with a short pubescence. Leaves obovate, entire, rounded or slightly notched at the apex, $\frac{1}{2}$ to 1 in. long; smooth, firm, and thick in texture, densely crowded and alternate on the branches. Flowers almost stalkless, very small ($\frac{1}{8}$ in. wide), borne in leaf-axils, with five brownish, reflexed petals of no beauty, and five stamens. Berry almost globular, about $\frac{1}{4}$ in. diameter, white.

Native of New Zealand; first seen in this country about 1875. It is a shrub of great botanical interest in being related to the violet and pansy, and although with not the least beauty of flower, is very attractive in autumn when laden with its abundant pure white berries. It is quite hardy at Kew. One of the finest specimens in the British Isles is in the Glasnevin Botanic Garden, 6 ft. high and 12 to 15 ft. diameter. It retains some of its leaves through the winter, but can scarcely be called evergreen. Propagated by cuttings or by seeds.

H. CHATHAMICA, *T. Kirk*, also from New Zealand, is genuinely evergreen, and has lanceolate leaves 3 to 4 ins. long, toothed and prominently veined. Hardy only in the milder parts of Ireland, Cornwall, etc.

HYPERICUM. HYPERICACEÆ.

A large and well-marked genus, composed mainly of herbaceous plants, but comprising also some twenty or more shrubby and sub-shrubby ones, hardy in this country, and of considerable beauty. The leading characteristics of these species are the five sepals and petals, and the three to five styles of the flower; the capsular fruit usually more or less cone-shaped; and the invariably opposite or whorled leaves, often dotted with pellucid glands. They rarely grow more than 4 or 5 ft. high in this country, and most of them retain more or less foliage in mild winters; in severe ones they are deciduous. The stems of some of the species here described are only half woody, and naturally die back some distance every winter. Although the flowers are always yellow in these shrubby species, there is considerable variety among them either in size or depth of shade. The plants themselves vary much in foliage and general aspect.

In gardens, perhaps the chief value of the Hypericums is in their habit of flowering during late summer and autumn, when comparatively few shrubs remain in bloom. Planted in groups, as the hardier species should always be, they also give during a large part of the year healthy masses of deep green or blue-green foliage. They are of the simplest culture, and all of them like a well-drained loamy soil and abundant moisture. Many of them produce seeds, and none, so far as I am aware, will not increase easily by cuttings. These should be taken off

in August, dibbled in pots of sandy soil, and placed in gentle heat. Species like *H. calycinum* and *inodorum*, that produce creeping root-stocks, are very easily increased by division.

H. ÆGYPTICUM, *Linnaeus*.

(Bot. Mag., t. 6481.)

A dwarf, evergreen shrub, 1 ft. or more high, with round stems. Leaves crowded, ovate or obovate, pointed, $\frac{1}{8}$ to $\frac{1}{3}$ in. long, greyish green. Flowers solitary at the end of short twigs, pale golden yellow; petals erect rather than spreading, $\frac{1}{4}$ in. long; sepals oblong, erect, half as long as the petals.

Native of the Mediterranean coasts and islands, but not of Egypt; said to have been introduced in 1787, but now rarely seen. The reason of this, no doubt, is its tenderness; it can only be grown permanently either in our mildest districts or with winter protection. This is unfortunate, for it is one of the daintiest and prettiest of its genus. It flowers in August.

H. ANDROSÆMUM, *Linnaeus*. TUTSAN.

(*Androsæmum officinale*, *Allioni*.)

A half-woody shrub of vigorous bushy habit, 2 to 3 ft. high, with angled or slightly winged stems branching towards the top, and bearing flowers on each branchlet. Leaves slightly aromatic, the largest among hardy *Hypericums*, and sometimes $3\frac{1}{2}$ to 4 ins. long, 2 to $2\frac{1}{4}$ ins. wide; ovate, blunt at the apex, cordate at the base, and stalkless. Flowers three to nine together in cymose clusters at the end of the main-stalk and lateral branches; each flower about $\frac{3}{4}$ in. across, light yellow; styles three; calyx about as wide as corolla. Fruit a three-celled, berry-like capsule, nearly globose, and about the size of a pea, turning first purple, finally almost black, filled when ripe with a wine-coloured juice.

Native of Europe; rare in Britain, but sometimes found wild in the south of England and west of Scotland. Although of no great beauty in regard to flower, this species is handsome in its healthy, robust appearance, fine big leaves, and dark fruits. The name "Tutsan" is a corruption of *toute-saine* (heal-all), and refers to the many curative properties the plant was once supposed to possess. It is one of the best things for furnishing rather shaded places, and flowers from June until September.

H. ASCYRON, *Linnaeus*.

A semi-herbaceous species, scarcely woody enough to be termed a shrub, sending up from the ground every year annual stems from 2 to 5 ft. high. Leaves narrowly oblong, $1\frac{1}{2}$ to 4 ins. long, rounded at the tip, the base clasping the stem. Flowers 2 ins. across, yellow; petals broad at the apex, narrowing to a claw at the base.

Native of N. America and N. Asia, and of little merit for gardens. Its habit is coarse and ungainly, and the lower leaves of the stem die early. Flowers in July and August.

H. AUREUM, *Bartram*.

(Bot. Mag., t. 8498.)

A deciduous, much-branched shrub of rounded habit, about 4 ft. high, often rising on a single stem from which the lower branches have fallen, thus giving it the aspect of a miniature tree; the older branches covered

with a greyish brown, peeling bark; young shoots two-winged. Leaves blue-green, oblong, 1 to 2 ins. long, with a minute, abrupt point, and numerous transparent glands. Flowers in clusters terminating the shoot and its upper branches, orange yellow, $1\frac{1}{2}$ ins. across, the stamens forming a dense bush $\frac{3}{4}$ in. across. The fruit is a three-celled, broad-based cone $\frac{1}{2}$ in. high, with the very large, leaflike, unequal sepals at the base.

Discovered by Bartram in 1776 "upon the steep dry banks of the Patse-Lega Creek, a branch of the Flint River," Georgia, this *Hypericum*, despite its great beauty, does not appear to have reached this country until late in the nineteenth century. Healthy plants flower and set their fruit in extraordinary abundance, and it is wise to remove the latter except such as may be required for seed. It appears to prefer rocky places in its native home, and is often found on the cliffs of river-courses where it gets some shade. It is wild in several of the south-eastern United States, and is the handsomest of all the American species. (See *densiflorum*.)

H. BALEARICUM, *Linnaeus*.

(Bot. Mag., t. 137.)

A remarkably distinct species of close, shrubby habit and about 2 ft. high, the stems winged and more or less warted. Leaves $\frac{1}{4}$ to $\frac{1}{2}$ in. long, ovate or oblong, rounded at the tip; the lower side covered with curious wart-like lumps with a corresponding depression on the upper side; the margin entire, but very wavy or wrinkled. Flowers terminal and solitary, $1\frac{1}{2}$ ins. wide, fragrant; petals narrow and fragile; stamens $\frac{1}{2}$ in. long.

Native of the Balearic Isles; introduced to Britain from Majorca in 1714. This curious plant, quite different in its warted leaves from all other cultivated *Hypericums*, is, unfortunately, not hardy except in the warmer parts of the country. It flowers from June to September.

H. BUCKLEYI, *Curtis*.

(Garden and Forest, 1891, fig. 91.)

A dwarf, deciduous, semi-woody plant forming a dense rounded tuft of slender, angled stems, 6 to 10 ins. high. Leaves $\frac{1}{4}$ to 1 in. long, oblong or obovate, rounded at the apex, tapered at the base. Flowers one or three at the end of the shoot, bright yellow, $\frac{1}{2}$ to 1 in. diameter; petals narrowly obovate; sepals leaflike, spreading in the fruiting stage.

This charming little shrub is one of the rarest of N. American plants, being confined in a wild state to a few mountain tops in N. Carolina and Georgia. It was introduced to Kew in 1893, but had been discovered fifty years before. Of too fragile and delicate a nature to hold its own in an ordinary shrubbery, it is on the other hand admirably adapted for some nook of the rock garden, where it makes gay little patches in July. It produces abundant seed. Under cultivation its leaves and flowers are considerably larger than in wild examples, and its dainty character is apt to be spoilt by too rich a soil. (See *densiflorum*.)

H. CALYGINUM *Linnaeus*. ROSE OF SHARON, AARON'S BEARD.

(Bot. Mag., t. 146.)

A low, nearly evergreen shrub, with a creeping root-stalk and erect, obscurely angled, unbranched stems, 12 to 18 ins. high. Leaves rich bright green, ovate oblong, 2 to 3 ins. long, slightly odorous, with little or no stalk.

Flowers solitary, rarely in pairs, at the top of the stem, 3 to 4 ins. across, bright yellow; petals obovate; sepals green, roundish, $\frac{1}{4}$ in. long; stamens in five bundles, yellow, $\frac{1}{4}$ to 1 in. long, very numerous; styles five.

Native of the Orient. Introduced in the latter part of the seventeenth century, this has proved so well adapted to our climate as to have become naturalised in some parts of the country. On the whole, it is the most useful and not far from the most beautiful of Hypericums, admirable for making a dense carpet on the ground in half-shaded places beneath trees, etc., where most shrubs would not thrive, flowering from the end of June to September. In hard winters it loses much of its foliage, and in any case, if a clean level growth is desired, it is best to cut the old stems down to the ground just as the new growths are pushing from the base in spring. Propagated with the greatest ease by dividing up the plants.

H. CHINENSE, *Linnaeus*.

A tender, quite woody species only hardy in the milder parts of the kingdom, growing about 2 ft. high; stems round. It has evergreen, narrow-oblong leaves, stalkless, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{1}{2}$ to 1 in. wide. Flowers either solitary or in terminal cymes of three to seven, bright yellow, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. across; stamens in five bundles, some as long as the petals; styles united to form one slender tapering column $\frac{1}{2}$ to $\frac{3}{4}$ in. long, divided at the top into five radiating stigmas.

Native of China; introduced in 1753; often used as a greenhouse plant, but I have seen it thriving out-of-doors in the Grayswood Hill garden, near Haslemere, flowering in September. Worth trying in the south and west.

H. DENSIFLORUM, *Pursh*.

(Garden and Forest, 1890, fig. 67.)

An evergreen shrub, 2 to 4 ft. high (6 ft. in its native state); branches erect, two-angled. Leaves 1 to 2 ins. long, usually less than $\frac{1}{4}$ in. wide, linear-lanceolate, recurved at the edges. Flowers very numerous, in compact cymose panicles; each flower $\frac{1}{2}$ in. across. Fruit three-celled, slender, $\frac{1}{4}$ in. long, subtended by the five oval-oblong, spreading sepals.

Native of the pine-barrens from New Jersey to Florida, and Kentucky west to Arkansas and Texas. It is a near ally of the commoner *H. prolificum*, but is smaller in flower and narrower in leaf; its fruit also is more slender. Some botanists have regarded them as forms of one species. The following arrangement will help towards the identification of the rather confused American species:—

FRUIT THREE-CELLED; STYLES THREE; FLOWERS STALKLESS.

1. *Aureum*.—Flowers $1\frac{1}{2}$ ins. across.

FRUIT THREE- SOMETIMES FOUR-CELLED; STYLES THREE; FLOWERS STALKED.

2. *Galioides*.—Leaves very narrow (see desc.); sepals linear.
3. *Buckleyi*.—Habit dwarf, compact; flowers up to 1 in. wide.
4. *Prolificum*.—Habit tall, erect; flowers 1 in. across.
5. *Densiflorum*.—Habit tall, erect; flowers $\frac{1}{2}$ in. across.

FRUIT FIVE-CELLED; STYLES FIVE.

6. *Lobocarpum*.—Habit tall, erect; flowers $\frac{2}{3}$ to $\frac{3}{4}$ in. wide; leaves green.
7. *Kalmianum*.—Dwarfer; flowers $\frac{2}{3}$ to 1 in. wide; leaves glaucous.

All these species have free stamens, being thereby distinguished from the Asiatic species, which have them in bundles, usually five bundles to each flower.

H. ELATUM, Aiton.(H. grandifolium, *Choisy*; H. multiflorum, *Hort.*)

A sub-evergreen shrub, up to 5 ft. high, with slightly angled, branching stems. Leaves aromatic when crushed, deep green, $1\frac{1}{2}$ to 3 ins. long, ovate, blunt or rounded at the tip. Flowers borne in abundant cymes at the ends of the shoots and in the axils of the terminal leaves, one to three flowers in each final subdivision of the inflorescence; each flower yellow, 1 in. across, with three long styles; sepals ovate, reflexed in fruit. Fruit dark brown, at first rather pulpy like that of *H. Androsæmum*, but longer and more tapered at the top.

Native of the Canary Islands, but now naturalised in some of the milder parts of the British Isles, e.g., the counties of Cornwall, Argyll, Perth, and Down. It is sometimes confounded with *H. Androsæmum*, but is amply distinguished by the aromatic, smaller foliage, the tapering fruit, and especially the much longer styles. (See also *H. hircinum*.)

H. EMPETRIFOLIUM, Willdenow.

(Bot. Mag., t. 6764.)

A dwarf evergreen shrub, up to 12 or 15 ins. high, with slender, erect, angled branches. Leaves produced occasionally in pairs, but usually three at each joint; $\frac{1}{4}$ to $\frac{1}{2}$ in. long, linear, with the margins curled under; stalkless. Flowers in an erect panicle, producing three cymes in each tier; each flower $\frac{1}{2}$ to $\frac{3}{4}$ in. across, pale golden yellow; sepals small, oblong, with black glands on the margin. Fruit a three-celled capsule $\frac{1}{4}$ in. long, with the spreading sepals attached at the base.

Native of Greece and the islands of the Grecian Archipelago; introduced to the Hammersmith nursery of Messrs Lee in 1788. It is a rather tender plant, and will survive only our mildest winters without protection. But for the warmer counties few more charming dwarf shrubs could be found. Even in cooler districts it is well worth the little protection it requires. Flowers from late July to September. Sometimes confounded with this species is

H. CORIS, Linnæus (Bot. Mag., t. 6563).—This is a semi-shrubby species, native of the south of France, Italy, and the Tyrol, but never reaching so far eastward as *H. empetrifolium*. It has erect stems, with linear leaves 1 in. long, produced in whorls of four to six. Panicle terminal, with three to five flowers at the end of each of its whorled branches; each flower $\frac{3}{4}$ in. across, golden yellow. It is known to have been cultivated in England in 1640. From *H. empetrifolium* it differs in the more numerous leaves at each whorl; its sepals being erect instead of spreading at the fruiting stage; and in its less woody character. It is also tender.

H. GALIODES, Lamarck.

(Garden and Forest, 1897, fig. 55.)

An evergreen bush, 2 to 3 ft. high, of broad, compact habit, and with round (not angled) stems, much branched towards the top. Leaves from $\frac{3}{4}$ to 2 ins. long, $\frac{1}{8}$ in. or less wide; dark green dotted with pellucid glands; margins recurved. Flowers $\frac{1}{2}$ to $\frac{3}{4}$ in. across, yellow, borne in cymes both terminal and axillary on the many branchlets, and thus transforming the end of each branch into a large panicle of flowers 6 to 10 ins. long and 3 to 4 ins. wide; sepals and petals narrow. Styles and cells of seed-vessel three; calyx linear, as long as the fruit.

Native of the eastern United States from Delaware to Florida; introduced to the Jardin des Plantes at Paris about 1790, but almost lost sight of until 1897, when it was reintroduced to Kew from the Arnold Arboretum. It commences to flower in July and continues until October. Its very narrow leaves and terete stems distinguish it among allied species. (See *densiflorum*.)

H. HIRCINUM, *Linnaeus*.

An almost evergreen, semi-woody plant, usually 2 to 3 ft., sometimes 4 ft. high, with erect, two-angled stems much branched towards the top. Leaves with a goat-like odour when crushed, ovate, stalkless, 1 to $2\frac{1}{2}$ ins. long. Cymes terminating the stem and its numerous branches; on strong shoots borne in the leaf-axils also. Flowers $1\frac{1}{2}$ ins. across, bright yellow, stamens $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long; styles three, rather shorter than the stamens. Fruit three-celled, $\frac{1}{4}$ in. long, tapered.

Native of the middle and southern latitudes of Europe and the Mediterranean region; introduced in 1640. It is now established in some parts of Britain, an escape from gardens. The only *Hypericum* with which it is likely to be confused is *H. elatum*, but besides its distinctive odour *H. hircinum* has longer stamens and styles, smaller leaves, later flowers, and the sepals fall away from the fruit. It flowers from early August to October. A very hardy, handsome plant.

Var. MINOR.—Of dwarf, compact, and more rounded habit, about 1 ft. high; leaves smaller. Very dainty.

H. HOOKERIANUM, *Wight*.

(*H. oblongifolium*, *Hooker*; Bot. Mag., t. 4949.)

A tall, erect species, 3 to 5 ft. high in cultivation, 8 ft. high in nature; evergreen or partly deciduous according to the locality and winter; branchlets not angled. Leaves 1 to 3 ins. long, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. wide; ovate, round or pointed at the tip. Flowers in a terminal cymose cluster, six or more together; each flower (of which there is usually but one at a time open) 2 ins. across, rather cup-shaped owing to the concave shape of the full, broad, overlapping petals. Stamens in five bundles.

Native of the Sikkim Himalaya and the mountains of Assam; originally introduced to cultivation by Thomas Lobb, from near Mufflong, in Assam. It is the handsomest and most vigorous of the North Indian species, hardier than *patulum*, but liking a sheltered place. It flowers from early August to October. It is apt to become gaunt in habit, and naked at the base with age, and should be renewed from seed when that condition arrives. From its two allies, *patulum* and *lysimachioides*, it differs in the branchlets being terete, especially just beneath the inflorescence.

H. INODORUM, *Willdenow*.

An elegant shrub, 3 to 4 ft. high, evergreen, with long, slender, usually unbranched stems compressed or slightly two-winged towards the top, and luxuriantly leafy (the leaf-pairs from $\frac{1}{4}$ to 1 in. apart). Leaves oblong or ovate, 1 to 2 ins. long, dull dark green, rounded at the apex, inodorous. Flowers small compared with the size of the plant, and wanting in beauty; often solitary at the end of the shoot, but on strong shoots produced in small terminal clusters; they are $\frac{3}{4}$ or 1 in. across, with narrow, fragile petals, linear sepals, and three styles; stamens longer than petals.

Native of E. Europe and the Caucasus. In its graceful arching habit and strong vigorous growth this species is attractive, but it is one of

the most disappointing in its flowers, which appear a few at a time from July to September. It has a creeping root-stalk, and eventually forms a large dense thicket; it is thus easily increased by division.

H. KALMIANUM, *Linnaeus*.

(Garden and Forest, 1890, fig. 24; Bot. Mag., t. 8491.)

An evergreen bush, 2 to 3 ft. high, with angled branches. Leaves glaucous green, 1 to 2 ins. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; narrow-oblong or oblanceolate, dotted with transparent glands. Flowers produced in small cymes at the end of the branch and in the axils of the terminal leaves; $\frac{3}{4}$ to 1 in. across, bright yellow; sepals $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit ovate, five-celled.

Native of Eastern N. America, where it is confined to the cliffs of rivers and lakes from the Falls of Niagara northwards; said now to have become rather rare. It is named after Peter Kalm, the famous Swedish naturalist and traveller who discovered it in 1750. Nine years later it was introduced to England, but appears to have disappeared from cultivation for a long period, the plants so-called being always *H. prolificum*. Mr Dunbar, of the Parks Dept., Rochester, N.Y., has recently sent to Kew seeds of the true plant. *H. prolificum* has narrower petals and not so handsome a flower, also a three-celled fruit. (See *densiflorum*.)

H. LOBOCARPUM, *Gattinger*.

(Garden and Forest, 1897, fig. 57.)

A free-growing shrub, 3 to 6 ft. high, with erect, angled branches. Leaves narrowly oblong or oblanceolate, 1 to $2\frac{1}{2}$ ins. long, scarcely stalked, margins decurved. Flowers in dense cymes forming large leafy panicles; yellow, about $\frac{1}{2}$ in. across; sepals about $\frac{1}{2}$ in. long, styles five; fruit five-celled. Blossoms in August and September.

Native of the south-eastern United States in N. Carolina and Tennessee; introduced in 1898. It has very much the aspect of *prolificum*, but differs in its five-celled fruit. (See *densiflorum*.)

H. LYSIMACHIOIDES, *Wallich*.

An evergreen or semi-evergreen shrub up to 4 ft. in height, but cut to the ground at Kew in severe winters and not likely to grow so high; branchlets angled. Leaves ovate, pointed, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, glaucous beneath. Flowers in terminal cymes, each flower 1 to $1\frac{1}{2}$ ins. wide; petals bright golden yellow; sepals $\frac{1}{2}$ in. long, linear-lanceolate; stamens very numerous, in five bundles.

Native of the west Himalaya; introduced to France in 1894 by Mr Maurice de Vilmorin, and to England ten years later. At Bitton, near Bristol, it thrives admirably, forming a graceful bush 3 or 4 ft. high, and flowering abundantly. It is nearly allied to *H. patulum*, but differs in its narrow sepals and smaller flowers.

H. MOSERIANUM, *Andr *.

(Garden, Dec. 17, 1898—coloured plate.)

A hybrid between *H. patulum* and *H. calycinum*, raised in Mr Moser's nursery at Versailles about 1887. It is a dwarf plant of tufted habit, sending up arching, reddish shoots each year 1 to $1\frac{1}{2}$ ft. long. Leaves intermediate between those of the parents and up to 2 ins. long, ovate, rather glaucous beneath. Flowers from one to five in a cluster at the end of the shoot, but not

more than one of each cluster open simultaneously ; each flower 2 to $2\frac{1}{2}$ ins. across, with broad, overlapping, golden yellow petals. Stamens in five bundles.

This is one of the most attractive of the Hypericums, whose only fault is that it is frequently killed back in winter, and when planted in a group, leaves the ground bare until the young growths push again, which is not until May. It is hardier than *H. patulum*, although it has inherited the cymose inflorescence of that species, and thus a great flower beauty. A bed at Kew stood unchanged for twenty years, only protected by dry leaves during hard frost. It flowers from July up to October.

Var. TRICOLOR.—Leaves edged with rose-colour and white. This appeared as a sport on typical *H. Moserianum* in 1891, but is too delicate to be of much value in the open air except in favoured spots.

H. PATULUM, *Thunberg.*

(Bot. Mag., t. 5693.)

A dwarf shrub in this country, but said to grow as much as 6 ft. high in Japan and the Himalaya. Leaves 1 to $2\frac{1}{2}$ ins. long, ovate, deep green above, glaucous beneath. Flowers 2 ins. across, borne in a cyme at the end of the shoot ; petals bright golden yellow, overlapping, roundish ; sepals broadly ovate, $\frac{1}{2}$ in. long. Stamens in five bundles.

Introduced to Kew from Japan by Oldham in 1862 ; a native also of China and the Himalaya. The type is not absolutely hardy, and almost always has its stems cut back to ground-level during the winter. These spring up again the following season from 1 to 2 ft. high, and flower from July to October. After a few years the shoots are apt to become more and more weakly and it becomes necessary to renew the stock from cuttings. The only species with which it can be confounded are : *H. Hookerianum*, from which it differs in the branchlets being two-edged, especially just beneath the flowers ; *H. lysimachioides*, which has narrow, linear-lanceolate sepals ; and *H. uralum*, with flowers half the size.

Var. HENRYI.—A much more robust plant than the type, surviving hard winters uninjured. Leaves larger, thicker in texture ; inflorescence larger, and stems stouter. This fine variety, superior to the type in every way, and one of the best of Hypericums, was introduced to Kew from China in 1898, by Prof. Henry. In general appearance it resembles *H. Hookerianum*, but has the two-edged branchlets of *patulum*.

H. PROLIFICUM, *Linnaeus.*

(Garden and Forest, 1890, fig. 66.)

A stout, erect-growing evergreen bush, 3 to 5 ft. high, the growths of the year but little branched, two-edged especially towards the top. Leaves dark, shining green, narrow-oblong, tapering to a short stalk ; $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{1}{2}$ in. wide, dotted with numerous transparent glands. Flowers in terminal clusters and in the leaf-axils near the end of the shoot ; each flower about 1 in. across, bright yellow. Fruits three-celled.

Native of the eastern and Central United States ; introduced about the middle of the eighteenth century. Under cultivation it is the healthiest and most vigorous of the American species, although not so handsome in flower as *H. aureum*. It bears enormous crops of fruit. Allied to *H. densiflorum*, it differs in its larger leaves and flowers ; and from *H. Kalmianum* and *H. lobocarpum* (which have five-celled fruits) its three-celled ones distinguish it. Commencing to flower in July, it continues for six or eight weeks. (See *densiflorum*.)

H. URALUM, *Don.*(Bot. Mag., t. 2375 ; *H. patulum* var. *uralum*, *Koehne.*)

A semi-evergreen shrub, 2 to 3 ft. high, with slightly two-edged, much-branched stems. Leaves ovate or oval, 1 to $1\frac{1}{2}$ ins. long, dull green above, glaucous green beneath ; with a faint orange-like aroma when crushed. Flowers produced during August and September in terminal cymes of three to fifteen flowers, each flower 1 in. across, golden yellow ; petals round, concave, overlapping ; sepals roundish oval, green, $\frac{3}{16}$ in. long ; stamens in five bundles, styles five ; fruit five-celled.

Native of Nepal ; introduced in 1820. The specific name has nothing to do with the Ural Mountains ; it is an adaptation of the Nepalese name for this shrub, "Urala swa." Nearly allied to *H. patulum*, it is a much freer-growing shrub, with thinner leaves and a hardier constitution, but it is not so handsome in flower.

HYSSOPUS OFFICINALIS, *Linnaeus.* HYSSOP. LABIATÆ.

A low, partially evergreen, aromatic bush, quite woody at the base, $1\frac{1}{2}$ to 2 ft. high ; shoots erect, green, square, covered when young with minute down. Leaves opposite, linear or narrowly oval, $\frac{1}{3}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{16}$ to $\frac{1}{4}$ in. wide ; tapered at both ends, very minutely toothed, or roughened at the edges, rich green, glandular-punctate on both surfaces. Flowers produced in close, axillary whorls on the shoots of the year, forming a terminal panicle, and commencing to open about midsummer and continuing until September. From six to twelve or more flowers appear in each whorl, and they of a bluish purple shade in the type, about $\frac{1}{2}$ in. long, two-lipped. The leaves and young shoots have a pleasant mint-like scent.

Native of S. Europe, in the Mediterranean region, and W. Asia. Cultivated as a medicinal herb in England since 1548, probably long before. An infusion of hyssop is an old-fashioned remedy for removing phlegm. It is an easily cultivated plant requiring a warm, light soil, and is easily increased by cuttings during the summer and autumn. There is a white-flowered variety.

IDESIA POLYCARPA, *Maximowicz.* BIXACÆ.(Bot. Mag., t. 6794 ; *Polycarpa Maximowiczii*, *Linden.*)

The genus *Idesia* consists, so far as is at present known, of one species, a medium-sized, deciduous tree, and commemorates E. I. Ides, a Dutchman who travelled in China early in the eighteenth century. The branches of *I. polycarpa* usually grow out from the trunk horizontally, and the younger ones have a large core of pith. Leaves dark green and quite smooth above, glaucous beneath, and hairy at the base where the main veins join the stalk ; heart-shaped, contracted at the apex to a short point, rather distantly toothed, and ordinarily about 6 ins. long by 5 ins. wide, but occasionally half as large again ; leaf-stalk usually three-

fourths as long as the leaf. Flowers yellow-green, without petals, in terminal panicles; unisexual, and produced on different trees. Male panicles 5 or 6 ins. long, each flower $\frac{1}{3}$ in. across, the usually five sepals covered, like the flower-stalks, with a short brownish down; stamens numerous. Female flowers smaller, and in a longer, looser panicle than the males, with similar but smaller sepals, and a prominent globular ovary. Fruits hanging like a bunch of small grapes, each berry about the size of a pea, globular, containing numerous seeds



IDESIA POLYCARPA.

lying in pulp; at first green, the berries become dark brown, finally a deep red.

This interesting tree was first made known to Europeans by R. Oldham, the Kew collector, who found it in Japan in 1862-3; it is a native also of China. Soon after, it was introduced to Europe by way of St Petersburg, and was already in the famous arboretum at Segrez in 1869. In general appearance it suggests a *Catalpa*, but the leaves are thicker and not so large. It grows very well in a loamy soil, and is hardy at Kew, where it flowers in June and July and produces fruit annually. As a flowering tree it has no claims to notice, but the fruits make it interesting, and, if the autumn be fine enough to enable them to reach their final stage of colouring, distinct and handsome. Seeds ripen on the Continent, whence they can be obtained, and germinate freely. They afford a better means of increase than cuttings.

ILEX. HOLLY. AQUIFOLIACEÆ.

A very large genus of deciduous and evergreen trees and shrubs found in almost all parts of the habitable globe except Western N. America and Australasia. In gardens they are best known by the evergreen group, especially by *I. Aquifolium* and its numerous forms. They have very frequently angular young shoots; leaves alternate, stalked. Flowers of little or no beauty, small, often dull white, produced in the leaf-axils, the males and females usually on separate plants. Petals and stamens four to six. Fruit although commonly called a "berry," really a drupe, usually red or black, with a thin, fleshy outer layer, surrounding one to several nutlets—generally termed "seeds."

The most valuable hollies are undoubtedly those with evergreen foliage, but the deciduous ones, especially those earlier known under the generic name of *PRINOS*, are sometimes handsome in fruit. Owing to the frequently unisexual character of the plants, these often fail to appear if both sexes are not grown. All the species like a moist, loamy soil. (For propagation, see under *I. Aquifolium*.)

I. AQUIFOLIUM, *Linnaeus*. COMMON HOLLY.

An evergreen tree, up to 80 ft. high, of very leafy, much-branched habit, forming naturally a dense pyramidal mass; branchlets often clothed more or less with minute dark down. Leaves glossy dark green, 1 to 3 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide; very variable in size, outline, and tothing. Ordinary seed-raised young trees have very wavy leaves with large, triangular, outstanding teeth $\frac{1}{2}$ in. long; but as they increase in height the leaves of the upper branches become less spiny, until finally the tops of good-sized trees will be found almost wholly furnished with quite entire leaves. The spines are no doubt a means of protection against browsing animals, and are no longer needed when the trees become tall. But even very large trees retain their spininess on the lower branches. Flowers small, dull white, short-stalked, fragrant; produced during May and June, clustered in the leaf-axils. Berries round, red, $\frac{1}{4}$ in. diameter, containing two to four nutlets. The common holly may be either male, female, or bisexual.

Native of Europe (including Britain, where it is found wild in all parts except the north-east of Scotland) and W. Asia. The common holly is on the whole the most useful of evergreen trees and shrubs. For providing shelter nothing else equals it, because of its habit of keeping dense near the ground; and during the dark months a holly tree well laden with its bright red fruit is one of the handsomest and most cheerful objects our winter landscape provides. It makes the best of all evergreen hedges.

The holly does not transplant well, and unless it be removed with a considerable amount of soil attached to its roots, this operation can only be done safely either about the end of September or in May, when root-activity has commenced. If the roots have been injured in transplanting, it is a good plan to proportionately reduce the top growth by as much as one-half (see chapter on Transplanting). The common holly should be raised from seed. Being slow of germination it is advisable, as with *Cratægus*, to mix the berries with sand or fine earth in a heap, which should be exposed for a year to all weathers and turned occasionally. This rots the outer covering and allows the two to four nuts or seeds each fruit contains to separate. They are then

sown (soil and seed together) shallowly. The varieties do not come true from seed, and have to be propagated by cuttings or by grafting. Cuttings are best made of thin side twigs about 4 ins. long, with a heel attached, and placed in mild heat. They will also take root under a handlight out-of-doors, but are slower. Grafting is done in spring on the seedlings of the type.

Cultivated, as it has been, for hundreds of years in Britain, the common holly has sported into an enormous number of varieties, most of them handsome, some curious, and a few worthless. An unfortunate practice, commenced long ago when they were few in number, has obtained of giving them cumbersome Latin names when colloquial ones would have served quite as well. A representative selection of these varieties is given below.

There is in Europe a well-marked group of evergreen hollies of which *I. Aquifolium* may be taken as the type, which includes also *I. Perado*, *I. platyphylla*, and its variety *balearica*. The origin of many garden hollies is not known or recorded, but it appears certain that some of the European hollies mentioned, chiefly perhaps the Balearic one, have been concerned in the production of the great race of garden varieties known to-day. Those with large, flattish, often less spiny and less glossy leaves show most strongly the influence of the Balearic holly; those with smaller, very polished, undulated leaves have inherited a greater proportion of characters from *I. Aquifolium*, or, like the variegated sorts, are branch sports from it.

It may be remarked that all variegated hollies whose variegation is in the centre of the leaf have a strong tendency to "run out," that is, to revert to the green sorts from which they originally sprang, and it is necessary to cut out the green twigs as they appear. The marginally variegated ones do not show such a tendency.

Var. *ALTAOLERENSIS*. Highclere Holly.—Leaves dark, slightly glossy green, up to $4\frac{1}{2}$ ins. long, 3 ins. wide; bark purplish; spines variable. One of the big-leaved group; male. The holly called "nobilis" scarcely differs from this.

Var. *ARGENTEA MARGINATA*. Silver-leaved.—Leaves up to 3 ins. long and 2 ins. wide, dark green in the centre with a silvery margin. There are about half a score forms included under this variety, all with white leaf margins amongst them:—*A. MARGINATA ERECTA*, centre of leaf mottled green; and *A. MARGINATA PENDULA* (Perry's weeping), branches pendulous.

Var. *ARGENTEA MEDIO-PICTA*. Silver Milkmaid.—Leaves dark green, with a large blotch of creamy white in the centre. Male and female.

Var. *ARGENTEA REGINA*. Silver Queen.—The best white variegated sort; young wood purplish, the variegation clear and broad. A male.

Var. *AUREA MARGINATA*. Gold-leaved.—This variety, like the "Silver-leaved," includes some half a score forms; they are all distinguished by the leaves having an unequal margin of yellow.

Var. *AUREA MEDIO-PICTA*. Golden Milkmaid.—A fine variety, the leaves very wavy at the margin, and the centre golden, with only a thin irregular margin of green. Male and female.

Var. *AUREA PENDULA*. Golden weeping.—A pendulous variety with purple bark, the dark green centre of the leaf surrounded by a margin of gold.

Var. *AUREA REGINA*. Golden Queen.—Probably the finest of all variegated golden hollies. Leaves up to $3\frac{1}{2}$ ins. long, $2\frac{1}{4}$ ins. wide, margined with deep yellow; some leaves wholly yellow. Male.

Var. *CAMELLIÆFOLIA*.—One of the very finest of green hollies. Leaves dark burnished green, oblong, the largest 5 ins. long and 2 ins. wide, mostly without spines, but sometimes with one to eight spines. Female.

Var. *CHINENSIS*, *Loesener*.—A wild Chinese form of *I. Aquifolium*; introduced by Wilson in 1901, and later. Leaves ovate-lanceolate, 3 to $4\frac{1}{2}$ ins. long, $1\frac{1}{2}$ ins. wide, very spiny. Distinct from common holly in the long narrow leaves.

Var. *CRASSIFOLIA*. Leather-leaf Holly.—An extraordinary variety, with thick, purple young branches. Leaves $1\frac{1}{2}$ to 2 ins. long, $\frac{3}{4}$ to $\frac{7}{8}$ in. wide, very thick and leathery, the triangular spines $\frac{1}{8}$ to $\frac{1}{4}$ in. long. It has no beauty, but is remarkably curious. Female.

Var. *CRISPA*. Screw-leaved.—Bark purple. Leaves spirally twisted and contorted, some having several spines; but mostly with few or none. One of the least ornamental. Var. *CRISPA PICTA*, is a form of it, blotched with yellow in the centre. Male.

Var. *DONNINGTONENSIS*. Donnington Holly.—An elegant variety with purple bark, glossy, dark purplish green narrow-oblong leaves, with a lance-shaped apex, 2 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, with a few large spines or none. Male.

Var. *FEROX*. Hedgehog Holly.—Bark purple. Leaves small, and besides having the usual marginal spines, armed with curious clusters or bands of them on the surface; male. Var. *FEROX ARGENTEA* is similar, but the spines and margin are white. Var. *FEROX AUREA*, leaves with the spines and margin green, the centre yellow.

Var. *FISHERI*. Fisher's Holly.—A fine green-leaved form; largest leaves 4 ins. long by $2\frac{3}{4}$ ins. wide; formidably armed with large spines. Male.

Var. *FLAVESCENS*. Moonlight Holly.—Leaves as in common holly, but suffused with yellow, especially when young. Female.

Var. *FRUCTU LUTEO*.—Yellow-fruited. Most of the red-berried species of *Ilex* have yellow-fruited varieties. This does not differ from the type, except in this respect. Female.

Var. *HANDSWORTH NEW SILVER*.—One of the best of the white-margined hollies; bark purple; leaves up to $3\frac{1}{2}$ ins. long, very dark green, the margin clear white, and armed with large spines. Female.

Var. *HASTATA* (*kewensis*).—A curious green-leaved variety of no beauty; bark purple; leaves $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, narrow, the basal part armed with disproportionately large spines.

Var. *HODGINSII*.—One of the hybrids between *Aquifolium* and perhaps *balearica*. Leaves roundish ovate, dull dark green, up to 4 ins. long. A very striking green, berry-bearing variety of vigorous habit.

Var. *LATISPINA*.—Bark purple; leaves green, ovate, 2 to 3 ins. long, marked by a long, slender, deflexed point, and one or more irregularly-placed, slender spines on the margin, $\frac{1}{4}$ to $\frac{3}{4}$ in. long; very distinct.

Var. *LAWSONIANA*.—Leaves dullish green, up to $3\frac{1}{2}$ ins. long, ovate or oval, rather spiny, the centre marked with a large irregular blotch of yellow. A striking holly, but very apt to revert to the green form, known as *HENDERSONI*.

Var. *MARNOCKII*.—A fine holly in the way of *camelliæfolia*, but with proportionately broader leaves, somewhat twisted, entire or armed with large spines. Female.

Var. *MONSTROSA*.—Resembling *latispina*, with the apex and spines of the same character, but with more of the latter—often four or five down each side.

Var. *MUNDYI*.—A vigorous, striking variety belonging to the hybrid group, showing *platyphylla* or *balearica* influence. Largest leaves 4 ins. by $2\frac{1}{2}$ ins. wide, dullish green, oval or roundish oval; the margins set regularly with short, slender spines, the surface rugose. Male.

Var. *MYRTIFOLIA*.—Leaves small, mostly about $1\frac{1}{2}$ ins. long by $\frac{1}{2}$ to $\frac{5}{8}$ in. wide, well armed with slender spines; sometimes larger and less spiny.

Var. *OVATA*.—A very distinct and pleasing sort; bark purple. Leaves especially thick and leathery, dark glossy green, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, ovate, very regularly armed on the margin with short outstanding spines. Male.

Var. *PENDULA*. Weeping.—Like the common holly, but with rather stiffly arching and pendulous branches. A striking lawn tree. (For the variegated "Perry's weeping," see *argentea marginata*.)

Var. *RECURVA*.—A dwarf kind with small, very spiny leaves, dark green, ovate, 1 to $1\frac{1}{4}$ ins. long, the midrib much decurved, the blade also twisted. Male.

Var. *SCOTICA*.—A very distinct sort, with lustrous deep green oval leaves up to 3 ins. long, remarkable for the entire absence of marginal spines; the apex is sometimes spine-tipped, usually blunt. Female.

Var. *SCOTICA AUREA*.—Has a central blotch of yellow; a sport from the above; raised by Paul of Cheshunt.

Var. *SHEPHERDII*.—A fine holly in the way of *Hodginsii*, but with bright green leaves, the largest of which are 4 ins. long, $2\frac{1}{2}$ ins. wide.

Var. *SMITHII*.—Of the same type as *donningtonensis*, but without the intense purple bark and purple tinge in the leaves of that variety. Male.

Var. *WATERERIANA*. Waterer's Holly.—A dwarf compact kind usually wider than high, and dense in habit. Leaves often quite without marginal spines or only a few; dark green with a rich yellow border. Male.

Var. *WILSONI*.—One of the finest of the *platyphylla* or *balearica* hybrids. Leaves only slightly glossy, up to 5 ins. long by nearly 3 ins. wide, well armed at the edges with spines $\frac{1}{4}$ in. long. Female.

I. CORNUTA, *Lindley*. HORNE HOLLY.

(Bot. Mag., t. 5059.)

An evergreen shrub, 8 to 10 ft. perhaps more high; of bushy, dense, rounded habit, and usually wider than high; young shoots smooth, pale, and somewhat angular the first year. Leaves leathery, dark glossy green, $1\frac{1}{2}$ to 4 ins. long, 1 to 3 ins. wide; of variable shape, but usually more or less rectangular, often comparable in outline to a flying bat, with four large spines at the corners representing the outstretched limbs; there is, in addition, always a terminal spine usually much decurved, and frequently one or two pairs of smaller spines at the sides. The number of spines therefore varies from five to nine, and they are rigid and needle-pointed; but on the upper branches of old specimens the spines are fewer or absent, as in the common holly; stalk $\frac{1}{8}$ in. or less long. Flowers small, dull white, produced in axillary clusters in April. Fruit round, red, larger than in common holly, borne on a stalk $\frac{1}{3}$ to $\frac{5}{8}$ in. long.

Native of China; found by Fortune near Shanghai, and sent by him to Messrs Standish of Bagshot in 1846. It is still a rather uncommon plant, although quite hardy in the London district. Of comparatively slow growth, and of neat compact habit, it is suitable for positions where many evergreens would soon become too large. Its distinct and handsome foliage also makes it interesting, but it bears fruit only shyly.

I. CRENATA, *Thunberg*. JAPANESE HOLLY.

An evergreen shrub, usually 3 to 6 ft. high, of very dense, rigid, compact habit; young shoots angular, and covered with minute dark down. Leaves crowded, oblong-lanceolate, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{8}$ to $\frac{1}{4}$ in. wide; tapered at the base to a short stalk, sharply pointed and with a few fine incurved teeth at the margins; glossy green, and of hard texture. Flowers dull white; fruit black.

Native of Japan; introduced to Europe about 1864. It is not easy to ascertain what is the typical form of this holly, but the one above described is what is commonly regarded as such—very distinct in its close habit and small leaves, and rarely more than 3 or 4 ft. high. But the two following are very distinct hollies from Japan also attributed to this species.

Var. *MAJOR* (syn. *elliptica*).—A small tree, occasionally 20 ft. high, with

box-like, oval leaves, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{4}$ to $\frac{5}{8}$ in. wide, minutely round-toothed. Fruit black, round, $\frac{1}{4}$ in. diameter, on stalks $\frac{1}{4}$ in. or less long. By some this is regarded as Thunberg's type.

Var. *MARIESII* (*Ilex Mariesii*, *Veitch*).—Whilst var. major represents one extreme of this variable species, var. *Mariesii* represents the other. It is a very stiff-habited, extraordinarily dwarf holly, with stunted twigs hidden by orbicular or broadly ovate leaves about $\frac{1}{4}$ in. wide, sometimes entire, sometimes with a pair of shallow teeth near the apex. Fruits black, on stalks $\frac{1}{2}$ in. long. Interesting for the rock garden as a pigmy. Introduced for Messrs Veitch by Maries about 1879. It only grows part of an inch a year. Perhaps a distinct species.

Var. *VARIEGATA*.—A form with leaves of the same shape and size as the type, but spotted or blotched with yellow, sometimes wholly of that colour.

Ilex crenata in all its forms is a popular shrub in Japan. It is used largely for clipping into fantastic shapes, also as a dwarf hedge. I have been told by a traveller that so dense and hard are some of these flat-topped hedges there, that a man can walk along the top of them. It can be increased by cuttings, and is quite hardy.

I. DECIDUA, *Walter*.

(*I. prinoides*, *Aiton*.)

A deciduous shrub, usually 5 to 10 ft. high, occasionally a small tree up to 30 ft. in the southern parts of its habitat; shoots smooth and covered with a grey bark. Leaves oval or narrowly obovate, tapered at both ends, often blunt at the apex, shallowly round-toothed; 1 to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide; of firm texture, smooth except along the midrib; stalk downy, $\frac{1}{6}$ to $\frac{1}{3}$ in. long. The leaves are often crowded on short lateral spurs. Male flowers on slender stalks $\frac{1}{2}$ in. long; females on shorter ones. Fruits round, orange to scarlet, $\frac{1}{4}$ in. diameter.

Native of the south-eastern United States; introduced in 1760. It occasionally bears a good crop of its berries, which are very persistent on the branches. The branches do not break into leaf until May, and the fruits formed the previous autumn are then still remaining. From the red-fruited *I. verticillata* and *I. lævigata*, this differs in having the nutlets many-ribbed; in the others they are smooth. Its habit of producing short spurs crowded with leaves and flowers also gives it a distinct aspect.

I. DIPYRENA, *Wallich*. HIMALAYAN HOLLY.

An evergreen tree, ultimately 40 ft. or more high, the angular young shoots and winter buds minutely downy. Leaves oblong or narrowly oval, tapered at the base, slenderly pointed and spine-tipped, 2 to 5 ins. long, $\frac{3}{8}$ to $1\frac{1}{2}$ ins. wide; dull, opaque green, leathery; stalk $\frac{1}{4}$ in. or less long. Like the common holly it is very spiny on the margins when young, but as the plant attains maturity the spines become fewer and finer, and ultimately the leaves of the upper branches become entire. Flowers very numerous, in dense round clusters in the leaf-axils. Fruits oval, red, large for a holly, commonly two-seeded.

Native of the Himalaya. Whilst inferior to the common holly as an ornamental evergreen, both in the lack of lustre on the foliage, and as rarely bearing fruit, this species is interesting and worth growing for its distinctness. There is an example at Kew over 20 ft. high and 17 ft. through, which makes a handsome specimen. I have never known this tree injured; even the great frosts of February 1895 did not affect it. But in a young state the species is susceptible to intense cold, and the Kew tree was killed back to ground-level in 1867.

I. ELLIPTICA (I. dipyrena var. elliptica, *Dallimore*).—Although commonly regarded as a form of the common holly, this is, no doubt, a variety or (more likely) a hybrid of the Himalayan one, which in general appearance it closely approaches, the leaves being a dull green, although shorter and comparatively broader.

I. FARGESII, *Franchet*. FARGE'S HOLLY.

An evergreen small tree, up to 15 or 20 ft. high, quite devoid of down in all its parts. Leaves narrow-oblong or narrowly oblanceolate, 2 to 5 ins. long, $\frac{3}{8}$ to $\frac{5}{8}$ in. wide; slenderly tapered and entire towards the base, more abruptly tapered towards the apex, where are a few incurved teeth; dull green; stalk $\frac{1}{3}$ to $\frac{1}{2}$ in. long, reddish. Fruit red, globose, often in threes or fours in the leaf-axils, $\frac{1}{4}$ in. diameter; stalk $\frac{1}{8}$ in. long, reddish.

Native of W. China, in the province of Szechuen; introduced by Wilson for Messrs Veitch in 1900. It is not a species of great promise as an ornamental evergreen, but is remarkably distinct in its long, narrow, opaque leaves. On young plants they are more toothed towards the base than in adult ones.

I. GLABRA, *A. Gray*. INKBERRY.

(*Prinos glaber*, *Linnaeus*.)

An evergreen shrub, 2 to 5 ft. high, with erect branches, densely leafy; young shoots angular, minutely downy. Leaves narrowly obovate to oblanceolate, entire, or with a few obscure teeth near the apex; $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, $\frac{1}{2}$ to $\frac{5}{8}$ in. wide; dark green above, paler beneath, glossy and smooth on both surfaces; stalk $\frac{1}{3}$ to $\frac{1}{2}$ in. long. Male flowers borne three or more together on a slender stalk; females solitary; both very small. Fruit round, black, $\frac{1}{4}$ in. diameter.

Native of Eastern N. America; introduced in 1759. Emerson says this shrub is occasionally found 8 or 9 ft. high, but it is very slow-growing, and plants I know to be forty years old are only 3 or 4 ft. high. It is a neat-habited evergreen, quite unarmed, but of no particular merit, and rather like a *Phillyrea*.

I. INSIGNIS, *Hooker fil.*

It is unfortunate that this splendid holly can only be grown in the milder parts of the British Isles. At Kew it has to be given the protection of a cool greenhouse. It is a small evergreen tree without any down; branchlets stout, silvery grey, lustrous. Leaves oblong, inclined to ovate; 5 to 9 ins. long, 2 to $2\frac{1}{2}$ ins. wide; slender-pointed, tapered at the base, armed at the edges with small spine-tipped teeth; dark dull green; midrib pale green, prominent; stalk $\frac{3}{4}$ to 1 in. long, purplish. Fruit bright red, roundish oval, $\frac{2}{3}$ in. long, scarcely stalked.

Native of Sikkim at 6000 to 8000 ft. In a small or seedling state it is quite distinct, the leaf-margins being wavy and formidably armed with numerous spiny teeth $\frac{1}{4}$ to $\frac{1}{3}$ in. long, pointing different ways.

I. INTEGRAL, *Thunberg*

(*Othera japonica*, *Hort.*)

An evergreen tree, 30 to 40 ft. high in Japan, about half as high at present in this country; pyramidal when young; young shoots angled, smooth. Leaves obovate or oval, $1\frac{1}{2}$ to 4 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide, tapered more

gradually to the stalk and to the blunt apex ; margin quite devoid of teeth or spines ; dark glossy green ; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Fruit deep red, globose, nearly $\frac{1}{2}$ in. diameter.

Native of China, Japan, and Corea ; introduced in 1864. This is distinct from the large-leaved hollies in the entire absence of spines on the leaves of either old or young plants. It is a handsome evergreen, slightly tender when raised from seed the first one or two winters, but perfectly hardy afterwards. Specimens that bear fruit are at Osborne, Isle of Wight ; Abbotsbury, in Dorset ; Enys, in Cornwall ; and, no doubt, in other places also

I. LÆVIGATA, *A. Gray*. SMOOTH WINTERBERRY.

(*Prinos lævigatus*, *Pursh*.)

A deciduous shrub, 6 to 8 ft. high ; young shoots smooth. Leaves narrowly oval, obovate or lanceolate, tapered at both ends ; $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide ; finely pointed, obscurely toothed, pale green and glossy on both surfaces, and smooth except sometimes for a little down along the veins beneath ; stalk $\frac{1}{4}$ in. or less long. Male flowers on slender stalks $\frac{1}{3}$ to $\frac{1}{2}$ in. long ; female ones on very short stalks ; calyx glabrous. Fruit orange-red, $\frac{1}{3}$ in. diameter, solitary.

Native of the eastern United States ; introduced in 1812. This is not so well known in gardens as *I. verticillata*, nor is it perhaps so ornamental with us. It is closely allied to that species, under the notice of which some distinctions are pointed out. It may be added here that the leaf-stalks are generally shorter and the fruits larger in *I. lævigata*. Both species affect low, wet situations in a wild state.

Var. *HERVEYI*, *Robinson*.—Fruits yellow.

I. LATIFOLIA, *Thunberg*. TARAJÓ.

An evergreen tree, occasionally 50 to 60 ft. high in Japan, rarely more than 20 ft. high in this country ; young shoots very stout, $\frac{1}{3}$ in. diameter, angular, not downy. Leaves very thick, dark lustrous green, oblong ; 4 to 8 ins. long, $1\frac{1}{2}$ to 3 ins. wide ; tapered about equally at both ends, the marginal teeth shallow and not spiny ; the under-surface is rather yellow ; stalk $\frac{1}{2}$ to 1 in. long. Fruit red, globose, $\frac{1}{3}$ in. diameter, crowded in considerable numbers on short axillary racemes.

Native of Japan ; introduced to Europe by Siebold in 1840. Although this species is hardy at Kew it does not succeed very well. But a few miles to the south it thrives admirably in favourable situations ; there are fine specimens at Claremont and at Leonardslee, and no doubt still larger ones in Devon and Cornwall ; at Chaddlewood, Plympton, it is over 20 ft. high. Sargent regards it as the handsomest broad-leaved evergreen of Japan.

I. MACROCARPA, *Oliver*.

(*Hooker's Icones Plantarum*, t. 1787.)

There is not much to be said as yet about this holly. It is a native of Szechuen and Hupeh in China, and was introduced by Wilson during his third expedition to China in the autumn of 1907, when collecting for Harvard University. It is a tree up to 50 ft. high, deciduous ; its branchlets and leaves perfectly glabrous on cultivated plants. Leaves oval to ovate, $2\frac{1}{2}$ to 4 ins. long, $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. wide ; broadly wedge-shaped at the base, shortly acuminate, finely and shallowly toothed, dark green above, glossy green beneath. These

characters are taken from plants raised from seed in the spring of 1908. In wild specimens the leaves are larger; the flowers are described as appearing one to three together, and the fruit is $\frac{3}{8}$ in. diameter. It appears to be quite hardy, and grows vigorously.

I. MONTICOLA, *A. Gray*. MOUNTAIN HOLLY.

A deciduous shrub (sometimes a tree in a wild state), with smooth young stems. Leaves ovate to oval, with a long, tapering, lanceolate point, and a wedge-shaped base, sharply toothed; 2 to 5 ins. long, $\frac{3}{4}$ to $2\frac{1}{4}$ ins. wide; pale green, smooth, or downy only on the midrib and veins; stalk slender, $\frac{1}{4}$ to $\frac{3}{8}$ in. long. Flowers white, the males crowded at the end of short spur-like branches, or in the leaf-axils of the previous year's growth, along with two or three leaves; the females short-stalked, fewer, often solitary. Fruit globose, bright orange red, $\frac{3}{8}$ in. across, borne on stalks about $\frac{1}{4}$ in. long.

Native of the eastern United States from New York State southwards. It is allied to *I. decidua*, having the fruits red, the seeds many-ribbed at the back, and leaves often clustered on short spurs, but *I. decidua* has round-toothed leaves usually widest above the middle, and blunt at the apex. Introduced to Kew from N. Carolina in 1899, but possibly in cultivation earlier.

I. OPACA, *Aiton*. AMERICAN HOLLY.

An evergreen tree, sometimes 40 to 50 ft. high in a wild state, with a trunk 6 to 9 ft. in girth, resembling the common holly in habit; young shoots minutely downy. Leaves dull green above, yellow-green beneath, oval, tapered more abruptly at the base than at the spine-tipped apex; $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, half as wide; the margins armed with broad, spine-tipped teeth, which tend to disappear from the uppermost leaves of adult specimens; stalk grooved, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, minutely downy. Male flowers in three- to nine-flowered, slender-stalked cymes; females usually solitary; all small, dull white; calyx-lobes edged with minute hairs. Fruit red, round, $\frac{1}{4}$ in. diameter, on a stalk about as long.

Native of the eastern and Central United States; introduced in 1744. In gardens this species is only likely to be confused with the Himalayan *I. dipyrena*, which has similarly opaque, evergreen foliage, but that species has longer narrow leaves with shorter stalks, and much shorter-stalked, more congested flower-clusters. The fruit also is larger. *I. opaca* sometimes bears fruit very freely in this country, and is then ornamental, but it is never so attractive as our common native species. The largest specimen I know is at Kew, 25 ft. high, two-thirds as wide.

Var. *XANTHOCARPA*, *Rehder*.—Fruits yellow; has been found wild in Massachusetts. Introduced in 1901.

I. PEDUNCULOSA, *Miquel*.

An evergreen shrub, or a tree up to 20 or 30 ft. high; young shoots smooth. Leaves unarmed, ovate or oval, tapering or rounded at the base, slender pointed, margins entire; $1\frac{1}{2}$ to 3 ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; dark glossy green and smooth; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. The chief peculiarity of this holly is the length of the fruit-stalk, which is 1 to $1\frac{1}{2}$ ins. long, so that the bright red fruits, each $\frac{1}{4}$ in. across, stand out conspicuously.

Native of Japan; introduced by Sargent in 1893. It is probably not now in cultivation, although it ought to be hardy.

Var. *CONTINENTALIS*, *Loesener*.—Introduced by Wilson to the Coombe Wood nursery from Hupeh, China, in 1901 and 1907, this differs from the

Japanese type in having leaves up to 4 or 5 ins. long, and a minutely ciliate calyx. It is apparently quite hardy. There is a line of minute down on the midrib above, and the young plants at Coombe Wood have the leaves inconspicuously toothed—perhaps a juvenile character only.

I. PERADO, *Aiton.*

(Loddiges' Botanical Cabinet, t. 549.)

An evergreen tree, hardy in the warmer parts of the kingdom, with deep green leathery leaves of variable shape, oval, ovate or obovate; 3 to 5 ins. long, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. wide; sometimes entire, sometimes with spiny teeth, the apex often blunt or rounded. Berries deep red, roundish oval, $\frac{1}{8}$ in. in diameter, on stalks about as much long, crowded in the leaf-axils.

Native of the Canary Islands and the Azores; cultivated in Britain since 1760. It thrives very well in the Isle of Wight and in Ireland, and no doubt elsewhere, but like *I. platyphylla* is confounded with *I. Aquifolium*. It may have hybridised with that species, and thus become a parent of some of the large-leaved, less spiny garden hollies. It differs from *I. Aquifolium* in the distinctly winged leaf-stalk, at each side of which beneath there is a groove. The spines also are much shorter.

I. PERNYI, *Franchet.*

An evergreen small tree, occasionally 20 to 30 ft. high in a wild state, more often a shrub half as high; branches stiff, densely furnished with leaves, and clothed with a short dense pubescence when young. Leaves squarish at the base, with a long triangular apex and two large spines, and often a smaller one, at each side; $\frac{3}{8}$ to 2 ins. long, $\frac{3}{8}$ to 1 in. wide; dark glossy green, leathery; stalk $\frac{1}{2}$ in. long, at first downy like the young shoot. Flowers pale yellow, produced in minute axillary clusters, the sepals roundish and edged with minute hairs. Fruit stalkless or nearly so, red, roundish oblong, $\frac{1}{4}$ in. diameter.

Native of Central and W. China; discovered in 1858 by the Abbé Perny; introduced by Wilson for Messrs Veitch in 1900. It appears to be widely spread and common in certain parts of China. It bears most resemblance to *I. cornuta*, but its smaller leaves, with the apices much more elongated, and its downy shoots distinguish it. Its habit, in a young state at least, is slenderly pyramidal and very shapely, and altogether it is a charming addition to dwarf, slow-growing evergreens. Paul Perny, after whom it is named, was a courageous French missionary who worked in the province of Kiuchu between 1850 and 1860. He was the first naturalist who explored that province, which he is said to have originally entered in the guise of a Chinese beggar.

Var. *VEITCHII*, *Hort.*, has larger and especially broader leaves.

I. PLATYPHYLLA, *Webb.* CANARY ISLAND HOLLY.

An evergreen tree, 30 or more ft. high, of densely leafy, bushy habit, young shoots minutely scurfy or downy. Leaves broadly oval, very stiff and leathery, rounded or tapered at the base, usually pointed and spine-tipped at the apex, 3 to 6 ins. long, 2 to $3\frac{1}{2}$ ins. wide; the margins set with short spines, irregular in number and size, often entire; stalk $\frac{1}{2}$ in. long, covered with scurfy down. Fruits deep red, $\frac{3}{8}$ in. diameter, on stalks $\frac{1}{4}$ in. long.

Native of the Canary Islands, cultivated in Britain since 1760. From *I. Aquifolium* it is not very easy to distinguish this species in words, although it is distinct enough in general appearance. Its leaves are larger and duller,

the teeth are smaller, the leaf-stalk flatter and the blade less undulated at the margin. It is pretty certain that either it or *balearica*, a geographical variety mentioned below, share in a greater or less degree the parentage of many garden hollies, especially those with big, flattish, rather dull-surfaced leaves. The true platyphylla of Webb (different from the holly so called in gardens.) is probably tender.

Var. *BALEARICA* (*I. balearica*, *Desfontaines*).—Leaves ovate or oval, 2 to 3½ ins. long, 1 to 2 ins. wide, stout and dark green; spines usually few and irregular or absent. Female plant in gardens. Native of the Balearic Islands and S. Spain.

Var. *MADERENSIS*.—Leaves ovate or oval, 2½ to 3½ ins. long, bright green, the margins uniformly spiny, the spines pointing forwards. Very close to *balearica*. A variegated holly known as *MADERENSIS VARIEGATA*, with an irregular yellow blotch in the centre, is probably a hybrid in whose origin *I. Aquifolium* has a share, as indicated by the large spines and wavy margin.

Var. *NIGRESCENS*.—A fine dark green variety, the largest leaves of which are 4 ins. long by 2¾ ins. wide, ovate, sparsely and irregularly spiny. A male.

I. SERRATA, *Thunberg*.

(*I. Sieboldii*, *Miquel*.)

A deciduous shrub, up to 12 or 15 ft. high, with spreading branches; young shoots angled, zigzag, minutely downy. Leaves oval and ovate to somewhat obovate; tapered at both ends, usually more slenderly at the apex; finely toothed, 1 to 3 ins. long, ½ to 1 in. wide; dull green above, and soft with minute down when young, becoming smooth later; covered with a more conspicuous, persistent down and prominently veined beneath; stalk ½ in. or less long; downy. Flowers inconspicuous in axillary clusters. Fruit red, globose, ½ in. diameter.

Native of Japan; apparently introduced for the first time in 1893 to Kew from Yokohama, but known in the United States since about 1866. It is quite hardy, and bears good crops of fruit. It has very much the aspect of the North American *I. verticillata*, but is not so ornamental, the fruits being smaller and scarcely so bright; its leaves are also more finely toothed. Sargent observes that the leafless branches are sold in immense quantities in Tokyo for house decoration; for this purpose they are admirably suited, as the berries hang on and retain their colour a long time.

Var. *LEUCOCARPA*.—Fruits white; leaves shorter and broader. Introduced in 1893.

I. VERTICILLATA, *A. Gray*. BLACK ALDER WINTERBERRY

(*Prinos verticillatus*, *Linnaeus*.)

A deciduous shrub, 6 to 10 ft. high, of spreading habit; young shoots smooth. Leaves oval, obovate, or lanceolate, tapered at both ends; 1½ to 3 ins. long, ½ to 1 in. wide; shallowly and often doubly toothed; smooth above, downy beneath, especially on the midrib and veins; stalk ¼ to ½ in. long. Male flowers in clusters of six or more in the leaf-axils; female ones fewer. Calyx edged with small hairs. Fruits often solitary or in pairs, bright red (or, in var. *CHRYSOCARPA*, *Robinson*, yellow), ½ in. diameter, round.

Native of Eastern N. America; introduced in 1736. This is the most ornamental of the American deciduous hollies, and is frequently very showy in autumn with the glossy scarlet berries, which are in full colour before the leaves fall. The only species with which it is likely to be confused is *I. laevigata* (*q.v.*), a species which has also red fruits and is deciduous. It

differs from this by its smooth or nearly smooth leaves; its long, slender-stalked male flowers; its calyx margins not being hairy; and by its solitary fruits. *I. verticillata* is somewhat variable, and American botanists distinguish the following varieties:—

Var. *CYCLOPHYLLA*, *Robinson*.—Leaves small, roundish, rather clustered at the end of the twig, finely downy on the veins beneath.

Var. *PADIFOLIA* (*Prinos padifolius*, *Willdenow*).—Leaves downy all over the lower surface.

Var. *TENUIFOLIA* (*Prinos tenuifolius*, *Torrey*).—Leaves thinner and less downy than in the type. Female flowers more often solitary.

I. VOMITORIA, *Aiton*. CASSENA.

(*I. Cassine*, *Walter*—not *Linnaeus*.)

An evergreen shrub, sometimes a small tree, 15 to 20 ft. high; young shoots rigid, spreading, covered with a minute down. Leaves smooth, glossy dark green, narrowly oval or inclined to ovate, tapered at the base, bluntish at the apex, the margin shallowly and remotely toothed; $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; stalk $\frac{1}{12}$ to $\frac{1}{8}$ in. long, downy like the young wood. Flowers produced in axillary clusters on the year-old wood, the males numerous and on stalks $\frac{1}{8}$ in. long; females solitary or in pairs. Fruit scarlet, round, $\frac{1}{2}$ in. diameter.

Native of the south-eastern United States; introduced in 1700. A neat evergreen shrub something like a *Phillyrea* in appearance, but incapable of withstanding our hardest winters.

I. YUNNANENSIS, *Franchet*.

An evergreen shrub, ultimately 10 to 12 ft. high, with bright green branchlets covered with outstanding down which persists two years. Leaves of a beautiful brownish red when quite young, becoming glossy green with age, ovate, rounded at the base, acutely pointed, round-toothed, $\frac{3}{4}$ to $1\frac{1}{8}$ ins. long, rather more than half as wide. Fruit about $\frac{1}{4}$ in. diameter, red.

Native of W. China; introduced by Wilson about 1901, and since cultivated in the Coombe Wood nursery. It has not yet flowered under cultivation, but is worth growing as a neat, cheerful-looking evergreen. It was first discovered by Delavay, afterwards by Henry. It is allied to *I. crenata*, but the leaves are more leathery, the branches more downy, and the fruit red.

ILICIMUM. ANISE TREES. MAGNOLIACEÆ.

A small genus of evergreen shrubs or small trees allied to *Magnolia*, with an agreeable aromatic odour resembling that of aniseed. Leaves alternate, entire. Fruit starlike, the carpels being borne round a central axis. Two species are grown out-of-doors in the British Isles, one from the S.E. United States, the other from China and Japan. Both are rather tender. They prefer a partially peaty soil, especially until well-established, and can best be propagated by layers.

I. FLORIDANUM, *Ellis*. POISON BAY.

(*Bot. Mag.*, t. 439.)

A shrub 6 to 8 ft. high, of compact, much-branched habit. Leaves 3 or 4 ins. long, lance-shaped to narrowly oval, tapered at both ends, entire, leathery,

smooth. Flowers borne singly near the end of the shoots, each one composed of from twenty to thirty strap-shaped, pointed petals, $\frac{3}{4}$ to 1 in. long, maroon-purple. Fruit a little over 1 in. wide.

Native of the southern United States ; first found by Bartram in W. Florida in 1766, and introduced to England five years later. A small specimen has lived outside for a long time without protection in the Coombe Wood nursery, where it stands on a sunny slope, but as a rule near London it requires the shelter of a wall or some winter covering. It is really best adapted for Cornwall and places with a similar climate. The whole plant is permeated with an agreeable aromatic fragrance.

I. RELIGIOSUM, *Siebold.*

(Bot. Mag., t. 3965.)

A shrub or small tree, the young branches of which are smooth, green spotted with brown. Leaves 2 to 3 ins. long, $\frac{3}{4}$ to 1 in. wide, narrowly oval, blunt at the apex, tapering at the base to a short, thick stalk. Flowers about 1 in. across, produced singly or in pairs from the leaf-axils, not fragrant. Petals narrow, numerous (up to thirty), pale greenish yellow.

Native of Japan and China ; introduced in 1790. Flowers from March to May. Hardy in Cornwall, Scilly, the south of Ireland, etc., this, near London, is suitable for a wall or specially sheltered spot. The leaves and wood have a strong aromatic and agreeable fragrance. This shrub was long thought to be the "star anise" of the Japanese and Chinese, but that tree is really quite a different species, now known as *I. VERUM*. (See J. D. Hooker in *Bot. Mag.*, t. 7005.) *I. religiosum* thrives well at Leonardslee.

INDIGOFERA. LEGUMINOSÆ.

A large genus of herbs and shrubs, notable in containing the indigo plant (*I. tinctoria*). Of the shrubby species a few may be grown out-of-doors in Britain, but the shoots in our climate, although woody, are usually of only annual duration, unless given the protection of a wall. Leaves pinnate ; flowers pea-shaped, and produced in axillary racemes. Pod long and narrow.

The four species here included are all handsome plants, requiring a good, but not a heavy, loamy soil, and a sunny position. They are increased by cuttings made of half-ripened shoots placed in a close, slightly heated frame. The cuttings should be kept under glass the first winter, remaining in their pots until spring.

I. DECORA, *Lindley.*

(Bot. Mag., t. 5063.)

A low deciduous shrub, 1 to 2 ft. high, perhaps more in mild districts. Stems reddish brown, slender, bearing pinnate leaves 4 to 6 ins. long at intervals of 1 to 1½ ins. Leaflets in three and a half to six and a half pairs on each leaf ; 1 to 2½ ins. long, $\frac{1}{2}$ to 1 in. wide ; ovate-lanceolate to oval, with a short, abrupt, bristle-like tip ; smooth above, furnished beneath with fine hairs attached by the centre. Racemes 6 ins. long, produced in the leaf-axils, twenty to forty flowers on each. Flowers $\frac{3}{8}$ to $\frac{3}{4}$ in. long, each borne on a

slender stalk $\frac{1}{4}$ in. long, the oblong standard petal white, lined with pale crimson towards the base ; wing-petals pink. Calyx with broadly triangular lobes.

Native of China and perhaps Japan ; introduced about 1845 by Fortune,



INDIGOFERA DECORA.

who found it growing in the gardens of Shanghai. It is a charming dwarf shrub, flowering freely in July and August, its shoots being mostly cut back to the ground in winter. It is not adapted for rough treatment, and should be given a front place in the shrubbery, or even a place in the rock garden.

I. GERARDIANA, *Wallich.*(I. Dosua, *Lindley*, in *Bot. Reg.* 28, t. 57—not *Hamilton*.)

A deciduous shrub with downy, slightly-ribbed branches. At Kew, where it is almost invariably cut back to the ground each winter, it sends up a dense thicket of erect, scarcely branched shoots 2 to 4 ft. high, clothed from top to bottom with leaves. Where the climate is milder the shoots survive, and it then becomes a much-branched shrub, perhaps 6 or 8 ft. high. On a wall at Kew it is 10 ft. high. Leaves pinnate, 2 to 4 ins. long, composed of six to ten pairs of leaflets and an odd one; leaflets $\frac{3}{8}$ to $\frac{5}{8}$ in. long, obovate or oval, clothed with grey appressed hairs on both sides, the apex notched or rounded and having a short bristle-like tip. Racemes produced from the leaf-axils in succession from below upwards, on the terminal part of the shoot. They are 3 to 5 ins. long, bearing short-stalked, pea-shaped flowers $\frac{1}{2}$ in. long, rosy purple, two dozen or more on each raceme. Calyx downy, with lance-shaped lobes. Pod deflexed when ripe, $1\frac{1}{2}$ to 2 ins. long, $\frac{1}{8}$ in. wide, cylindric, six- to ten-seeded.

Native of the north-western Himalaya. Commencing to blossom about the end of June, and continuing until the end of September, having also foliage of great beauty and luxuriance, this is one of the most ornamental of late-flowering shrubs. It has the disadvantage of starting late into growth, and it is not until June that the stools become well furnished. For this reason it is not suitable for planting alone in masses. It likes abundant sunshine, and does not flower so freely in dull seasons.

I. HEBEPETALA, *Benth.*

(Bot. Mag., t. 8208.)

A deciduous shrub, growing about 4 ft. high at Kew, but considerably taller where it is not cut back during winter; stems smooth, except when quite young. Leaves pinnate, 7 to 9 ins. long, with usually seven to nine (occasionally eleven) leaflets, which are oblong, broadly oval or slightly ovate, short-stalked; 1 to $2\frac{1}{2}$ ins. long, half as much wide; rounded or notched at the apex, smooth above, the appressed hairs beneath attached by their middle. Racemes 3 to 9 ins. long, produced from the leaf-axils of the terminal part of the shoot, and developing in succession as it lengthens: Flowers closely set, twenty to sixty on one raceme, each $\frac{1}{2}$ to $\frac{5}{8}$ in. long, the standard petal crimson, wing and keel petals rose-coloured. Pod $1\frac{1}{2}$ to 2 ins. long, cylindric, smooth, carrying eight to ten seeds.

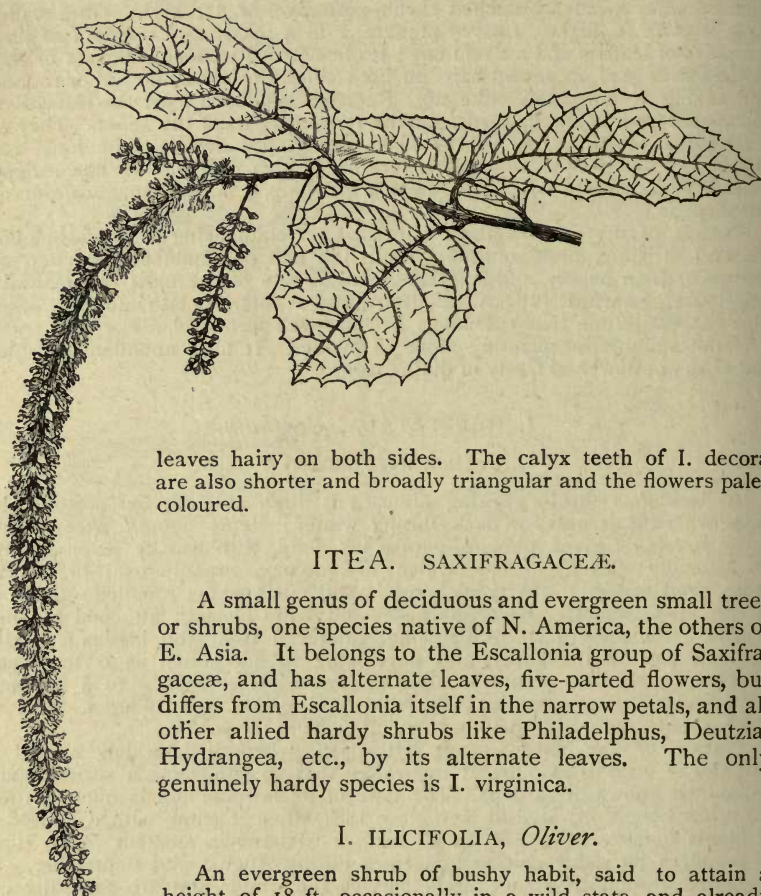
Native of the north-western Himalaya, where it is widely spread at altitudes of 6000 to 8000 ft. It is strange that so handsome a shrub should be so little known in gardens. The date of its introduction is not recorded, but it has been cultivated at Kew since 1881, when it came with a collection of plants bequeathed by Mr J. C. Joad, a well-known amateur of his time. It produces its richly coloured racemes during August and September. In the open ground its stems rarely survive the winter, and are generally cut back to the old woody stool, a new crop springing up in early summer.

I. KIRILOWI, *Maximowicz.*

A shrub or sub-shrub, with erect stems, which are slightly hairy when very young, soon smooth and somewhat angular. Leaves pinnate, 4 to 6 ins. long, composed of usually seven to eleven leaflets which vary in shape from roundish to broadly oval, obovate, or rhomboidal, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, wedge-shaped or rounded at the base, tapered at the apex, and terminated by a

fine bristle-like elongation of the midrib; bright green above, both surfaces furnished with pale flattened hairs. Racemes erect, about 5 ins. long, the flowers crowded on the upper half; rose-coloured, $\frac{3}{4}$ in. long; calyx slightly hairy, and with sharp, unequal, lance-shaped lobes. Pod $1\frac{1}{2}$ to 2 ins. long, $\frac{1}{6}$ in. wide.

Native of N. China, Manchuria, and Korea; not very common in cultivation. It is allied to *I. decora*, but is distinguished by the shorter, broader



ITEA ILICIFOLIA.

leaves hairy on both sides. The calyx teeth of *I. decora* are also shorter and broadly triangular and the flowers paler coloured.

ITEA. SAXIFRAGACEÆ.

A small genus of deciduous and evergreen small trees or shrubs, one species native of N. America, the others of E. Asia. It belongs to the Escallonia group of Saxifragaceæ, and has alternate leaves, five-parted flowers, but differs from Escallonia itself in the narrow petals, and all other allied hardy shrubs like Philadelphus, Deutzia, Hydrangea, etc., by its alternate leaves. The only genuinely hardy species is *I. virginica*.

I. ILICIFOLIA, *Oliver*.

An evergreen shrub of bushy habit, said to attain a height of 18 ft. occasionally in a wild state, and already 6 to 8 ft. high in this country; stems quite smooth. Leaves holly-like but thinner, broadly oval, 2 to 4 ins. long, $1\frac{1}{2}$ to $2\frac{3}{4}$ ins. wide, the apex short-pointed; dark glossy green above, paler below, both surfaces smooth, except for tufts of hair in the axils of the chief veins beneath; margins armed with stiff spiny teeth; stalk $\frac{1}{4}$ to $\frac{1}{2}$ in. long. Racemes pendulous, arching, 6 to 12 ins. long, $\frac{1}{2}$ in. wide, crowded with greenish white flowers; petals narrow, $\frac{1}{6}$ in. long. Blossoms in August.

Native of W. China; discovered by Henry, and first raised from seeds sent by him to the late Lord Kesteven, with whom it flowered at Casewick in 1895.

It is not hardy at Kew, and can only be regarded as suitable for the warmer part of the British Isles, although it may succeed on walls in colder districts. Easily increased by cuttings of fairly ripened wood with a heel. Its foliage is handsome, and its racemes elegant.

I. VIRGINICA, *Linnaeus*.

(Bot. Mag., t. 2409.)

A deciduous shrub, 3 to 5 ft. high, with erect, smooth, clustered stems, branched only towards the top. Leaves narrowly oval or oblong, tapering at both ends, $1\frac{1}{2}$ to $3\frac{1}{2}$ ins. long, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide; bright green and smooth above, paler and slightly hairy beneath, chiefly on the midrib and veins; margins set with fine, regular teeth; stalk $\frac{1}{2}$ to $\frac{1}{4}$ in. long, downy, grooved on the upper side. Flowers fragrant, creamy white, $\frac{1}{2}$ to $\frac{1}{2}$ in. across, produced very close together on slender, erect, cylindrical, downy racemes 3 to 6 ins. long and about $\frac{3}{8}$ in. through, terminating short, leafy twigs; each flower is on a downy stalk, $\frac{1}{2}$ in. long. Petals narrow, $\frac{1}{4}$ in. long; calyx downy, with five linear, pointed lobes half as long as the petals. Seed-vessels brown, dry, $\frac{1}{4}$ in. long, downy.

Native of the eastern United States, usually affecting moist places; introduced in 1744. This is a pretty shrub, and useful in flowering during July. The leaves often remain on the plant until December. It sends up its erect, slender stems one summer, which branch copiously near the top the next, each twig producing a raceme at the end. It may be increased by means of cuttings made of moderately ripened wood in July or August, and given gentle heat; but for ordinary garden purposes division of the old plants is quicker and usually sufficient. Pruning should consist of entirely removing sufficient of the older stems to afford light and space for the young ones, by means of which the plant is continually renewing itself from the base. It loves a good soil and abundant moisture.

JAMESIA AMERICANA, *Torrey*. SAXIFRAGACEÆ.

(Bot. Mag., t. 6142.)

A deciduous shrub, 4 to 7 ft. high, of bushy, rounded habit, and usually more in diameter than it is high; branches stout, stiff, very pithy, covered with a bright brown, downy bark, which afterwards peels off in papery flakes. Leaves opposite; on the barren shoots ovate, 1 to 3 ins. long, $\frac{3}{4}$ to 2 ins. wide; coarsely and regularly toothed, with scattered, flattened hairs above; downy, almost felted beneath; on the flowering twigs the leaves are much smaller, and often of more oval outline; stalks downy, $\frac{1}{4}$ to $\frac{3}{4}$ in. long. Flowers slightly fragrant, pure white, $\frac{1}{2}$ in. across, produced during May in erect, terminal pyramidal panicles 1 to $2\frac{1}{2}$ ins. long and broad; petals five, oblong; calyx woolly, with five-pointed ovate lobes; stamens ten.

Native of Western N. America; introduced to Kew in 1862. This interesting and pretty shrub was first found in 1820 by Dr Edwin James, after whom it was named; he was then acting as botanist and historian to Major Long's Expedition to the Rocky Mountains. It can be propagated by cuttings, and, given a sunny position, and an open, not too

rich soil, thrives excellently. It is the only species of the genus. Var. *ROSEA*, *Purpus*, found in S. Nevada, I have not seen.



JAMESIA AMERICANA.

JASMINUM. JASMINE. OLEACEÆ.

Of the large number of species belonging to this genus (over 100), only about six can be cultivated permanently in the open air in Britain. They are either climbers or shrubs of loose, spreading habit, and are either evergreen or deciduous; leaves alternate or opposite, trifoliate or pinnate. Flowers yellow or white, rarely red, usually fragrant; corolla with

a slender, tapering tube, expanding at the mouth into normally five (sometimes more) spreading lobes. The berry-like fruits are normally twin, but frequently only one develops. The species here described may be distinguished as follows:—

A. LEAVES ALTERNATE.

* *Calyx-lobes awl-shaped, about as long as the calyx-cup.*

1. *Floridum*. Leaflets three or five.
2. *Fruticans*. Leaflets never more than three.

** *Calyx-lobes triangular, much shorter than the calyx-cup.*

3. *Humile*. Leaflets three; flowers in clusters of up to four.
4. *Revolutum*. Leaflets three or five, rarely seven; flowers in clusters of six to twelve.
5. *Wallichianum*. Leaflets five to eleven (rarely thirteen); flowers often in triplets.

B. LEAVES OPPOSITE.

* *Flowers yellow.*

6. *Nudiflorum*. Deciduous, winter-flowering; leaflets small.
7. *Primulinum*. Semi-evergreen, spring and summer flowering; leaflets large.

** *Flowers white.*

8. *Officinale*.

Provided the climatic conditions are suitable, the jasmines are easily cultivated; they like a good loamy soil and a sunny position. All are easily increased by cuttings of moderately ripened wood. *Nudiflorum*, *officinale*, and *floridum* are seen at their best on walls; *primulinum* will in most places need winter protection.

A curious jasmine has recently been introduced from W. China by Messrs Bees of Liverpool, who have named it *J. BEESIANUM*. It is a climber of vigorous growth, with slender grooved stems, slightly downy, especially about the joints. Leaves opposite, ovate-lanceolate or lanceolate, $1\frac{1}{4}$ to 2 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, slender-pointed; dull dark green above, grey-green beneath, with short down on both sides; stalk $\frac{1}{8}$ in. or less long. Flowers one to three at the end of the shoot, each $\frac{5}{8}$ to $\frac{3}{4}$ in. long, rose-coloured; calyx-lobes $\frac{1}{4}$ in. long, almost threadlike; flower-stalk $\frac{1}{8}$ in. long. In spite of its unusual colour of flower, this plant has not as yet been attractive.

J. FLORIDUM, *Bunge*.

(Bot. Mag., t. 6719.)

A nearly evergreen shrub of rambling habit; branches angled, smooth. Leaves alternate; mostly composed of three leaflets, but occasionally five, never apparently more. Leaflets oval, sometimes obovate or ovate, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ to $\frac{3}{8}$ in. wide, pointed, smooth. Flowers yellow, in terminal cymose clusters, usually produced from July onwards; corolla $\frac{1}{2}$ to $\frac{3}{4}$ in. long, the lobes five, pointed. Calyx-lobes five, about $\frac{1}{8}$ in. long, awl-shaped. Fruit about the size of a small pea, black.

Native of China; cultivated in that country and Japan; introduced by the Earl of Ilchester about the middle of last century. It was originally discovered in North China, but Henry found it frequently in Central China, about Ichang. It is closely allied to *J. revolutum*, having alternate leaves and yellow flowers, but differs in the longer, more slender calyx-lobes, and in never having more than five leaflets to one leaf. It has long been grown on a wall at Kew, but is not so hardy as *J. revolutum*.

J. FRUTICANS, *Linnaeus*.

(Bot. Mag., t. 461.)

A semi-evergreen shrub, producing a dense mass of slender, erect stems from 3 to 5 ft. high, but thrice as much against a wall; young shoots angular, smooth. Leaves alternate; composed of three leaflets on a common stalk about $\frac{1}{4}$ in. long, or of one leaflet only. Leaflets narrow-oblong or linear-obovate, $\frac{1}{4}$ to $\frac{3}{4}$ in. long, one-third as much wide; tapering at the base, more rounded at the apex, deep green, smooth on both surfaces, but edged with minute hairs. On strong sucker shoots, the leaflets are occasionally twice as large. Flowers yellow, produced from June onwards, usually in threes or fives at the end of short twigs. Corolla $\frac{2}{3}$ in. long and wide; calyx bell-shaped, with five slender lobes. Fruit globose, shining black, the size of a pea.

Native of S. Europe, N. Africa, and Asia Minor; cultivated since the middle of the sixteenth century, perhaps before. The largest plant I have seen is growing on a house front between Kew Bridge and the entrance to Kew Gardens; it covers the wall up to 10 or 15 ft. high. On the hills above Hyères, I have seen it growing abundantly and quite handsome in the fall of the year by reason of the crop of shining black berries. There the shrubs are mostly $1\frac{1}{2}$ to 3 ft. high. In hot seasons it fruits freely in England.

J. NUDIFLORUM, *Lindley*.(Bot. Mag., t. 4649; J. Sieboldianum, *Blum.*)

A deciduous shrub of rambling habit, growing 12 to 15 ft. high against a wall, with long, slender, pendulous, smooth, four-angled branchlets. Leaves opposite, composed of three leaflets borne on a common stalk about $\frac{1}{4}$ in. long. Leaflets oval-oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ ins. long, one-third to half as wide, tapered at both ends, deep lustrous green, not toothed, but furnished at the margin when young with tiny hairs. Flowers bright yellow, $\frac{3}{4}$ to 1 in. diameter, produced from November to February; they are solitary on stalks $\frac{1}{4}$ in. long, clothed with several small, narrow, green bracts. Corolla tubular at the base and nearly 1 in. long, spreading into six divisions. Calyx-lobes six, linear, pointed.

Native of China; introduced by Fortune for the Horticultural Society in 1844. A very hardy plant, of great value in gardens because of its habit of flowering during the very darkest months. No plant does so much to lighten up in midwinter dull suburban streets of London, and the fact that it will thrive in such places adds much to its worth. It blossoms best against a sunny wall, but, after warm summers especially, flowers very freely in the open ground. A pleasing arrangement is to plant it in association with *Berberis Aquifolium*, against whose purplish winter-shade of leaf the leafless flower-laden sprays of this jasmine are peculiarly bright and effective.

Var. *FOLIIS AUREIS* has leaflets blotched with yellow.

J. OFFICINALE, *Linnaeus*. COMMON JASMINE.

(Bot. Mag., t. 31.)

A deciduous, or nearly deciduous, climbing shrub, making shoots 6 ft. or more long in one season, and ultimately, if carefully trained, reaching 40 ft. in height; young shoots very slender, angled, smooth or soon becoming so. Leaves opposite, pinnate, composed of five, seven, or nine leaflets, which are $\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, $\frac{1}{6}$ to 1 in. wide; slightly downy at or about the margin, the terminal one much the largest and stalked; side one stalkless. Flowers white, deliciously fragrant, produced from June until October in a terminal

cluster of cymes, each cyme with three or five blossoms. Corolla $\frac{7}{8}$ in. long, and about the same across the four or five spreading lobes. Calyx-lobes almost thread-like, $\frac{1}{2}$ in. long; flower-stalk about 1 in. long. Fruit not regularly or freely produced, black, $\frac{1}{2}$ in. long, solitary or twin.

Var. *AFFINE* (J. *affine*, *Carrière*).—A form with larger flowers and broader calyx-lobes.

Var. *AUREUM*.—Leaflets rather handsomely blotched with yellow, but it is scarcely as hardy as the green type. Loudon mentions a double-flowered variety, but this I have not seen.

Native of Persia, N.W. India, China. The common jasmine (or jessamine) has been cultivated from time immemorial in Britain, and its fragrance and beauty have given it a place in English gardens as secure as that of the lilac or lavender. In the north it is hardy only against a wall or on a roof, but in the south it grows well in the open, where if supported in the early stages and pruned back every spring it will make a self-supporting bush. But perhaps its charm is greatest when allowed to form a loose tangle on a house front, as one may often see it in cottage gardens between London and the south coast. Even in winter the tangle of young stems has a cheerful green effect. A popular perfume is extracted from the flowers.

J. PRIMULINUM, *Hemsley*.

(Bot. Mag., t. 7981.)

An evergreen, rambling shrub, probably 6 to 10 ft. high, forming a dense interlacing mass of branches; young stems four-angled, smooth. Leaves opposite; composed of three leaflets borne on a common stalk about $\frac{1}{2}$ in. long. Leaflets lance-shaped or narrowly oval, 1 to 3 ins. long, $\frac{1}{2}$ to $\frac{3}{4}$ in. wide, short-stalked (the side ones smaller), dark glossy green. Flowers $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. diameter, bright yellow, produced in spring and summer, solitary on stalks $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, and furnished with tiny, green, leaflike bracts. Corolla often semi-double, composed of from six to ten divisions, each $\frac{1}{2}$ to $\frac{1}{2}$ in. wide, rounded at the end. Calyx-lobes usually five or six, narrow, pointed, $\frac{1}{4}$ in. long, smooth or minutely ciliate.

Native of W. China; introduced by Wilson for Messrs Veitch in 1900. As the plant had never been found bearing seed, the collector was obliged to send home living plants by an overland route to Hong-Kong, and thence to England. This jessamine is certainly the most striking of all those that can be grown out-of-doors anywhere in this country, but it is only likely to thrive in the very mildest spots. At Kew, even against a wall, it succumbs to severe frost. The best method of cultivating it is, apparently, to grow it in pots out-of-doors, exposed to full sunshine and generously treated at the root, then to house it and keep it as dry as possible without losing its foliage during the winter. It then makes a fine display in spring. It appears to have found acceptable conditions in middle and south Italy, where I have seen it profusely in flower. It is closely allied to *J. nudiflorum* in all essential characters, but is much larger in all its parts.

J. REVOLUTUM, *Sims*.

(Bot. Mag., t. 1731; Bot. Reg., t. 178.)

A nearly evergreen shrub, not climbing, but of lax, spreading habit; stems not downy, slightly angular, the stoutest among cultivated jasmines. Leaves alternate, composed of usually three or five, sometimes seven leaflets, which are oval or ovate, tapered to both ends, the side ones $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, the terminal one up to 2 ins. or more long, and $1\frac{1}{4}$ ins. wide; all of a dull, very dark

green above, paler and brighter green beneath; stalk of terminal leaflet up to $\frac{1}{2}$ in. long; of the others, very short or absent. Flowers yellow, fragrant, produced in terminal corymbs of six, twelve, or more together. On very vigorous shoots the terminal inflorescence is augmented by two or three axillary ones, making the whole cluster forty- to fifty-flowered, and about 5 ins. across. Corolla $\frac{3}{4}$ to 1 in. across; calyx-lobes about one-third as long as the cup, triangular.

Native of Afghanistan and the north-west Himalaya. It varies somewhat in size of leaf, and the jasmines known in gardens as *J. Reevesii* and *J. triumphans* are this species. It is nearly allied to *J. Wallichianum* (*g.v.*), and like it is sometimes cut back in winter, but as it flowers from June onwards on the shoots of the year this is not of much consequence. Still, a sheltered spot should be given to it. Belonging to the same group of alternate-leaved jasmines with very short calyx-lobes is *J. HUMILE*, *Linnaeus*, a native of S.E. Europe. It is a dwarf plant with nearly always ternate leaves, and one to four flowers on a stalk. It was cultivated by Tradescant in 1656, but being rather tender, and not so ornamental as either *revolutum* or *Wallichianum*, has probably disappeared from cultivation. It used to be known as "Italian iasmine" (*Bot. Reg.*, t. 350).

J. WALLICHIANUM, *Lindley*.

(*Bot. Reg.*, t. 1409.)

A nearly evergreen shrub, with slender, angled, smooth branchlets. Leaves alternate, composed of seven to thirteen leaflets which are lanceolate to ovate, taper-pointed, $\frac{1}{2}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{4}$ in. or more wide; the terminal one much the longest and largest, dark green; both blade and stalk sometimes more or less downy. Flowers yellow, $\frac{3}{8}$ in. long, $\frac{1}{2}$ in. across the rounded, spreading lobes; produced in a cluster at and near the end of the shoot, solitary on the stalk, or often in triplets. Calyx-lobes about one-third as long as the cup, triangular, downy.

Native of Nepal; introduced about 1812. It is most nearly allied to *J. revolutum*, differing in the greater number and smaller size of the leaflets, in the few flowers on the cyme, and in being less robust. Both these species differ from the two other alternate-leaved jasmines in the very short, comparatively broad calyx-lobes.

JUGLANS. WALNUT. JUGLANDACEÆ.

The walnuts, of which eight or nine species are in cultivation, are deciduous trees, or occasionally shrubs, with pinnate leaves aromatically scented. Flowers unisexual, both sexes on the same plant; the male flowers very numerous in slender, pendulous catkins, with many stamens produced in the axil of a lobed scale; female flowers few. The male catkins (rather elegant in the Asiatic species) are borne towards the end of the previous year's shoots; the nut-bearing spike terminates the young shoot of the current season. Fruit a hard-shelled nut, surrounded by a thin or fleshy husk. The cultivated species are from Europe, N. Asia, and N. America, but two or three species of which little is known are found in S. America. The only other genus of trees with which *Juglans* is likely to be confused is *Carya* (the hickories), but among other differences, *Juglans* is distinguished by the pith of the young shoots being in thin transverse plates, thus dividing the hollow portion of the

shoot into a series of chambers, and by the unbranched male catkins. In *Carya* the pith is continuous, and the male catkins three-branched.

In gardens, *Juglans* is seldom represented except by the common walnut, grown for its nuts, and by the black walnut, grown for its stately form and noble foliage. The striking group of North Asiatic species—*cordiformis*, *cathayensis*, *stenocarpa*, etc.—is scarcely known, yet in a young state their leaves are 2 to 3 ft. long. Hopes have been entertained that the same group may prove of value for their edible nuts, which they bear, many together, in clusters, but I do not think that they, or any other species except the common one, will ever be worth growing for the fruit. *J. nigra* and *J. regia* both yield a valuable timber, but the former never appears to have been given a fair trial under favourable conditions as a forest tree in Britain.

Walnuts should always, if possible, be grown from seed, and as they bear transplanting badly, should be given permanent places early. The nuts should be sown as soon as ripe, and not allowed to become dry. All the species like a deep loamy soil. The named varieties of common walnut are propagated by grafting on the type. Some of the species are tender in a young state and apt to be cut by late frost, thus rendering them bushy-topped. It is, in consequence, sometimes necessary to tie up a shoot to form a new leader. The walnut flowers have no colour beauty, and are fertilised by wind; hybrids have been obtained from species growing near to each other. The following have been named:—

J. ALATA, *Carrière* (*J. cinerea* × *regia*).—Young wood downy. Leaflets usually nine, resembling those of *J. regia*, but slightly toothed; downy beneath.

J. PYRIFORMIS, *Carrière* (*J. nigra* × *regia*).—Leaves of nine to thirteen leaflets, finely toothed, smooth beneath, and generally intermediate between the parents; fruit more resembling that of *J. regia*.

J. VILMORINIANA, *Carrière* (*J. nigra* × *regia*).—Foliage as in *J. pyriformis*, but the fruit more resembling that of *J. nigra*. The original of this hybrid is now a noble tree in Mr de Vilmorin's garden at Verrières-le-Buisson, near Paris. It was planted where it stands, in 1816, to commemorate the birth of an eldest son in the de Vilmorin family, and when I saw it a few years ago it was over 90 ft. high, and 10 ft. in girth of trunk.

J. CALIFORNICA, *S. Watson*.

A very large shrub, 10 to 25 ft. high, with numerous stems, or a tree as much as 50 to 70 ft. high, with a distinct trunk. Leaves 6 to 12 ins. long, composed of eleven to nineteen leaflets, which are ovate-lanceolate, $1\frac{1}{2}$ to 4 ins. long, coarsely toothed, taper-pointed, smooth except for tufts of hair in the vein-axils beneath. Male catkins 2 to 4 ins. long; fruit globose, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. wide, with a thin, downy rind; nut smooth, except for shallow grooves running lengthwise.

Native of California; introduced to Kew about the end of last century, but afterwards lost; small plants have been recently obtained from America. This tree is allied to *J. rupestris*, especially its variety major, but it differs in the nut being nearly smooth instead of deeply grooved as in *J. rupestris*. The tree form of this walnut (*J. californica* var. *Hindsii*, *Jepson*) occurs in N. California; the shrubby form in S. California. The species is much used in California as a stock on which to graft the common walnut. Nothing certain can yet be said of its adaptability for British gardens.

J. CATHAYENSIS, Dode.

A tree up to 70 ft. high, with thick young shoots covered the first year with very viscid, gland-tipped hairs, as are also the main-stalks of the leaves, the fruits, and fruit-stalks. Leaves 2 to 3 ft. long, with eleven to seventeen leaflets, which are ovate-oblong, 3 to 6 (occasionally 8) ins. long, half as wide; obliquely rounded or heart-shaped at the base, taper-pointed, finely toothed, dark green and downy above, paler and with starry down beneath; midribs with gland-tipped hairs like those of the main leaf-stalk. Male flowers in pendulous, cylindrical catkins 9 to 15 ins. long. Fruits clustered at the end of a stout stalk about 6 ins. long, egg-shaped, $1\frac{1}{2}$ to $1\frac{3}{4}$ ins. long, pointed. Nut of similar shape, sharply pointed, six- to eight-angled, the angles spiny-toothed; rim $\frac{1}{8}$ to $\frac{1}{6}$ in. thick.

Native of Central and W. China, where it is common. Introduced by Wilson in 1903 to the Coombe Wood nursery, where young trees 8 or 10 ft. high have already borne fruits. Owing to the thickness of the shell, the nuts are of small value for eating, although the kernel is of good flavour. It is a promising, fine-foliaged tree of the same type as *J. mandshurica*; they differ chiefly in the fruit, but the present species is a better grower.

J. CINEREA, Linnæus. BUTTER-NUT.

A tree 50 to 60, rarely 100 ft. high, usually forming a wide-spreading head of branches; young wood covered with a dense, rusty brown, clammy felt, which partly falls away by the end of the season. Leaves 10 to 20 ins. long, composed of seven to seventeen leaflets, which are 2 to 5 ins. long, $\frac{3}{4}$ to $2\frac{1}{2}$ ins. wide; oblong lance-shaped, taper-pointed, obliquely rounded at the base, finely and regularly toothed; upper surface at first hairy, especially on the midrib; lower surface covered with soft, star-shaped hairs; common-stalk thickly furnished with gland-tipped, sticky hairs. Male flowers in catkins 2 to 4 ins. long. Fruits three to five in a drooping cluster, each tapering to a point at the top, rounded at the base, $1\frac{1}{2}$ to $2\frac{1}{2}$ ins. long, covered with sticky hairs. Nut 1 to $1\frac{1}{2}$ ins. long, with a short point; kernel sweet, oily.

Native of Eastern N. America; introduced early in the seventeenth century. Although so long cultivated, this tree is comparatively rare in Britain, and is evidently not so well adapted for our climate as the black walnut, rarely bearing fruit. As a small tree it is quite handsome, but grows slowly. According to Elwes, the largest tree in the country, at Coolhurst, Horsham, is a little over 50 ft. high. From *J. nigra* it differs in its pointed, more numerous fruits, its more downy leaves, and by a transverse tuft of down between the scar left by each fallen leaf and the bud above it.

J. CORDIFORMIS, Maximowicz.

A tree up to 50 ft. high; young shoots stout, covered with brownish glandular hairs. Leaves as in *J. mandshurica* and *Sieboldiana*, except that the leaflets are somewhat more distinctly heart-shaped at the base, but not enough to afford a reliable means of distinction. Male catkins often 1 ft. in length. Fruit globose, $1\frac{1}{2}$ ins. diameter, produced in dense clusters of ten or more. Nut $1\frac{1}{4}$ ins. long, very distinct in shape; it has a broad, rounded, heart-shaped base, and a slender pointed apex, and is much flattened.

Native of Japan, but apparently uncommon in a wild state. Although scarcely distinguishable from its allies, *J. Sieboldiana* and *J. mandshurica*, in growth, it is very distinct from them in the shape of the nuts, which are offered for sale in the markets of Japanese towns. In my experience this

is the best grower of this group of walnuts. A tree at Kew about fifteen



JUGLANS CORDIFORMIS.

years old is 20 ft. high, and produces both male and female inflorescence freely. The former are very striking, although yellowish green. Nuts $1\frac{1}{4}$ in.

long have formed on this tree, and have occasionally matured. It is one of the most striking of pinnate-leaved trees.

J. MANDSHURICA, *Maximowicz*.

A tree 50 to 70 ft. high; young shoots very stout, and like the common stalk of the leaf, clothed with brown, glandular hairs. Leaves $1\frac{1}{2}$ to 2 ft. (in vigorous young trees 3 ft.) long, composed of eleven to nineteen leaflets, which are oblong, taper-pointed, finely toothed, obliquely rounded or slightly heart-shaped at the base; 3 to 7 ins. long, $1\frac{1}{4}$ to $2\frac{1}{2}$ ins. wide. When young, both surfaces are furnished, the lower one especially, with starry tufts of down, much of which afterwards falls away from the upper side. Male catkins 4 to 10 ins. long, slender, pendulous. Fruits clustered several on a stalk, roundish ovoid, $1\frac{3}{4}$ ins. long, covered with sticky down. Nut deeply pitted and grooved, $1\frac{1}{2}$ ins. long, abruptly pointed at the top.

Native of Manchuria, especially in the regions of the Amur and Ussuri rivers, and of N. China; first introduced by Maximowicz to St Petersburg. As a young tree it is, like *J. cordiformis* and *Sieboldiana*, remarkably striking in the size of its leaves. It is closely allied to the latter, but in my experience does not succeed so well; botanically, the chief difference is in the form of the nuts, and the leaves of *J. mandshurica* are distinctly more slenderly pointed.

J. NIGRA, *Linnaeus*. BLACK WALNUT.

A tree 80 to over 100 ft. high, with a wide-spreading head and a tall dark trunk, with deeply furrowed bark; young shoots downy. Leaves 1 to 2 ft. long, composed of eleven to twenty-three leaflets, the terminal odd one often absent. Leaflets fragrant when rubbed; 2 to 5 ins. long, $\frac{3}{4}$ to 2 ins. wide; ovate or oblong lance-shaped, obliquely rounded at the base, long and taper-pointed, unevenly toothed, glossy and smooth above except when quite young, downy beneath; common stalk minutely downy. Male catkins 2 to 4 ins. long. Fruit globose or slightly tapered at the base, solitary on the stalk or in pairs, $1\frac{1}{2}$ to 2 ins. thick, not downy. Nut 1 to $1\frac{1}{2}$ ins. across, broader than long.

Native of the eastern and Central United States; introduced early in the seventeenth century. Next to the common walnut this is the best known in the genus. Its nuts are of no value as food, but it is a more ornamental tree than *J. regia*, thriving almost as well in this country as in any of its native haunts. Trees over 100 ft. exist; the largest I have seen stands in Marble Hill Park, a magnificent tree with a trunk 5 yds. in girth. As a young tree the black walnut is particularly handsome, with its shapely pyramidal habit and large pinnate leaves. One of the most valuable of the world's timber trees, it is now becoming rare in a wild state.

Var. *ALBURYENSIS*, *Jackson*, an interesting variation from the type, grows at Albury Park, near Guildford; this bears its fruits in clusters like *J. cinerea*, sometimes as many as six together, and it is also distinct in its pendulous branches.

J. REGIA, *Linnaeus*. COMMON WALNUT.

A tree 60 to 100 ft. high, with a rounded, spreading head of branches; the bark of the upper branches smooth and ash-coloured; young shoots without down. Leaves somewhat acrid-scented when rubbed, usually 8 to 12 ins. long, on vigorous young growths 18 ins.; composed mostly of five or seven, some-

times nine, rarely eleven or thirteen leaflets. These are oval or ovate, shortly pointed, margins entire; terminal leaflet the largest, 3 to 6 ins. long, the basal pair less than half the length and width; both surfaces smooth except for small tufts of hair in the vein-axils beneath. Male catkins 2 to 4 ins. long. Fruit green, smooth, $1\frac{1}{2}$ to 2 ins. across.

Native of E. Europe and Asia Minor to Afghanistan. The date of its introduction is not known, but it has existed in this country for many centuries. As an ornamental tree the common walnut is not so striking as several other species. It is chiefly grown for its nuts and for its soft, unripe fruits, which are made into a pickle. Its timber is a very valuable one, being perhaps the best obtainable for gunstocks. It is also largely used for furniture and veneering. Numerous varieties of the walnut have sprung up in cultivation:—

Var. *BARTERIANA*.—Nuts almond-shaped.

Var. *HETEROPHYLLA*.—Leaflets long, narrow, irregularly lobed.

Var. *LACINIATA*.—Leaflets very handsomely cut into deep narrow lobes. A handsome foliage tree, superior to var. *heterophylla*.

Var. *MAXIMA* (*macrocarpa*). Bannut or Clawnut.—Nuts about twice the ordinary size, but not good keepers. Probably the same as the “Noyer à bijoux” of the French, so-called because of the large shells being mounted as jewel boxes.

Var. *MONOPHYLLA*, *De Candolle*.—Leaflets reduced in number to a large terminal one and a pair of small ones, the latter often absent.

Var. *PENDULA*.—Branches stiffly pendulous.

Var. *PRÆPARTURIENS*.—A dwarf bushy form, fruiting when quite young; known in orchards as “Prolific.”

Var. *RACEMOSA*, *Duhamel*.—Fruits in clusters of ten to fifteen; known in orchards as “Cluster.”

Var. *RUBRA*.—Flesh of the kernel red, the skin blood-red; found wild in Styria, and said to come true from seed.

Of the above the only one notable as an ornamental tree is var. *laciniata*. Other varieties are cultivated for the qualities of their fruit, such as “Highflyer,” “Meylanaise,” “Mayette,” “Noix St Jean,” “Parisienne”; but a consideration of them is outside the scope of this work. A curious variety known as “thin-shelled” (to the French as “à coque tendre”), has shells so thin that they are easily pierced by birds; in some districts it is valueless on that account.

J. RUPESTRIS, *Engelmann*. TEXAN WALNUT.

A small tree, often semi-shrubby; young shoots covered with short, yellowish down. Leaves 6 to 12 ins. long; leaflets seven to over twenty, lance-shaped or narrowly ovate; 1 to 3 ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; long and taper-pointed, finely toothed, obliquely rounded at the base; when young both surfaces are covered with minute down, which mostly falls away except on the midrib and chief veins; common stalk downy like the young shoots. Male catkins slender, 2 to 4 ins. long. Fruit globose, $\frac{1}{2}$ to 1 in. diameter, covered with a thin, smooth husk. Nut deeply grooved. Native of Central and W. Texas.

Var. *MAJOR*, *Torrey*.—A tree 50 ft. high, with larger, more downy and more coarsely toothed leaves (up to 6 ins. long); fruit $1\frac{1}{2}$ ins. diameter, clothed with brownish red down. Native of New Mexico, Arizona, etc.

The typical *J. rupestris*, discovered in West Texas in 1835, was sent to Kew by Prof. Sargent in 1881, and again in 1894. It is a handsome bushy tree, quite distinct from all other cultivated walnuts in its small, narrow, thin leaves. The var. *major* has a more western habitat, and is of less interesting, coarser appearance.

J. SIEBOLDIANA, *Maximowicz.*

A tree over 50 ft. high, with stout young shoots clothed, like the common stalk of the leaf, with glandular hairs. Leaves $1\frac{1}{2}$ to 2 (occasionally 3) ft. long, composed of eleven to seventeen leaflets, which are oblong, taper-pointed, finely toothed, obliquely rounded or slightly heart-shaped at the base; $\frac{3}{4}$ to 7 ins. long, $1\frac{1}{2}$ to 2 ins. wide; downy on both surfaces, especially beneath. Male catkins slender, up to 1 ft. long. Fruits clustered on long spikes, roundish ovoid, 2 ins. long, covered with sticky down. Nut about $1\frac{1}{4}$ ins. long, rounded at the base, pointed at the top, nearly smooth, but with a prominent ridge at the union of the two halves.

Native of Japan; introduced to Europe about 1860, by Siebold. It is abundant in the forests of Japan, and its nuts are valued as food there. In Britain it gives no promise of bearing fruit to any advantage, and in spite of the considerable period that has elapsed since its introduction, there appears to be no large specimen in the country. It appears to differ from *mandshurica* chiefly in the apex of the leaflet being more abruptly tapered and shorter-pointed, and in the prominent ridge and smoother surface of the nut.

J. STENOCARPA, *Maximowicz.*

Little is known of this walnut, but it is an ally of *J. mandshurica* and *Sieboldiana*, differing, however, in the following respects: the terminal leaflet is obovate, and thus very distinct in shape from the side leaflets, which are oblong; there is no patch of down above the scar left by the fallen leaf, as in the *mandshurica* group. The species was discovered in Manchuria by Maximowicz, who described the nuts as cylindrical or oblong-oval, with a long tapering apex. *J. stenocarpa* has been grown on the Continent as *J. macrophylla*, an appropriate name, for I have a leaf 2 ft. 8 ins. long, with only eleven leaflets, the terminal one 8 ins. long by 5 ins. wide; the largest side ones $7\frac{1}{2}$ ins. long by 3 ins. wide.

JUNIPERUS. JUNIPER. CONIFERÆ.

The junipers are spread widely over the temperate and sub-tropical regions of the northern hemisphere, the hardy species coming from China and Japan, N. America, Europe, and N. Africa. The only species native of the British Isles is *J. communis*, which is not uncommon on chalk hills. They are evergreen, and range from trees up to 100 ft. high down to low, spreading, or prostrate shrubs. The bark is usually thin, and often peels off in long strips. Leaves of two types: (1) awl-shaped, and from $\frac{1}{8}$ to $\frac{7}{8}$ in. long, borne in whorls of threes or in pairs; (2) small, scale-like, and rarely more than $\frac{1}{16}$ in. long, arranged oppositely in pairs and closely appressed to the branchlet. The first kind is found on the juvenile plants of all species; and several species, notably those of the *communis* group, retain it permanently. But other species, namely, those of the *Sabina* group, including *virginiana* and *chinensis*, as they get older, develop more and more of the minute scale-like type of leaf which is essentially characteristic of the adult plant. A number of species, long after they have reached the fruit-bearing stage, continue to produce the juvenile as well as the adult type. This peculiarity is, however, apparently more characteristic of cultivated than of wild specimens. The flowers are unisexual, and most frequently the two

sexes occur on separate trees, sometimes on one. The male flowers are small, erect, columnar or egg-shaped bodies, composed of ovate or shield-like scales, overlapping each other and each carrying anthers at the base. The fruit is composed of usually three to six coalescent, fleshy scales, forming a berry that carries one to six seeds. It is this fruit that distinguishes the junipers from the true cypresses, which they much resemble in foliage. Without fruit, the junipers can usually be recognised by a peculiar, aromatic, somewhat pungent odour, especially strongly developed in the savin.

Junipers like a well-drained, loamy soil, and are essentially lime-lovers, all the cultivated species except *J. horizontalis* being found commonly, although not invariably, on a limestone formation. This gives the genus a special value in chalky districts, where the impossibility of growing satisfactorily most of the heath family somewhat limits the number of evergreens available. Many of the species take two years to ripen their fruit, and the seeds will often lie dormant a year. Their germination may sometimes be hastened by plunging them in boiling water from three to six seconds, but this should only be regarded as an experiment, and tried with a portion of the seeds. All junipers can be increased by cuttings, a method especially suitable for the shrubby sorts.

The species most to be recommended are :—

Tall.—*Virginiana*, *chinensis*, *excelsa*, *drupacea*, and *communis* var. *fastigiata*.

Shrubby.—*Sabina* and its varieties, *procumbens*, *communis*, and *communis* var. *compressa*.

J. CEDRUS, *Webb*. MOUNTAIN CEDAR.

Of this interesting tree very few specimens are said now to remain in a wild state, mostly in almost inaccessible places in the Canary Islands. Unfortunately it is only likely to be permanently hardy in the south-western counties, but it should certainly be tried there. Its leaves are in whorls of threes, set closely on three-cornered branchlets; they are uniformly awl-shaped, $\frac{1}{2}$ to $\frac{3}{4}$ in. long, $\frac{1}{16}$ to $\frac{1}{12}$ in. wide; very concave, and with two glaucous, stomatic bands above. Berries globose, $\frac{1}{2}$ in. wide. The wood of this tree is very pleasantly perfumed, and was highly valued by the Guanches of Teneriffe for making mummy cases. Dr Perez of Orotava has lately done much to revive an interest in this remarkable juniper, some specimens of which he says have trunks a yard or more in diameter. It is one of the *communis* group, and differs from that species and *J. rigida* by having two distinct glaucous lines on the upper side of the leaf, separated by a midrib.

In the Mediterranean region occurs another juniper, *J. OXYCEDRUS*, *Linnaeus*, which appears to be only a geographical form of *J. Cedrus*, somewhat hardier, but now very rarely seen in this country and needing a warmer climate. It thrives very well on the Riviera, where I have seen good specimens at the Villa Thuret, Antibes. Elwes mentions a tree 35 ft. high near Montpellier. Fruits up to $\frac{1}{2}$ in. diameter, dark brown with more or less glaucous bloom. Leaves stouter than in *J. Cedrus*. (Fig. p. 670.)

J. CHINENSIS, *Linnaeus*. CHINESE JUNIPER.

A tree up to 60 ft. high; young shoots terete. Leaves of two types that are nearly always found on the same tree, viz., juvenile awl shaped ones, and

small, scale-like, adult ones. The former are $\frac{1}{4}$ to $\frac{1}{3}$ in. long, sharply and stiffly pointed, arranged either in threes or oppositely in pairs, with two glaucous lines on the upper surface, green elsewhere. Scale-like leaves usually in pairs, rarely in threes, closely flattened to the branchlet, $\frac{1}{16}$ in. long, blunt at the apex. The plants are unisexual, and the male flowers, very freely borne in early spring, are yellow and pretty. Fruits about $\frac{1}{4}$ in. diameter, roundish or rather top-shaped, whitish with bloom when ripe ; seeds three.

Native of Japan, Mongolia, and China ; introduced to Kew in 1804 by W. Kerr. This juniper and *J. virginiana* are the commonest and best of tree-like junipers for gardens. It is perfectly hardy. From *J. virginiana* it differs in its blunt, scale-like leaves, and in the awl-shaped ones being frequently in whorls of threes. As a rule both juvenile and adult leaves occur



JUNIPERUS OXYCEDRUS.

on the same tree, but occasionally specimens of good age have nothing but juvenile foliage. There are male trees at Kew which bear flowers in the axils of leaves of the awl-shaped, juvenile type.

Var. *ALBO-VARIEGATA*.—A well-marked form in which a considerable portion of the younger growth is wholly creamy white, the rest wholly green. Introduced from Japan by Fortune, one of whose original plants used to grow in the Knap Hill nursery. This variety is of sturdier habit and dwarfer than the type.

Var. *AUREA*. Young's Golden Juniper.—The whole of the young parts of this plant are golden yellow, very striking in summer. Raised in Young's nursery at Milford, in Surrey ; of rather dense, slender form.

Var. *JAPONICA*.—A dwarf shrub with foliage mostly of the juvenile type. It is represented in gardens by two sub-varieties, viz., *japonica AUREA*, with all

the young growths of a golden yellow, habit spreading, producing a few long branches; and japonica AUREO-Variegata with portions of the young growths golden-yellow, also dwarf.

J. SPHERICA, *Lindley*.—Trees under cultivation by this name do not appear to differ from J. chinensis. The true plant, according to Henry, has much larger fruits ($\frac{1}{10}$ in. diameter) spherical, not glaucous, and containing numerous seeds. It was originally discovered by Fortune in 1846, in China, and is probably not now in cultivation.

J. COMMUNIS, *Linnaeus* COMMON JUNIPER.

A shrub of spreading habit, sometimes a small tree, usually 6 to 12 ft. high (occasionally 20 to 40 ft.). Young shoots three-cornered, bearing the leaves in whorls of threes. Leaves spreading, $\frac{1}{4}$ to $\frac{5}{8}$ in. long, $\frac{1}{16}$ in. wide; always awl-shaped and terminated by a needle-like point, concave on the upper surface, with one comparatively broad glaucous band of stomata up the centre, divided sometimes by a green line towards the base; beneath, the leaf is green and keeled. Fruit globose or rather oval, about $\frac{1}{4}$ in. diameter, black covered with a blue bloom, and containing two or three seeds embedded in resinous mealy pulp, ripening the second or third year.

Native of Europe from the mountains of the south to Russia and Norway; reaching eastwards to the Himalaya and Kamtschatka. It is widely spread in Britain, and is also found in both eastern and western N. America. The common juniper is essentially a shrub of limestone hills, and in elevated gardens on that formation, it and its varieties are some of the most satisfactory and pleasing of evergreens. It is not uncommon as a tree in Scandinavia, but grows so slowly when it has reached that state, that scarcely any difference is perceptible in one man's recollection. It is best raised from seeds, which frequently lie dormant a year. The berries were once used as a diuretic in medicine, and are still employed to flavour gin. In Norway a kind of beer is made from them.

There are several named varieties, both wild and of garden origin:—

Var. AUREA.—Young shoots and young leaves yellow.

Var. COMPRESSA.—A slender, cone-shaped shrub of minute dimensions, with branches and leaves so dense as to form a rigid mass, the leaves very short. This remarkable shrub is the daintiest of conifers, and probably the slowest growing of them. Plants twenty years of age will often not have reached $1\frac{1}{2}$ ft. in height. It is sometimes called the Irish juniper (*hibernica*), but that name, I think, belongs to var. fastigiata (*q.v.*).

Var. ECHINIFORMIS. Hedgehog Juniper.—Of dwarf, globose habit.

Var. FASTIGIATA (syns. var. hibernica; var. suecica). Irish Juniper.—A slender, perfectly columnar tree with short leaves, very striking when in good health. The best specimens I have seen are in Scotland. There is one at Abercainey over 20 ft. high and 3 ft. in diameter, and another at Scone Palace. The tree is extremely effective in formal arrangements. It is found wild in Norway, Sweden, etc.

Var. HEMISPHERICA.—A dwarf, globose variety, said to grow wild on Mount Etna and other mountainous parts of S.E. Europe.

Var. NANA (syn. alpina).—A dwarf, alpine form, growing about 1 ft. high, with a stunted habit, short branches, and small fruit. Its dwarfness is apparently due merely to climate conditions, as both it and an intermediate form (INTERMEDIA) are said to revert to ordinary communis under lowland conditions. It is found wild in the Tyrol, etc., and similar forms occur in N. America, which have been called CANADENSIS.

J. DRUPACEA, Labillardière. SYRIAN JUNIPER.

(Arceuthos drupacea, Antoine.)

An unisexual tree of pyramidal or columnar shape, 30 to 40 ft. high in cultivation, 60 ft. high in nature; young shoots three-cornered, and bearing the leaves in spreading whorls of three. Leaves uniformly awl-shaped, sharply and stiffly pointed, $\frac{1}{2}$ to $\frac{7}{8}$ in. long, $\frac{1}{12}$ to $\frac{1}{8}$ in. wide at the base; upper surface slightly concave, marked with two dull glaucous bands of stomata separated by a narrow green midrib; margins also green. The under-surface is wholly green, and has the midrib rather prominent. Fruit globose, $\frac{3}{4}$ to 1 in. wide, brown with a glaucous covering.

Native of the mountains of Greece, Asia Minor, and Syria; introduced about the middle of last century. It thrives better than most junipers at Kew, and from its beauty and the distinctness of its shape, is well worth cultivation. It is easily distinguished by the size of its leaves, which (like the fruits) are the largest found among junipers. It differs from other species in the leaf-bases being attached to the stem, and extending downward to the next whorl (decurent). No fruits appear to have been developed in this country.

J. EXCELSA, Bieberstein.

A tree 30 to 40 ft. high in cultivation, twice or thrice as high in nature; bark brown, peeling off in strips; branchlets very slender. Leaves of both adult and juvenile forms, the latter awl-shaped, in pairs or in threes, $\frac{1}{2}$ to $\frac{1}{4}$ in. long, sharply pointed. Adult leaves scale-like, in pairs, closely appressed to the branchlets, ovate, $\frac{1}{2}$ in. long, thickened towards the pointed apex, which is incurved; there is a glandular hollow towards the base. Male and female flowers on the same or separate plants. Fruit globose, $\frac{1}{2}$ in. diameter, dark brown covered with a blue bloom, containing four to six seeds.

Native of S.E. Europe, Asia Minor, and the Caucasus. It is an elegant, narrowly pyramidal tree in cultivation, and thrives very well. The typical form seems to lose its juvenile foliage, but in the handsomer var. *PERKINSII*, well marked by its glaucous hue, the leaves are wholly of a semi-juvenile or intermediate type, half or less than half of the length of the true juvenile ones, but quite distinct from the true adult, scale-like leaves. They are from $\frac{1}{8}$ to $\frac{1}{2}$ in. long, in pairs or in threes, awl-shaped and spreading. From *J. virginiana*, *chinensis*, and *Sabina* this species is distinguished by having twice or thrice as many seeds in each fruit.

Var. *STRICTA* has the same type of foliage as var. *Perkinsii*, but is not so glaucous.

J. FORMOSANA, Hayata.(J. *taxifolia*, Masters—not Hooker.)

In a few gardens in Britain, notably at Eastnor Castle and Bicton, there grows a juniper usually known as "*oblonga pendula*" or "*communis pendula*." It is the *J. formosana* described in 1908 by Hayata, the Japanese botanist, which had previously been confused with the *J. taxifolia*, Hooker. It was introduced by Fortune from China, where it is a tree 40 ft. high, probably between 1843 and 1845, and was put in commerce a few years later by Knight and Perry of Chelsea as *J. oblonga pendula*. It is an elegant tree, with the ends of the branches pendulous. Branchlets very slender and lax, three-cornered, bearing the narrowly awl-shaped leaves in whorls of three, the whorls $\frac{1}{4}$ to $\frac{1}{2}$ in. apart. Leaves $\frac{1}{2}$ to $\frac{5}{8}$ in. long, finely pointed, spreading, glaucous on the upper side, with a fine green line up the centre; lower side

wholly green, keeled. Fruit globose, $\frac{1}{8}$ in. across, reddish brown, containing three seeds. It much resembles *J. rigida* in habit and leaf, but that species is well distinguished by the groove that traverses the centre of the upper surface of the leaf, which has, moreover, no green line dividing the glaucous band into two parts.

J. PACHYPHLÆA, *Torrey*.

CHEQUER-BARKED JUNIPER.

A tree 50 to 60 ft. high, with a very distinct bark that cracks up into curious small squares. Leaves of two kinds, awl-shaped and scale-like, with intermediate states; the former $\frac{1}{8}$ to $\frac{1}{4}$ in. long, very sharply pointed, mostly in threes, whitish on the upper side, glaucous beneath; the scale-like ones in pairs or in threes, closely flattened to the branchlet, $\frac{1}{16}$ in. long, ovate, pointed, with the points incurved. Under a strongish glass minute teeth can be seen on the margin, and there is a resin-gland on the back. Fruits ripening the second year, globose or slightly longer than broad, $\frac{1}{2}$ in. long, covered with blue bloom.

Native of dry mountain-sides in the south-western United States. It has been cultivated at Kew since about 1873, but is still scarcely 20 ft. high. Our climate is scarcely sunny and hot enough for it. The specimen at Kew, however, shows the curious chequered bark which is the most distinctive feature of this juniper. A fine specimen in the Jesup collection of timbers at the Natural History Museum of New York shows this character remarkably well. *J. pachyphlæa* is very pretty in the silvery young growth of the juvenile form, and is now offered for sale by nurserymen.

J. PHŒNICEA, *Linnaeus*.

Although trees and shrubs bearing this name are occasionally to be met with in gardens, it would seem that the true plant is now rare, and only to be found in the warmer parts of the country. It is a native of S. Europe, N. Africa, and the Canary Islands, and, according to Aiton, was introduced in 1683. The adult leaves are in pairs or in threes, scale-like, $\frac{1}{2}$ in. long, very closely arranged and appressed to the branchlet; the juvenile leaves (few or absent in old trees) are needle-like and in whorls of threes. Fruit variable, but mostly globose, about $\frac{1}{8}$ in. diameter, dark reddish or yellowish brown, without bloom, containing three to nine seeds.



JUNIPERUS PHŒNICEA.

Var. *TURBINATA*.—Fruits egg-shaped, sometimes top-shaped, as compared with the usually spherical ones of the type.

J. PROCUMBENS, Siebold.

A low, spreading shrub of sturdy habit, $1\frac{1}{2}$ to 2 ft. high, and densely furnished with stiff branchlets. Leaves $\frac{1}{4}$ to $\frac{1}{3}$ in. long, always awl-shaped, and in threes, ending in a sharp, stiff point; concave on the upper side and glaucous, but with a distinct green midrib and margins; lower side bright green, with a groove near the base. The leaves point forward, and are somewhat incurved towards the tip.

Native of Japan; described by Siebold in 1844, about which time it was in cultivation as *J. squamata* at Kew. It appears afterwards to have almost disappeared from cultivation, but was reintroduced in 1893. There is a very fine example in the Vicarage Garden at Bitton, 4 or 5 yds. across and about 18 ins. high. It is allied to *J. squamata*, but is a more vigorous and hardy shrub, its foliage larger, stiffer, and more spiny at the tip. No dwarf juniper, indeed, is handsomer than this, or makes a more striking low, dense covering for the ground. It never appears to have borne fruit in cultivation, but strikes root readily from cuttings. It must not be confused with a prostrate form of *J. Sabina* found in N. America, which is also known by this name.

J. RECURVA, Buchanan-Hamilton. HIMALAYAN JUNIPER.

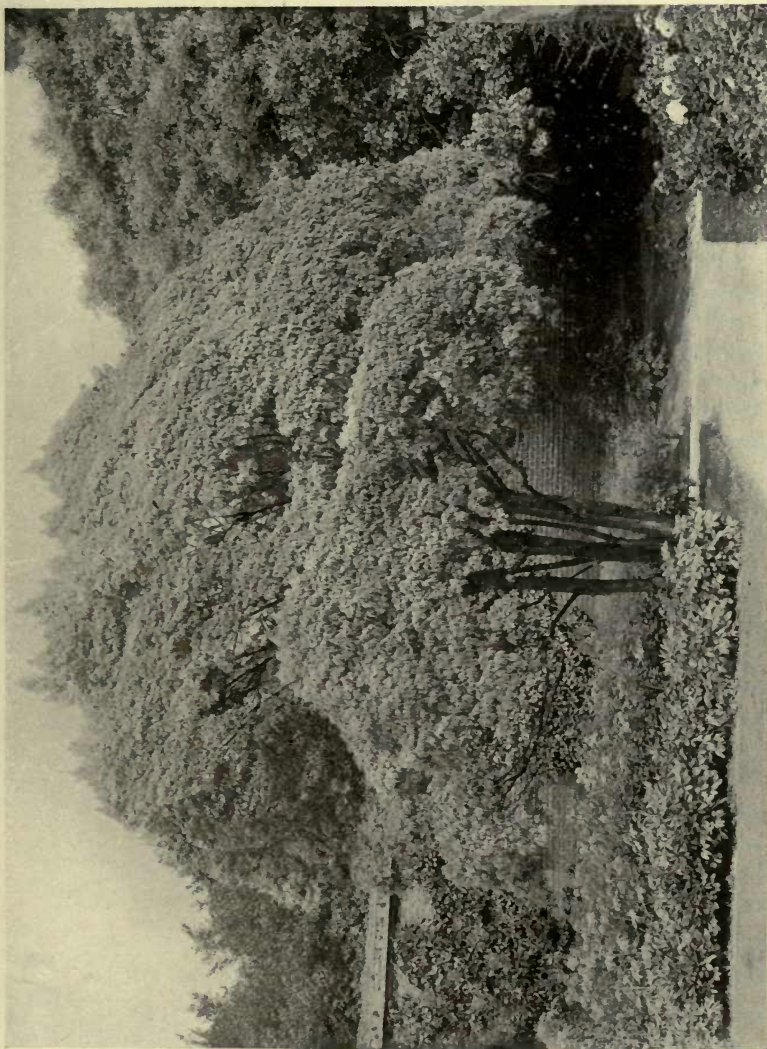
A tree 30 to 40 ft. high, or a shrub, usually broadly pyramidal in shape, and clothed to the ground with branches, which are curved downwards at the ends; bark brown, peeling off in thin flakes. Leaves in whorls of threes, $\frac{1}{3}$ to $\frac{1}{2}$ in. long, uniformly awl-shaped, all pointing forwards and rather appressed to the branchlet which they completely hide; upper (inner) surface very concave and glaucous; outer surface dull green changing to brown before the leaf falls, grooved along the middle. Fruit egg-shaped, $\frac{3}{8}$ in. long, brown the first year, ripening to a dark purple the second; one-seeded.

Native of the Himalaya; introduced in 1830. A graceful tree and distinct, its value in gardens is decreased by the dull colour of the foliage, giving very frequently the impression of bad health. Male and female flowers occur on the same tree. It has lived out-of-doors at Kew for many years, but requires the warmer, moister conditions of such places as Cornwall to show it at its best.

J. RIGIDA, Siebold.

A tree sometimes 20 ft. or more high, of elegant form, the branches being pendulous at the ends; young shoots smooth, triangular. Leaves triangular in section, always needle-like and very slender, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, and produced in spreading whorls of threes; very sharply pointed. The upper surface is deeply grooved and has one glaucous band of stomatic lines along the middle; elsewhere the leaf is bright green. Fruit $\frac{1}{4}$ in. or more wide, at first broadly conical, then globose, dark brown, ripening the second year. Seeds one to three in each berry.

Native of Japan; introduced by John Gould Veitch in 1861. It thrives very well in the southern counties of England, making a small, broadly pyramidal shrub or small tree, but is not very common. Most closely allied to *J. communis*, it is still very distinct in its narrower, longer leaves grooved along the upper side, and thinner, more elegant habit. (Fig. p. 675.)



JUNIPERUS RECURVA at Claremont.

1.]

[Face p. 674.]

J. SABINA, *Linnaeus*. COMMON SAVIN.

A shrub reaching in certain conditions 10 to 15 ft. in height, but usually



JUNIPERUS RIGIDA.

less than half as high; the whole plant emitting a strong, aromatic odour when bruised. The habit is usually stiff and spreading. Leaves of two types:

the juvenile awl-shaped, and the adult scale-like. Juvenile leaves in opposite pairs, spine-tipped, $\frac{1}{8}$ to $\frac{1}{6}$ in. long, the concave upper side glaucous, except on the margins. The scale-like, genuinely adult leaves are on very slender branchlets, and about $\frac{1}{20}$ in. long, green, bluntish at the apex, thickened and rounded at the outside, which is marked about the centre with a sunken gland. As in other junipers with dimorphic foliage, there is an intermediate state in which the leaves are larger and more pointed than the fully adult ones. Plants either uni- or bi-sexual. Fruit globose or broadly top-shaped, $\frac{1}{8}$ to $\frac{1}{4}$ in. diameter, dark brown, ultimately covered with a blue bloom, and containing usually two seeds.

Native of the mountains of Central and S. Europe, and chiefly, but not invariably, found on limestone. It was cultivated in England in the first half of the sixteenth century. It is one of the handsomest and most useful of dwarf evergreens, especially for elevated and chalky districts, being easily increased by cuttings.

Var. *HUMILIS*, *Endlicher*. Carpet Juniper.—A low shrub of spreading habit, $1\frac{1}{2}$ to 2 ft. high, with both types of foliage.

Var. *TAMARISCIFOLIA*, *Aiton*. Spanish Savin.—A shrub of spreading habit like the preceding, but taller; leaves of the two types, the juveniles often in threes.

Var. *VARIEGATA*.—A dwarf shrub with close branches whose younger parts are tipped with creamy white.

On the shores of the Great Lakes and other parts of Eastern N. America there is found a low, prostrate juniper very closely allied to *J. Sabina*. It is known by various names, chiefly as *J. Sabina* var. *prostrata*, sometimes as *J. procumbens*, which, however, belongs rightly to the Japanese species previously described under the name; also as *J. hudsonica*, *Loddiges*. It is apparently a distinct species, and is treated as such by American botanists under the name of *J. HORIZONTALIS*, *Moench*, "Waukegan juniper." Its adult scale-like leaves are sharply pointed and in pairs. Fruit about $\frac{1}{4}$ in. diameter, with usually two or three seeds. The whole plant has a glaucous-blue colour; it is, perhaps, the bluest of junipers and very striking, although not abundant in cultivation. It does not occur on limestone.

J. SQUAMATA, *Buchanan-Hamilton*.

(*J. densa*, *Gordon*.)

A low shrub with the main branches spreading over the ground, and the branchlets rising about 2 ft. above them. Leaves always awl-shaped (never scale-like), and arranged in threes; they are pointed forwards, but not appressed to the stem, $\frac{1}{8}$ to $\frac{1}{6}$ in. long, terminated by a slender fine point; margins green on the upper side and incurved, the concave centre uniformly glaucous; lower side of leaf wholly green, and with a central groove. Fruit egg-shaped, about $\frac{1}{4}$ in. long, reddish brown the first year, ripening and changing to purplish black the second; it carries one seed.

Native of the Himalaya and China; introduced to Chiswick from the former about 1836, or perhaps earlier. It is allied to *J. recurva*, which it resembles in its uniform foliage, and the purple-black, one-seeded berries. The leaves, however, are broader, shorter, and more conspicuously glaucous, and the habit and general aspect very different. There is a good specimen at Bayfordbury from which the above description was made, which makes a handsome low shrub, very dense and leafy in growth.

J. THURIFERA, *Linnaeus*. INCENSE JUNIPER.

A tree 30 to 40 ft. high in a wild state; narrowly pyramidal in cultivation. Leaves of two sorts, viz., awl-shaped and scale-like; the former sharply

pointed, $\frac{1}{8}$ to $\frac{1}{6}$ in. long, arranged in opposite pairs in four superposed rows, the upper surface having two glaucous lines separated by a green one; scale-like leaves $\frac{2}{10}$ to $\frac{1}{10}$ in. long, pointed, and with a hollow at the back. Intermediate forms occur. Fruit $\frac{1}{4}$ to $\frac{1}{3}$ in. diameter, roundish, covered with glaucous bloom when ripe.

Native of S.W. Europe and N. Africa; long introduced, but rare. It is fairly hardy at Kew, and is now about 30 ft. high, most of its foliage being of the juvenile or intermediate kind. Its young shoots are nevertheless occasionally much cut by severe winters, as they were in that of 1908-9. The trees are unisexual.

J. VIRGINIANA, *Linnaeus*. RED CEDAR.

A tree usually 40 to 50, occasionally 60 to 100 ft. high; the bark peeling off in long loose strips. It is pyramidal when young, becoming more round-topped with age. Leaves of both awl-shaped (juvenile), and scale-like (adult) forms on the same tree. The former, arranged in pairs, are $\frac{1}{8}$ to $\frac{1}{4}$ in. long, pointed, concave inside and glaucous except on the margins, grey-green and convex outside, pointing forward. Scale-leaves $\frac{1}{10}$ in. long, ovate, pointed (sometimes slenderly), thickened and convex outside, overlapping. Young specimens have none other than the awl-shaped type of leaf; as they grow older, branches of scale-like leaves appear until, in the adult state, the tree bears scarcely any other, and it is on these that the fruits are borne; fruits, however, are sometimes to be seen on branches bearing an intermediate type of leaf. Male and female flowers are usually separated on different trees, but occasionally appear on the same. Fruits roundish, $\frac{1}{4}$ in. long, scarcely so wide, covered with a blue glaucous bloom, carrying one or two seeds.

Native of the eastern and Central United States and eastern Canada; introduced about the middle of the seventeenth century. This juniper is by far the commonest and largest of the arborescent species cultivated in gardens. The largest I have seen is at Arley Castle in Shropshire, nearly 70 ft. high and 5 ft. in girth of trunk, but according to Elwes there is one at Pains Hill, 13 ft. 9 ins. in girth. It likes a well-drained loamy soil, is perfectly hardy, and altogether one of the best thriving of Eastern N. American trees in this country, especially on chalky soils. From the next most common of tree-like junipers, *J. chinensis*, this in all its forms is best distinguished by its awl-shaped leaves being always in pairs, and by its scale-like leaves being always pointed. Small plants are like *J. Sabina*, but that is to be distinguished by its peculiar rank smell when crushed.

Under cultivation *J. virginiana* has produced a good number of varieties owing to its variability when raised from seed. Of these varieties the following are the most distinct:—

Var. AUREO-Variegata.—A proportion of the young shoots are yellow, sometimes wholly, sometimes the tips only. Vars. AUREO-SPICA and ELEGANTISSIMA are improved forms of this.

Var. BEDFORDIANA (syn. *J. Gossaintheana*, *Loddiges*).—A tree of columnar form, with long slender branches, pendulous at the ends. The habit is elegant, and the leaves never appear to assume the quite short scale-like form, but remain either in the juvenile or intermediate states. More tender than the type, and possibly belonging really to *J. barbadensis*, a sub-tropical representative of *J. virginiana* found in the southern United States and West Indies.

Var. DUMOSA.—Of close, rounded form, always dwarf; leaves bright green. COMPACTA and HUMILIS are the same or similar.

Var. GLAUCA (syn. *argentea*).—Leaves silvery grey during the spring and summer, changing to green.

Var. *PENDULA*.—Various pendulous forms are known, the best being a female one of the typical colour, the branches of which are horizontal, the tips pendulous; *PENDULA VIRIDIS* has bright green foliage.

Var. *SCHOTTI*, *Gordon* (syn. *viridis*).—Leaves bright green, habit compact, pyramidal.

Var. *TRIPARTITA*.—A bush of spreading habit and low growth.

J. WALLICHIANA, *Hooker fil.* BLACK JUNIPER.

(*J. pseudo-sabina*, *Hooker fil.*—not *Fischer*.)

A tree 60 ft. high in Sikkim, according to Brandis, with spreading branches. Leaves of two types—(1) juvenile, in whorls of threes, $\frac{1}{8}$ to $\frac{1}{4}$ in. long, sharply pointed, pointing forwards, concave and very glaucous above, green and keeled below, all very closely set upon the branchlet, with the stalk extending down and attached to it (decurent); and (2) adult leaves $\frac{1}{8}$ in. long, scale-like, arranged in opposite pairs overlapping each other and appressed to the branchlet, pointed with the points incurved, grooved outside, bright green. Male and female flowers on separate trees. Fruits egg-shaped, tapered at the top, $\frac{1}{4}$ to $\frac{1}{2}$ in. long, at first dark brown, blue when ripe, one-seeded.

Native of the Himalaya up to 15,000 ft. elevation; introduced by Sir Joseph Hooker in 1849 to Kew, where there is a healthy tree about 20 ft. high. This bears both types of foliage. A healthy specimen at Leonardslee has mostly the juvenile type, but bore fruit in 1911, and one at Kew bears male flowers.

The true *J. PSEUDO-SABINA*, *Fischer*, is an allied species, but shrubby, and has the scale-like leaves blunt or rounded at the end; the fruits are like those of *Wallichiana* in being one-seeded, but more globose and smaller. Native of Siberia, probably not in cultivation.

KADSURA JAPONICA, *Jussieu*. MAGNOLIACEÆ.

This is the only hardy member of a small genus belonging to the Magnolia family, and closely related to the Schizandras, but differing from them in having the fruits arranged in a globose head instead of an elongated spike. *K. japonica* is a climbing, evergreen shrub, with slender, twining branches. Leaves oval or lanceolate, slender-pointed, dark green, 2 to 4 ins. long, $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. wide; quite smooth and remotely toothed. Flower solitary on a slender stalk 1 to $1\frac{1}{2}$ ins. long, and borne singly in the leaf-axils of the current season's growth from June until autumn; the corolla yellowish white, $\frac{3}{4}$ in. across, composed of six to nine fleshy petals. Berries scarlet, clustered in a globose head.

Native of Japan; introduced in 1860. This interesting and uncommon twiner is not particularly hardy in the open, and should be given the shelter of a wall. It can be increased by cuttings of half-ripened wood put in gentle heat.

Var. *VARIEGATA*.—Leaves with an irregular border of creamy white.

KALMIA. ERICACEÆ.

A small group of shrubs, mostly evergreen, native of Eastern N. America, and named by Linnæus in honour of Peter Kalm, one

of his pupils, and the author of a famous eighteenth-century book of North American travel. They are all handsome plants, especially *K. latifolia* and *K. glauca*, with the leaves in some species alternate, in others opposite or in threes. Flowers five-parted, flattish, open, and produced in showy clusters. They show an interesting mechanism to secure fertilisation. There are ten stamens, which on first expanding are bent back so that the anthers are held in little cavities in the corolla. The "knee" formed by the stalk of the stamen is sensitive, and when the pollen is ripe, if it be touched, the anther is released with a jerk, sending a little dust of pollen in the direction of the stigma, or over the insect whose movements set it in motion. The fruit is a globose capsule, five-celled and many-seeded. The foliage of *Kalmias* is mostly considered poisonous to animals that graze on it. *K. angustifolia* is on this account known as "lamb-kill" in the United States.

Kalmias like a peaty soil and cool, permanently moist conditions at the root. They are best propagated by seed, which should be sown as advised for rhododendrons, and afterwards pricked off in boxes. *K. glauca* may be increased by cuttings of moderately ripened growths in July and August.

K. HIRSUTA, *Walter*, a very distinct species with alternate leaves and hairy branchlets, leaves, flower-stalks, and calyx, is probably not in cultivation, nor quite hardy. Native of the south-eastern United States.

K. ANGUSTIFOLIA, *Linnaeus*. SHEEP LAUREL.

(Bot. Mag., t. 331.)

An evergreen shrub, varying considerably in height and habit. The largest form is 2 to 4 ft. high, and of thin, open growth; the smallest a dwarf, tufted plant 6 ins. or so high; young wood slightly downy. Leaves in pairs or in threes, oval or ovate; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{4}$ to $\frac{3}{4}$ in. wide; smooth and bright green above, paler or semi-glaucous beneath; stalk $\frac{1}{2}$ to $\frac{3}{4}$ in. long. Flowers produced in June, densely packed in rounded clusters 2 ins. across at the termination of the previous year's growth. Corolla saucer-shaped, $\frac{1}{2}$ in. across, deep rosy red; lobes five, shallowly triangular. Calyx and flower-stalk downy.

Native of Eastern N. America; introduced in 1736, and the commonest of *Kalmias* in gardens. It spreads by sucker growths at the base, and the dwarfier forms are dainty shrubs. Propagated by seed or by pulling old plants apart in spring. Several minor forms have been given names referring to differences in habit, shape of leaf, and colour of flower, such as: *NANA* (syn. *pumila*), dwarf; *OVATA*, leaves ovate, broader; *ROSEA*, flowers rose-coloured; *RUBRA*, flowers deeper red than ordinary. The specific name "*angustifolia*" has no significance except in relation to *K. latifolia*.

K. CAROLINA, *Small*, is a near ally of *K. angustifolia*, kept apart from it on the strength of its permanently downy leaves and style.

K. CUNEATA, *Michaux*.

(Bot. Mag., t. 8319.)

A deciduous, sometimes partially evergreen shrub, 3 to 4 ft. high, of thin, erect, gaunt habit; young shoots reddish, glandular-hairy. Leaves alternate, nearly or quite stalkless, obovate or narrowly oval; $\frac{3}{4}$ to 2 ins. long, $\frac{1}{2}$ to $\frac{1}{3}$ in. wide, always narrowed towards the base, but pointed or rounded at the apex;

smooth and dark green above, paler and with scattered gland-tipped hairs beneath. Flowers produced in June and July at the end of the previous year's growth in a series of clusters (fascicles), each consisting of two to six blossoms. Corolla white, $\frac{1}{2}$ to $\frac{5}{8}$ in. across, cup-shaped; lobes shallow, rounded. Calyx-



KALMIA CUNEATA.

lobes $\frac{1}{8}$ in. long, ovate, green, smooth; flower-stalks thread-like, $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long, beset with a few scattered hairs.

Native of the Carolinas, south-eastern United States; discovered by Michaux, and introduced to Britain in 1820, but for many years quite lost to cultivation, until reintroduced to Kew in 1904. It is a distinct species, but has a somewhat inelegant habit owing to its sparse branching. It loses all or

nearly all its leaves in severe weather, and is, perhaps, seen to best advantage planted thinly with an undergrowth of some dwarf peat-loving evergreen like *Leiophyllum* or *Bruckenthalia*.

K. GLAUCA, *Aiton*. PALE LAUREL.

(*Bot. Mag.*, t. 177 ; *K. polifolia*, *Wangenheim*.)

An evergreen shrub, 1 to 2 ft. high, of rather thin, erect, bifurcating habit,



KALMIA GLAUCA.

but bushy ; young shoots two-edged, covered with a fine down at first. Leaves opposite in pairs, or in threes ; narrowly oblong or ovate ; $\frac{3}{4}$ to $1\frac{1}{2}$ ins. long, $\frac{1}{8}$ to $\frac{3}{8}$ in. wide ; recurved at the margins, tapering at both ends ; dark lustrous green above, and smooth except on the midrib ; lower surface glaucous white ; stalk $\frac{1}{2}$ in. long, appressed to the stem. Flowers in a terminal, flattish cluster, 1 or $1\frac{1}{2}$ ins. across ; produced late in April. Corolla saucer-shaped, about $\frac{1}{2}$ in. across, with five broad, shallow lobes, of a beautiful pale purplish rose ; stamens

of the same colour, but with brown anthers. Calyx-lobes $\frac{1}{8}$ in. long, oblong; flower-stalks smooth, very slender.

Native of Eastern N. America; introduced in 1767. Naturally a swamp plant, it likes a cool, moist soil. Under the drier conditions usually given it under cultivation it is a sturdier, more erect shrub than it appears to be in nature, where it is described as straggling. It is very hardy, and one of the brightest of spring-flowering shrubs of its colour. Useful for forcing early into bloom for conservatories.

K. LATIFOLIA, *Linnaeus*. CALICO BUSH.

(Bot. Mag., t. 175; K. lucida, *Hort*.)

A large, robust, evergreen shrub with rather the aspect of a rhododendron when not in flower, a single plant sometimes forming a dense thicket 10 ft. high, and 15 ft. through; young shoots slightly downy. Leaves alternate, leathery, smooth, rich glossy green, oval; 2 to 5 ins. long, $\frac{3}{4}$ to $1\frac{1}{2}$ ins. wide; tapering at both ends, often in a cluster at the end of the twig; stalk $\frac{1}{4}$ to 1 in. long. Flowers crowded in several flattish or rounded clusters, terminating the growth of the previous year, and collectively 3 or 4 ins. across. Corolla saucer-shaped, $\frac{3}{4}$ to 1 in. across, varying in colour from white or pale blush to deep rose, with five triangular, blunt lobes. Stamens white, with brown anthers. Calyx-lobes ovate, $\frac{1}{10}$ in. long, covered with viscous hairs like the flower-stalk, which is slender, and $\frac{3}{4}$ to $1\frac{1}{4}$ ins. long. The flowers vary much in depth of shade, size, and density in the truss.

Native of Eastern N. America; introduced in 1734, and probably the most beautiful evergreen shrub obtained from that region. There are bushes of the dimensions given above in the south of England, but generally the species has not been planted so extensively as it deserves. Both wild and cultivated, it is the most beautiful of evergreens of the eastern United States. A great breadth of it in the Arnold Arboretum, near Boston, U.S.A., 200 to 300 yards long, provides every June one of the public flower feasts of that city. I have also seen it wild on the New Hampshire Hills, where it grows in woods, but is seen at its best on grass and juniper covered hills sprinkled in groups, or as isolated bushes, generally 4 to 6 ft. high.

Var. MYRTIFOLIA *Jäger* (K. myrtifolia, *Andrè*), is a dwarf bush usually 2 to 4 ft. high, the largest leaves about 2 ins. long. It is a pretty, neat bush, useful in places where the type is too large.

Var. POLYPETALA, *Nicholson*.—A form in which the corolla lobes are divided almost to the base. It appeared in the Arnold Arboretum, and is merely a curiosity of no merit.

KERRIA JAPONICA, *De Candolle*. ROSACEÆ

(Bot. Reg., t. 1873.)

A deciduous shrub of bushy form, 4 to 6 ft. high, branches and twigs slender, supple, quite smooth and glossy, forming a dense interlacing mass. Leaves alternate, $1\frac{1}{2}$ to 4 ins. long, ovate-lanceolate, parallel-veined, the base rounded, the point long and tapering, smooth above, hairy (especially on the veins) beneath; the margins doubly toothed. The leaves are much larger on the barren shoots of the year than on the flowering twigs. Flowers yellow, solitary at the end of short leafy twigs springing from the previous year's shoots; $1\frac{1}{4}$ to $1\frac{3}{4}$ ins. across; petals normally five, obovate; calyx green, $\frac{1}{2}$ in. across, with five

oblong lobes. Stamens numerous, yellow. Fruit not often produced in this country, but as seen on wild specimens, is a cluster of two or three nut-like bodies about the size of peppercorns, enveloped in the persistent calyx. Flowers in April and May.



KALMIA LATIFOLIA var. *MYRTIFOLIA*.

Var. *AUREA VARIEGATA* has yellow-margined leaves.

Var. *FLORE PLENO* (*Corchorus japonicus*, *Hort.*), *Bot. Mag.*, t. 1296.—A double-flowered variety much commoner in gardens than the type, and remarkably distinct in growth, the branches being stouter, more erect, and the shrub of a gaunt and rather lanky habit, showing none of the dense twiggy character of the type. The flower is a rounded mass of bright yellow petals, $1\frac{1}{2}$ to 2 ins. across. It is not so hardy as the type, and likes wall protection. In the vicarage garden at Bitton it is 12 ft. high.

Var. *VARIEGATA*, *Zabel*.—Like the type in habit, but scarcely so vigorous; its leaves are deeply and irregularly margined with white. It flowers more or less during the whole summer, but is scarcely so hardy as the type.



KERRIA JAPONICA.

The *Kerria* has long been cultivated in Japan, and its existence there was known as long ago as 1700, but the double-flowered form (the first introduced) did not reach England until 1804, when it was introduced to Kew by Wm. Kerr, a plant collector sent out from that establishment the previous year to China. As the reproductive parts were wanting, its botanical affinities could only be surmised, and it was called "*Corchorus japonicus*," a name which still clings to it in establishments somewhat behind the times. *Corchorus* is a genus allied to the lindens. When the single-flowered typical plant was introduced in 1834 by Mr Reeves, and blossomed two or three years later, it was seen to belong to the rose family, and was then named *Kerria* by De Candolle. This species, the only one of its genus known, is a native of China, and is only naturalised or cultivated in Japan. It was collected in flower and fruit by Wilson in W. Hupeh, China, in 1900, and earlier by Henry.

The typical *Kerria* is a beautiful shrub when in flower, and quite hardy, thriving in good loamy soil. It is easily increased by moderately soft cuttings placed in brisk bottom heat. The variegated form needs a sheltered spot. All the *Kerrias* are benefited by an occasional thinning out of old stems.

KETELEERIA FORTUNEI, *Carrière*. CONIFERÆ.

(*Abies Fortunei*, *Murray*; *Gardeners' Chronicle*, 1884, i, figs. 64-7.)

An evergreen tree, probably 100 ft. high, with horizontal branches; young shoots furnished with down which persists to the second or third year; winter buds small, the basal scales with long, free, linear points, Leaves linear, 1 to 1½ ins. long, $\frac{1}{1\frac{1}{2}}$ to $\frac{1}{5}$ in. wide; flat, pointed, broadest near the base, where they are abruptly narrowed to a short stalk; shining green on both sides, with twelve to sixteen stomatic lines beneath,

forming a pale, faintly defined band each side the midrib, which is quite prominent on both surfaces. The leaves are arranged like those of many silver firs, being attached spirally, but twisted at the base so as to bring them into two opposite spreading sets; they persist five or more years. Cones (only known from imported specimens) erect, cylindrical, 4 to 6 ins. long, stalked, and described as purple.

Native of China; introduced by Fortune in 1844, and extremely rare in cultivation. The finest tree in Europe is in Messrs Rovelli's nursery at Pallanza, in Italy. I saw this tree in May 1912, when Mr Rovelli told me it was 85 ft. high; its trunk was 2 ft. 9 ins. in diameter; many old cones were scattered beneath. It is scarcely hardy enough to thrive in the average climate of the British Isles, but would no doubt succeed well in Cornwall, S.W. Ireland, and such-like places. A small plant in the tree nursery at Kew was practically stationary in size for several years, although it withstood hard frosts with impunity. Fortune described the tree as having the appearance of a cedar of Lebanon; the Pallanza tree, comparatively young, has very much the aspect of a silver fir. *Keteleeria* is most nearly allied to *Abies*, but is very distinct in the male catkins being borne in umbels.

K. DAVIDIANA, *Franchet*, is another species native of W. China. It was introduced to Kew by Henry in 1889, and Wilson found it and introduced it again in 1908. The young plants have leaves like those of *K. Fortunei* in size, colour, and shape. But according to Wilson's specimens of adult plants, the leaves of cone-bearing or adult branches differ from those of *K. Fortunei* in becoming blunt and conspicuously notched at the apex, and in having the midrib sunken above. The cone-scales are also more reflexed at the margin. Wilson found cones 8 ins. long.

KOELREUTERIA PANICULATA, *Laxmann*. SAPINDACEÆ.

A deciduous tree, up to 30 to 60 ft. high, with soft, pithy wood and rather gaunt habit in a young state, becoming more compact with age; young shoots minutely downy. Leaves alternate, pinnate, sometimes partially bipinnate; the nine to fifteen leaflets ovate, short-stalked or stalkless, coarsely and irregularly toothed, downy beneath. The entire leaf is from 6 to 18 ins., or even more, in length, and the separate leaflets from 1 to 4 ins. long, the larger ones often pinnately lobed at the base. Flowers in a large, terminal, pyramidal panicle, sometimes over 12 ins. long, made up of a series of elongated, slender racemes, carrying numerous short-stalked, yellow flowers, each about $\frac{1}{2}$ in. wide; petals four; stamens eight, downy. Fruit a conical, inflated, three-valved capsule, $1\frac{1}{2}$ to 2 ins. long; seeds about the size of peas, dark brown.

Native of China; introduced to England in 1763, and said to have first been cultivated at Croome, in Worcestershire. It is quite hardy and very handsome, flowering in July and August. When seen at its best the tree is a mass of deep yellow flowers, and these are succeeded by the striking bladder-like fruits. It loves the sun, and I have never seen it quite so striking in this country as it is in Central France. Its handsome

leaves turn bright yellow in autumn. It likes a good loamy soil. The seeds afford the best means of propagation, and are obtainable from French nurserymen. Failing them, root-cuttings may be used. The tree



KOELREUTERIA PANICULATA.

is probably not long-lived, and is rather subject to the attacks of coral-spot fungus. One of the finest specimens in this country is in Mr Water's nursery at Knap Hill. It is 40 ft. high, its trunk 6 ft. in girth, and its

head of branches 105 ft. in circumference. J. G. Koelreuter, after whom the genus was named, was a professor of botany at Karlsruhe in the eighteenth century.

K. BIPINNATA, *Franchet*, another Chinese species, is not hardy here nor in Paris, although it has been tried several times. It differs from K. paniculata in its leaves being invariably doubly, sometimes trebly,



KOLKWITZIA AMABILIS.

pinnate, in its more regularly and less coarsely toothed leaflets, and the rounder, broader valves of the fruit.

Mr Wilson introduced from China, in 1900, a rather distinct Koelreuteria with very large and often quite bipinnate leaves, apparently intermediate between these two species. It is hardy at Coombe Wood

KOLKWITZIA AMABILIS, *Graebner*. CAPRIFOLIACEÆ.

A deciduous bush, 5 or 6 ft. high, of twiggy habit; young shoots at first hairy, then rough. Leaves opposite, broadly ovate, long-pointed, rounded at the base, shallowly and remotely toothed; 1 to 3 ins. long, $\frac{3}{4}$ to 2 ins. wide, dark dull green and sparsely hairy above; paler, prominently net-veined and bristly on the veins beneath; ciliate; chief veins three or four each side the midrib; stalk bristly, $\frac{1}{12}$ to $\frac{1}{8}$ in. long. Flowers twin, produced during May and June in corymbs 2 to 3 ins. across, terminating short lateral twigs. Corolla bell-shaped, $\frac{5}{8}$ in. long and the same in width at the mouth, where are five roundish, spreading lobes; pink with yellow in the throat, hairy. Calyx $\frac{1}{2}$ in. across, with five or six very narrow, radiating lobes, hairy; flower-stalk $\frac{1}{3}$ to $\frac{5}{8}$ in. long, slender, hairy. Stamens four. Fruit egg-shaped, $\frac{1}{4}$ in. long, covered with brown bristles $\frac{1}{8}$ in. long. A curious feature is the persistent elongated calyx standing out beyond the fruit.

Native of the province of Hupeh, China, on the watershed of the Han and Yangtse rivers, where it occurs among rocks at 9000 to 10,000 ft.; introduced by Wilson for Messrs Veitch in 1901, and cultivated in the nursery at Coombe Wood, where it first flowered under cultivation in June 1910. The flowers of this rare and remarkable shrub resemble those of *Abelia*, but its remarkable, hairy calyx and fruit are very different. (Fig. p. 687.)

END OF VOL. I.

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