short stout more or less contorted branches which spread almost at right angles from the trunk; at the north it is much smaller and often a shrub. The leaves vary from four to six inches in length and from two to four inches in width, and in the autumn turn to delicate shades of yellow and orange more or less tinged with red. The flowers are produced in racemes about two inches in length and a third of an inch in diameter when fully expanded. The fruits, which ripen in September or October and are a third of an inch long, are raised on stalks an inch and a half to two inches in length. Exceedingly abundant in some years, the fruit of the Sassafras is usually produced rather sparingly, and is devoured by birds as soon as it begins to assume its brilliant colors. This beautiful and interesting tree is distributed from eastern Massachusetts through southern Vermont to southern Ontario and central Michigan, eastern Iowa, eastern Kansas and the Indian Territory, and southward to central Florida and the valley of the Brazos River in Texas. The Sassafras was probably one of the first North American trees used in European gardens, as the figure of the plant published in 1633 in Gerard's Herbal was made from a specimen which had grown in a garden near London. The Sassafras can be propagated by seeds which should be sown as soon as ripe when they will germinate early the following spring, or by root suckers which are often produced in great profusion. The large thick fleshy roots which penetrate deep into the ground make the Sassafras difficult to transplant and only small plants should be selected for the purpose. The genus is also represented by two species which occur in eastern Asia and which have not yet proved hardy in the Arboretum. No other American tree of its beauty and interest has been so rarely planted in this country as the American Sassafras, owing perhaps to the idea that it is difficult to transplant. Certainly it cannot be found in any American nursery, and it is doubtful if it occurs now often in Europe. There are two or three natural groups in the Arboretum and the largest and handsomest is perhaps on the border of the woods directly behind the collection of Crabapple at the base of Peter's Hill. There is another group nearly as large above the Hawthorns on Peter's Hill, and there are a male and a female plant on the right hand side of the road opposite the Lilacs which were collected in West Roxbury and planted there in 1878 but are not conspicuous or handsome plants.

Deciduous-leaved trees of pyramidal habit. Although much less numerous than pyramidal conifers, all pyramidal trees with leaves which fall in the autumn are worth the attention of tree lovers. The best known of these is the variety *italica* of the European Black Poplar (*Populus nigra*) from which it differs in its tall, narrow growth, glabrous young shoots and its confirmed habit of suckering from the roots. This tree, the so-called Lombardy Poplar, has been universally planted in Europe and was early introduced into the United States.
Conifers. There are few regions less suited to the successful cultivation of Conifers than eastern New England and the Arboretum has reason to be satisfied perhaps with its success in increasing the knowledge of these plants and of their cultivation. Of the conifers of western North America only a few of those which grow west of the Rocky Mountains can be successfully cultivated in New England. None of those confined to the southern states, southern Europe, southern Asia, or northern Africa, or any part of the southern hemisphere, are hardy here, so of the thirty genera of these plants now recognized only fourteen can be found in the Arboretum. This means that some of the great conifers of the world like the two Sequoias, several of the Pines and most beautiful Firs, and the Araucarias are not in the collection. The Arboretum collection has been increased in three ways,—by the discovery of new species, the study of the range of others in the hope that the widely distributed species may be found in some parts of their range which will prove hardy here, and by the appearance of new forms here among the seedlings of well known species.

Of the new species of Conifers introduced by the Arboretum the most important are those raised from seed which Mr. E. H. Wilson brought from western Szechuan near the borders of Tibet in 1910. In this collection is a Cephalotaxus, two forms of Pinus sinensis, two Larches, thirteen Piceas, six Abies and one Juniper. No other seeds of these trees have been collected, and all now in cultivation were raised and distributed from the Arboretum or from seeds distributed in Europe from this collection. The trees are all growing well in the
Arboretum with the exception of *Picea Sargentiana* which does not appear to be perfectly hardy here, but there are numerous plants in Europe raised from Mr. Wilson's seeds. These trees cannot be purchased in any American or European nursery, and it would be an exceedingly difficult and expensive undertaking to make another collection of the seeds for many years, at least, for central China is now in an extremely disturbed condition and unsafe for European travelers.

Other Asiatic conifers introduced by the Arboretum are *Abies holophylla*, *Abies koreana* and *Thuja koraiensis* from Korea, *Picea Koyamai*, *Juniperus communis var. nipponica*, *J. conferta* and *J. rigida* from Japan.

Of other introductions of the Arboretum *Tsuga caroliniana*, the Carolina Hemlock, as it grows here is generally considered the most graceful and beautiful cone-bearing tree in the collection. It is a native of the Blue Ridge, the eastern range of the Appalachian Mountains on which it grows from southwestern Virginia to northern Georgia usually in scattered groves on the rocky banks of streams at elevations between two thousand five hundred and three thousand feet. For some reason not easy to explain it escaped the attention of botanists who explored the southern Appalachian Mountains during the last half of the eighteenth and the first half of the nineteenth century, and its distinct character was first noticed by Dr. L. B. Gibbes of Charleston, South Carolina, although it was not described by Dr. Engelmann until thirty-one years later. First raised at the Arboretum in 1880 the tallest tree here is now about forty feet high, that is nearly as high as it usually grows in its native habitat, although trees occasionally seventy feet high are said to occur. It is therefore a much smaller tree than the northern Hemlock. The branches are more pendulous and the leaves are darker green and more lustrous than those of the latter; the leaves, too, are usually notched at the apex and slightly toothed, while those of the northern tree are usually rounded at the apex and are not toothed. The two trees, however, are best distinguished by their cones; those of the southern tree are not stalked and their scales are much longer than broad with obtusely pointed bracts, while those of the northern tree are stalked and the scales are about as long as wide and broad and truncate at the apex.

*Picea Engelmannii*, which is the common and most widely distributed Spruce of the Rocky Mountains, was discovered in Colorado in 1862 by Dr. C. C. Parry. It is probably one of the most important introductions of the Arboretum. Seeds are said to have been sent by Dr. Parry in that year to the Harvard Botanic Garden, but there is no record that plants were raised there, and it is believed that the tree was first cultivated in 1879 when seeds were planted in the Arboretum. On the Colorado mountains Engelmann's Spruce is sometimes one hundred and fifty feet high with trunks up to five feet in diameter, although further north and south the trees are smaller, growing in great forests which fifty years ago covered the slopes of these mountains up to altitudes of ten thousand feet, and with its light cinnamon red bark and narrow pyramidal crown of soft light
gray green leaves it was one of the handsomest of all Spruce trees. The tallest trees in the Arboretum are now nearly forty feet high and the trunks of the largest trees are naked for a distance of seven or eight feet from the ground. It is a good ornamental tree to plant in New England for its hardiness, the rapidity of its growth and the value of its timber may make it a valuable tree for planting in the northeastern states. From all points of view *Picea Engelmannii* is certainly the best Spruce which has been planted in the Arboretum.

*Picea omorika* from southeastern Europe was first raised in the Arboretum in 1880 from seeds presented by the late Dr. Bolle of Berlin, and is one of its best introductions. The tallest trees here now are more than forty feet tall with trunks clothed to the ground with short branches which form a narrow pyramid covered with leaves dark green and lustrous on the dorsal surface and pale on the other. This tree, which is perfectly hardy in the Arboretum, is one of the handsomest conifers in the collection where there are several individuals.

Among the hardy trees obtained by the Arboretum by studying the extended range of several species the most important and certainly the most interesting is the Cedar of Lebanon which has been found to grow in Asia Minor on the Anti-Taurus far north of the Lebanon Range in Palestine and in a much colder climate. As the Palestine Cedar is not hardy in New England the Arboretum had seeds of this tree collected on the Anti-Taurus with the view of introducing a hardy race of Cedars into New England. The seeds were sown here in the spring of 1902 and a large number of plants were raised. They all proved perfectly hardy, not one having suffered from cold, although once or twice in severe winters they lost most of their leaves, the buds being uninjured. Some of the trees have been lost in attempts at transplanting for no other tree has proved so difficult to move. The rapidity of their growth is shown by some of the Arboretum trees which have reached the height of twenty-one feet in thirteen years, and several of them are now more than thirty feet high. Another important tree obtained by the study of its range is the Douglas Spruce, *Pseudotsuga taxifolia*, raised from seed collected in Colorado, which is perfectly hardy and has grown rapidly, although this tree from the northwest coast is not hardy in New England. In the coast region of the northwestern states and British Columbia, *Thuja plicata*, the western Arborvitae, grows to a great size and is one of the handsomest and best timber trees of North America. Fortunately it ranges eastward to Idaho and northern Montana, and from this cold region it was brought to the Arboretum in 1879. It is the largest and handsomest of the Arborvitae, and is believed to be one of the handsomest and most satisfactory conifers which has been planted in the Arboretum.

**Pacific Coast Conifers.** Of the conifers of the Pacific coast of North America which can be grown in the Arboretum the White Pine, *Pinus monticola*, is the most successful here. It is hardy, grows rapidly, and although not more beautiful or as valuable as the native White Pine, *Pinus Strobus*, it is a tree well worth attention in New England.
The Sugar Pine, *Pinus Lambertiana*, which on the California Sierra Nevada becomes the largest of all Pine trees, is perfectly hardy here and is in good condition although it grows slowly. The White Fir of the California Sierras, *Abies concolor*, lives here in good condition for many years but is a less valuable tree in this climate than the form of the same species derived from Colorado. *Abies nobilis* can live here in sheltered positions but does not become a tree, although the beautiful *Abies amabilis* which grows with it on the mountains of Oregon and Washington does better but grows slowly, and has now been in good condition in the Arboretum for several years. Another tree which is rarely seen in northern collections, *Libocedrus decurrens*, the Incense Cedar of California, is in good condition in the small collection of conifers near the top of Hemlock Hill in an exceedingly sheltered position. The Incense Cedar is a tree of narrow columnar habit with bright green foliage, and in California sometimes grows to the height of one hundred and fifty feet and forms a massive trunk. The two beautiful White Cedars of the northwest coast, *Chamaecyparis Lawsoniana* and *C. nootkatensis*, can just be kept alive in the Arboretum where they drag out a miserable existence. Jeffrey's Pine, *Pinus ponderosa* var. *Jeffreyi*, lives here but that is all which can be said about it. It is possible, too, to grow here the White Fir of the northwest coast, *Abies grandis*, and the coast Hemlock, *Tsuga heterophylla*, raised from seeds gathered on the Rocky Mountains of Idaho as these two trees also range far inland.

**Torreya nucifera.** Of the genus Torreya, which is related to the Yews, there are six species found in Florida, California, Japan and China. The Japanese species, *T. nucifera*, is well established in the Arboretum, and one of the trees has produced a few green olive-like fruits. In Japan this Torreya is a magnificent tree sometimes ninety feet high with a massive trunk and a dense crown of dark green shining leaves. It should be better known in this climate where it is apparently one of the rarest of exotic trees. The best specimen is in the Hunnewell Pinetum at Wellesley, Massachusetts. The peculiarity of this Torreya is that it does not begin to grow until July. In spite, however, of its short growing season it makes long annual shoots and increases rapidly in height. There is a group of this tree among the Laurels at the base of Hemlock Hill, and there is a plant of *Torreya californica* among the exotic conifers near the top of Hemlock Hill where it has been kept alive for several years by careful winter protection. As an ornamental tree it has nothing to recommend it in this climate.

Most of the genera of conifers with a single species are successfully grown in the Arboretum. Of these, *Taxodium*, the deciduous Cypress, is confined to the southern United States and is one of the remarkable trees of eastern North America; *Pseudolarix*, *Sciadopitys* and *Cryptomeria* are Asiatic. *Cryptomeria* can just be kept alive in the Arboretum; on Long Island, and southward it does better. *Sciadopitys*, the Japanese Umbrella Pine, is hardy in Massachusetts. It is an interesting and handsome tree, forming a dense pyramid while young. It grows so slowly, however, that it will not be popular with planters with whom rapidity of growth is the chief merit of
trees. For the northern states and for general cultivation the most valuable of the monotypic Asiatic conifers is certainly the Chinese Golden Larch, *Pseudolarix amabilis*, a tree with deciduous leaves and large cones erect on the branches with scales which fall when mature from the axis of the cone like those of Fir trees and the Cedar of Lebanon. Robert Fortune, who was sent to China by the London Horticultural Society in 1843 as a botanical collector, first made this tree known to Europeans. He found it in temple gardens growing in pots and much stunted, and it was not until 1854 that he found it growing in open ground at the monastery of Tsan-tsin. The stems of these trees, growing at an elevation of from one thousand to fifteen hundred feet above the level of the sea, measured fully five feet in circumference two feet from the ground and carried this size, with a slight diminution, to a height of fifty feet, this being the height of the lower branches. The total height of the trees varied from one hundred and twenty to one hundred and thirty feet. In spite of all the efforts which have been made to introduce this tree into Europe it has not become common there. The largest specimen in Europe is in the Rovelli nursery at Pallanza in Italy. In 1907 this tree was sixty-four feet high with a trunk ten inches in girth. There are a few of the original trees in France, Germany and Belgium, the largest being the tree in the nursery of the Horticultural Society at Calmp-thout near Antwerp.

If the Arboretum collection of living conifers is not a large or particularly successful one owing to the climate, its herbarium contains representatives of every known genus and is probably the best in the world.

These Bulletins will now be discontinued until the spring of next year.