dually becomes perfect wood, in consequence of the de­position of matter which then takes place, and fills up its pores ; so that the *rationale* of the process appears to be, that the sap of one year deposits nourishment, in its up­ward passage, which strengthens the sap-wood or alburnum of previous years ; that then, after being elaborated in the leaves, it becomes cambium, and in its descent adds bulk both to the alburnum and the bark. It must however be observed, that there is not in timber any appearance of a gradual change from alburnum to perfect wood. On the contrary, in all cases the division is most decided ; one concentric layer is perfect wood, the next in succes­sion is alburnum. Mr Knight gives it as his opinion, that “ towards the conclusion of summer, the true sap, that is, the cambium, simply accumulates in the alburnum, and thus adds to the specific gravity of winter-felled timber, and increases the quantity of extractive matter.” He says he has “ reason to believe that the true sap descends through the alburnum as well as through the bark : that is, that the superabundance of true sap is there deposited, and enriches the upward current of aqueous sap, or the sap of the ensu­ing spring.” In confirmation of this, he tested the ascend­ing current of spring sap, extracted from the trunks of trees at various heights, and found that the specific gravity in­creased with the height, and that the taste also very sen­sibly altered. He argues from the foregoing facts, that by girdling trees in the spring, and suffering them to grow un­til the ensuing winter, the wood above the girdling would be increased in specific gravity. In one experiment, in which the belt of bark had been abstracted for several years, he found that the specific gravity of the wood above was 0∙590, while below it was only 0·491, and also that the alburnum had acquired a greater degree of hardness, and consequently of durability. This is important, for Du Ha­mel established by experiment very conclusively, that the strength of timber of the same species varied very nearly as its weight. There are many other theories as to the growth of plants, founded also on experiment, but we can­not, within the limits of this article, enter into the *rationale* of the whole of them. We have therefore taken this of Mr Knight, because, although there may be some points in it which may be objected to, we conceive that, as a whole, it probably approaches more nearly to the truth than does any other, and indeed leaves but little doubt upon the mind as to its general correctness.

There are not less than 140 species of oak known, and although there are many sorts cultivated and growing in England, botanists and arborists agree that there are prin­cipally two varieties ; these are, the Durmast oak, and an­other, which is commonly called the old English oak, al­though both are supposed to be indigenous. In the Dur­mast oak, the *Quercus sessil∣flora,* the acorns grow in clus­ters close to the twig, and the leaves are set on short leaf­stalks : while in the old English oak, the *Quercus Robur,* or *Quercus pedunculata,* the acorns grow generally singly, at most two together, on stalks of from one to two inches in length, and the leaves are close to the twig, without the intervention of any length of leaf-stalk. These are the principal distinguishing marks between the two varie­ties. Many writers attempt to draw distinctions from the colour and shape of the leaves, and the colour and appear­ance of the bark ; but it is doubtful whether these may be depended upon, as, from a careful examination of the evi­dence, it is more than probable that the colour and appear­ance vary much with the soil and locality. There is no doubt, however, as to the comparative inferiority of the tim­ber of the Durmast oak. Almost all the English writers on timber have asserted it, and both Buffon and Du Hamel cor­roborate their assertions, and give a most decided prefer­ence to the oak bearing large acorns on separate stalks, over the oak bearing acorns in clusters; which characteris­

tics are just the distinguishing differences that have been particularized as existing between the English and the Dur­mast oaks.

In favourable soils the old English oak has seldom more than twelve to fifteen concentric layers of alburnum ; but in the Durmast oak there are frequently from twenty to twenty- five or even thirty. This proves at once, by analogy, the inferiority of the Durmast oak ; for it is an established fact, that the best hard-wood timber is that in which the propor­tion of heart-wood to sap is the largest ; besides which, the numerous layers of alburnum form the basis of a propor­tion which shows the greater age the Durmast timber must attain before it becomes perfect wood. And therefore it is evident, that in order to attain large scantling, comparatively older timber must be felled, and consequently a greater risk be incurred of its being overgrown. The following table of the number of concentric layers of sap-wood observed in various species of timber trees is extracted from a valuable work on Naval Timber by Patrick Matthew ; a work which abounds in much sound practical information, though mixed up with many things irrelevant to its subject.

*Trees of Home Growth.*

Common oak, some trees 10, others 14, others 18.

Spanish chestnut, 2, 5, 6.

Scotch elm, *U. Montana* 16, 25, 32.

English elm, *U. campestris........* 0, 10 0.

Red-wood willow 8, 14, 0.

Laburnum 3, 5, 0.

Wild cherry 16, 24, 0.

Black Italian poplar 9 0, 0.

Scotch fir 20, SO, 40.

Pinaster 0, 10, 0.

White larch 5*, ......* 12, 18.

*Trees of Foreign Growth.*

Memel fir 0, others 44, others 0.

Red Canada pine 0, 100, 0.

Yellow Canada pine 38, 44 0.

Several of these, which are not cultivated generally as tim­ber trees, are yet valuable, and are made available for local building purposes, and for the manufacture of the convey­ances and implements for agriculture. Of these, the red­wood willow may claim the first rank in utility. It is a tim­ber much used in France in cottages and farm buildings, and it has the advantage of being very easily worked. The numerous varieties of the willow tribe are also useful in the manufacture of baskets. The woods of the laburnum, the cherry, and the apple and pear trees, are greatly used by cabinet-makers for articles of furniture.

Although in most parts of England there is soil favour­able to the growth of timber, it may well be supposed that all soils are not equally favourable to ali timber, nor will they produce timber of equally good quality. Thus in Eng­land the Sussex oak has always been celebrated as being superior to all other ; and in France the oak of Provence enjoys a similar reputation. Still, an oak tree grown in a soil but ill adapted for it, as, for instance, a marshy soil, will retain its superiority of species over the inferior tim­bers, as the willow and the poplar, to which such a soil is less unfavourable, although in quality it will fall very short of the standard of perfection for oak timber. In fact, oak grown on such soils will in some measure partake of the qualities of the timber to which they are better adapted, and be of more open texture, of softer fibre, and of less dura­bility than average oak timber. Oaks of slow growth, those, for instance, from the mountains of Scotland, and from Cumberland and Yorkshire, are proverbially hard and du­rable. The oak from marshy soils is often of a dull-red colour, or has “ foxey ” stains in it, as this incipient decay is