called. These stains are generally around the heart of the tree. Timber grown in loose soils is often what is termed “ quaggy that is, the centre of the tree is full of shakes and clefts. Sometimes a shake will extend around a great portion of the trunk, between two of the annual concentric layers, so as to divide them from each other. This is call­ed a cup-shake, and the timber is said to be “ cuppy.” It is not attributable to the soil, but is supposed to originate in the effect of frosts on the aqueous sap in its ascent. When the alburnum of a tree has been wounded, or a branch im­properly lopped or damaged, the subsequent growth of the tree will cover it, and it is then called a rind-gall, which, should the injured part have had time to become decayed, or partially so, or even sodden with the rains, will frequently cause an extensive rottenness in the plant. This is remark­ably the case with elm timber. Doatiness, probably dotti­ness, which is a spotted or speckled appearance, like small stains in the wood, is most commonly a disease of beech timber ; it is, however, occasionally seen in all, and fre­quently in the American oak. These diseases are in general incidental to the soil.

In treating of soils in connection with the qualities of the timber which grows upon them, it may be necessary to re­member that the object is not to compare various sorts of timber, but to compare the differences in the same species in connection with the soils which produced them. It may also be observed, that as oak is by far the most valuable timber of English growth, the general inquiries we may enter into in the course of this article principally apply to it, unless other species of timber are particularized.

We have already casually adverted to marshy soils, and to the state of the timber grown on them. The grain of such timber is open, its colour of a deep yellow, sometimes with a tinge of red, especially towards the heart; the texture is soft, and the fibre coarse. The quantity of alburnum, and also of bark, is large in comparison with the quantity of per­fect wood, and the outer surface of the bark is very coarse and rough. The wood splits easily, and when split it has not the same bright and varnished appearance possessed by the best timber. The chips from the axe do not cling well together, but fall into separate fragments ; and a shaving or a small splinter may be easily crumbled between the finger and thumb. When such timber is weighed, although it is far more saturated with moisture, it is of less specific gravity ; and when weighed after seasoning, the weight lost will be comparatively greater. Such timber, it is evident, will be more subject to decay, and to become worm-eaten, the softness of its texture inviting the attacks of these insects.

These peculiar characteristics attach more or less to tim­ber grown in all soils which are of a moist nature, whether they are marshy, or wet from long-continued periodical in­undations. They also apply to timber grown in deep sandy soil, in which almost the only nutriment for the roots is the water which percolates downward, and the bottom damps which rise upward through it. In all these soils the timber is of rapid growth, and the trees attain early to a large size. A similar result attends the timber grown in sandy soils on a clay bottom, for the water which falls not being able to penetrate the clay, cannot escape, and the roots of the trees are therefore virtually in the same circumstances as if they were growing in marshy land. As a general axiom, timber trees have an antipathy to stagnant waters ; and therefore these observations on marshy soils, and on sandy soils with clayey bottoms, refer themselves to this fact. The soil gene­rally the best adapted for the growth of timber appears to be a rich loam. This may have a considerable admixture of sand, without any apparent detriment to the timber. In such soils roots can penetrate and spread without difficulty, while the loam is capable of retaining sufficient moisture to dis­solve and hold in solution the various substances that are found combined with it, so as to fit them to be absorbed as

food by the roots of the plants. If the soil be too sandy, it neither retains the moisture sufficiently long in it, nor does it contain adequate nutriment. If, instead of a loam, some of the very stiff clays be mixed with the sand, they do not counteract this quality; for although such clay is capable of combining with a great quantity of water, it will not easily absorb and mix with it; and the tender roots have great difficulty in penetrating the masses of clay. For these reasons, soils composed wholly of stiff clay are not favour­able to the growth of good timber, but the lighter clayey earth produces very fine oaks. As has been before stated, sand or gravel, with a large mixture of rich loamy earth, is precisely that sort of dry generous soil which affords ample nourishment to the roots of trees, and allows of their spread­ing themselves freely in search of it. Of all timber, how­ever, oak accommodates itself most easily to soil ; growing in almost every thing but sterile sand, if there be sufficient depth of stratum. Wherever oak will grow, even in those soils the least genial to its growth, it is a valuable timber. This fact cannot be too often pressed upon the attention of landholders. It is admirably adapted for planting in hedge-rows between arable fields, because it is found to be less destructive to the undergrowth than almost any other tim­ber ; and as its roots seek their nourishment deep in the soil, they not only do not impoverish the ground for the growing crop, but are themselves protected from any injury which they might otherwise sustain from the tillage. Oaks so planted require, however, to be protected during several years, as their early growth is slow. The timber grown in such exposed situations is seldom large; the trees are stunted and crooked ; but this rather increases their value for ship-building purposes, as they convert as compass or knee tim­ber. The timber of hedge-row oak is very close grained ; that of park-grown oak is more open, and the trees being better protected, spread more freely and grow to a very large size, with strong lateral branches ; while forest oak will frequently grow to a great height without pushing out any lateral shoots. Forest oak is invariably inferior in qua­lity to that which grows singly ; and in forests the trees that grow on the skirts are always the best timber. The oak flourishes in variable climates, which is probably the cause of the superiority of the English oak.

In whatever soil planted, each vegetable will retain its own peculiar characteristics. These apparently result from some property inherent in the plant itself, which leads it to extract only that nourishment from the soil which is appro­priate to it. This has been illustrated by the example of a pea and a grain of wheat both planted in the same soil, and both treated in exactly the same manner : the corn will have absorbed silex from the earth, which will visibly form a com­ponent of its stalk, while the pea will not have taken up any. This indicates that at least a degree of selection with respect to their food is inherent in vegetables, without which indeed it would be difficult to account either for plants of various sorts all flourishing equally well in the same soil, or for others which cannot be reared in certain soils. This selection of food is however limited ; for it is a well-ascertained fact that vegetable life is destroyed by the same poisonous substances that are fatal to animal life, and that plants do not possess the power of refusing to ab­sorb such substances when mixed with the food in which their roots are plunged. Although the root of corn would absorb silex and the pea refuse it, they would both perish from the unavoidable absorption with their food, of sub­stances inimical to animal and vegetable life. This is, however, merely saying that the vegetable is not possess­ed of greater powers of discriminating the beneficial from the hurtful, than is the animal under similar circumstances.

A curious fact connected with the supply of food for trees is also established, proving that there is not only a proportion between the spread of the roots and that of the branches of