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VOL. II.
BY
EVELYN.



S I L V A:
OR,
A DISCOURSE OF FOREST-TREES,
AND
THE PROPAGATION OF TIMBER
IN HIS MAJESTY'S DOMINIONS;
AS IT WAS DELIVERED IN
The Royal Society, on the 15th of October 1662,
Upon occasion of certain QUERIES propounded to that ILLUSTRIOUS ASSEMBLY,
by the Hon. the Principal Officers and Commissioners of the Navy.
TOGETHER WITH
An Historical Account of the Sacredness and Use of
STANDING GROVES.

BY JOHN EVELYN, Esq. F. R. S.

With NOTES,

BY A. HUNTER, M. D. F. R. S. L. & E.

THE THIRD EDITION,
REVISED, CORRECTED, AND CONSIDERABLY ENLARGED.

TO WHICH IS ADDED
THE TERRA: A PHILOSOPHICAL DISCOURSE OF EARTH.

—
IN TWO VOLUMES.—VOL. II.
—

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Anno 1801.

S I L V A.

DENDROLOGIA.

BOOK THE SECOND.

CHAPTER I.

*The CEDAR, JUNIPER, CYPRESS, SAVINE,
TAMARISK, and THUYA.*

BUT now after all the beautiful and stately trees, clad in perpetual verdure, let me not forget the CEDAR^a, which grows in all extremes; in the moist Barbadoes, the hot Bermudas, (I speak of those trees so denominated) and in the cold New-England; even where the snow lies,

CHAP. I.

^aTHE CEDAR of LEBANON is now classed with the Pines; and the other Cedars described by Mr. Evelyn, are classed with the Junipers. But as I did not choose to disturb the order of the chapters, I have reserved the description of the Cedar for this place. Linnæus calls it *Pinus foliis fasciculatis acutis*. Sp. Pl. 1420.

This tree is generally supposed to be an inhabitant of Mount Libanus only, but it is now found upon Mount Taurus, Amanus, &c.; and, from its hardy nature, it is probable that it may easily be naturalized to any climate.

Having procured the cones from the Levant, or of our own growth, the seeds, a little before sowing, should be got out in the following manner: Let a hole be bored with a pafser exactly up the centre of each cone, from the base to the apex; after this operation put them into a tub of water, where they should remain till the next day; then having a wooden peg, rather bigger than the pafser, let it be thrust down the hole, and

BOOK II.

as I am told, almost half the year; for so it does on the mountains of Libanus, from whence I have received cones and seeds of those few remaining trees. Why then should it not thrive in Old England? I know not, save for want of industry and trial.

It grows in the bogs of America, and in the mountains of Asia, so as there is, it seems, no place or clime which affrights it. And I have

it will so divide the cones, that the different scales may be taken away, and the seeds picked out. In doing this, great care must be taken not to bruise or hurt the seeds.

The soil in which you sow these seeds should be rather of a sandy nature; or, for want of this, some mould taken fresh from a rich pasture, and mixed with a little drift sand, will serve the purpose.

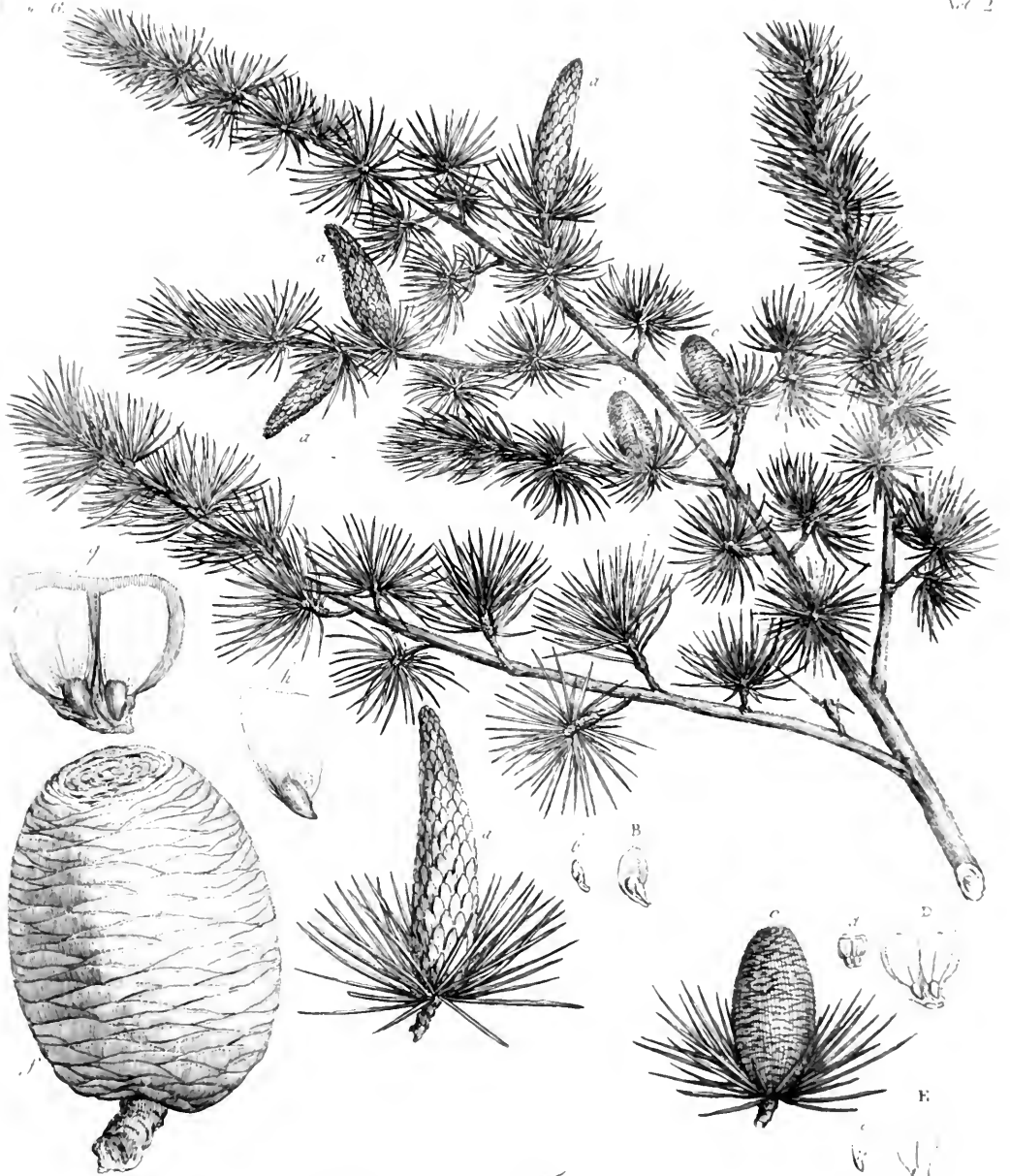
Having the seeds ready, let them be sown about the middle of March in pots or boxes near half an inch deep. In about seven or eight weeks the plants will come up, when they should be removed into the shade from the heat of the sun, where they may stand, but not under shelter, all the summer; during which time they should be kept clean of weeds, and watered now and then. In winter they must be removed into a warmer situation; and if the season be likely to prove very severe, they should be sheltered either by mats, or removed into the green-house, or covered with an hot-bed frame; for they are subject to lose their young tops at first by the severity of frosts.

In the beginning of April following, these plants may be pricked out, in beds, four inches asunder; and if the weather prove dry, they should be shaded and watered till they have taken root; after which they will want little shading and less watering. Indeed, nothing more is required than keeping them clean from weeds, and covering the ground so as to keep it moist, and prevent its chapping by the rays of the sun. In these beds they should continue two years, when, in the spring, they should be transplanted into the nursery, where they may remain till they are planted out for good.

During the time they are in the nursery, and after planting out, many will have a tendency to droop in their leading shoot. As soon, therefore, as this is perceived, an upright stake must be driven into the ground, to which the shoots should be tied with bafe matting, to keep them in their upright growth. The Larch-tree, which is nearly allied to this species, will sometimes rebel in this way; so that it would not be amiss, in both cases, when the first sign of such a tendency is discovered, to lighten the heel by nipping off the extremities of some few of the largest branches.

When these trees are planted out for good they should be left to nature, after being properly fenced. Not a knife nor a hat-het should come near them; lopping even their lowest branches is so injurious, that it both retards their growth and diminishes their beauty.

It is matter of surprise that this tree hath not been more cultivated in England formerly; for, till within a few years past, there were but few here; since it would be a great ornament to barren bleak mountains, where few other trees will grow so well, it being a native of the coldest parts of Mount Libanus, where the snow continues great part of the year. And, from the observations made of those now growing in England, it is found they



The Cedar Tree

Edith and John G. ...

1850

frequently raised it from the seeds and berries, of which we have the very best in the world from the Summer-Islands, though now almost exhausted by the unaccountable negligence of the planters; as are likewise those of Mount Libanus, by the wandering and barbarous Arabs. The Cedar we have from Jamaica is a spurious sort, and the wood so porous, that wine will soak into it. On the contrary, that of Carolina is so firm and close, that barrels and other vessels preserve

thrive best on the poorest soil; for such of them as have been planted in a strong, rich, loamy earth, have made but a poor progress, in comparison to such as have grown upon a stony meagre soil. And that these trees are of quick growth, is evident from four of them now growing in the physic garden at Chelsea, which, as Mr. Miller observes, were planted there in the year 1683, being at that time not above three feet high; two of which trees are at this time (1774) upwards of twelve feet and a half in girth, at two feet above the ground, and their branches extend more than twenty feet on every side their trunks; which branches, though they are produced twelve or fourteen feet above the surface, do at every termination hang very near the ground, and thereby afford a cool shade in the hottest months of the year.

In the garden of the old palace at Enfield, stands a Cedar of Libanus, of considerable stature. The body, exclusive of the boughs, contains about 103 cubical feet. This tree was planted by Dr. Uvedale, who kept a flourishing boarding-school in this house at the time of the great plague in 1665. It is in height about 45 feet at present, eight feet having been broken off from its top by the high wind in 1703. Several other Cedars of considerable size are scattered about in different parts of this kingdom. Of these one of the most remarkable was blown down by the hurricane that happened on the 1st of January, 1779. It grew on the North-side of Hendon Place, eight miles from London.—The height 70 feet; the diameter of the horizontal extent of the branches, 100; the circumference of the trunk, seven feet above the ground, 16; twelve feet above the ground, 21. At this latter height it began to branch; and its limbs, about ten in number, were from six to twelve feet in circumference. This tree is supposed to have been two hundred years old, and planted in the reign of Queen Elizabeth: Tradition says by her Majesty herself. When blown down, it was perfectly sound and undecayed, and seemed as if not grown to maturity. The following are the dimensions of a fine Cedar growing at Hillington. The perpendicular height is 53 feet; the diameter of the horizontal extent of the branches from East to West, 96; from North to South, 89; the circumference of the trunk close to the ground, 13½; seven feet above the ground, 12½; twelve feet above the ground, 14 feet 8 inches; and thirteen feet and a half above the ground, just under the branches, 15 feet 8 inches. It has two principal branches, one of which is bifid 1½ foot above its origin: Before it divides it measures in circumference 12 feet: after its division, one of its forks measures 8½ feet, the other 7 feet 10 inches. The other primary branch, at its origin, measures 10 feet: and soon dividing, throws out two secondary ones, each 5½. Its age is supposed to be 116 years.

We do not exactly know when and by whom the Cedar was first introduced into

BOOK II. the strongest spirits in vigour. The New-England Cedar is a lofty grower, and prospers into excellent timber, which, being sawed into planks, makes delicate floors. They shingle their houses also with it, and generally employ it in all their buildings. Why have we no more of it brought us, to raise, plant, and convert to the same uses? There is the *Oxycedros* of Lycia, which the Architect Vitruvius describes to have its leaf like the Cypress; but the right Phœnician resembles more the Juniper, bearing a cone not so pointed as the other, as we shall come to show.

After these, I shall not here descend to the inferior kinds, which some call Dwarfs, and common Juniper-like shrubs, fitter to head the borders

England. Turner, one of our earliest herbalists, where he treats "of the Pyne-tree, and other of that Kynde," says nothing of it. Gerarde, published by Johnson in 1636, mentions it not as growing here; and Parkinson, in his *Theatrum Botanicum*, 1640, speaking of the *Cedrus Magna conifera Libani*, says "The branches, *some say*, all grow upright, but others, strait out." It is very certain, from what Mr. Evelyn says in the beginning of this chapter, that the Cedar of Lebanon was not in 1664, cultivated in England; but from the warm manner that he expresses himself upon this head, it is probable that it soon after became an object of the planter's attention.

There are said to be a few Cedar-trees still remaining upon Mount Libanus, which are preserved with a religious strictness: For we are informed, from the Memoirs of the Missionaries in the Levant, that, upon the day of the Transfiguration, the Patriarch of the Maronites, (Christians inhabiting Mount Libanus,) attended by a number of bishops, priests, and monks, and followed by five or six thousand of the religious from all parts, repairs to these Cedars, and there celebrates that festival which is called "The feast of Cedars."—We are also told that the Patriarch officiates pontifically on this solemn occasion; that his followers are particularly mindful of the Blessed Virgin on this day, because the scripture compares her to the Cedars of Lebanon; and that the same holy Father threatens with ecclesiastical censure those who presume to hurt or diminish the Cedars still remaining.

The epithet of *lofty* sometimes given to the Cedar is by no means just; since from the experience we have of these trees growing in England, as also from the testimony of travellers who have visited the few remaining ones on Mount Libanus, they are not inclined to be lofty, but, on the contrary, extend their branches very wide. The Psalmist makes a proper allusion to this tree in his description of the flourishing state of a people. "They shall spread abroad like a Cedar in Libanus." Had Milton been as good a naturalist as he was a poet, he would not have wrote,

————— and over head upgrew
 Insuperable height of loftiest shade
 Cedar, and Pine, and Fir, and branching Palm.

PARADISE LOST, B. IV.

of coronary gardens, and to be shorn. There is yet another of the North America, lighter than cork itself, of a fragrant scent which is its only virtue.

CHAP. I.

After all these exotics brought from our plantations, answering to the name of Cedar, I should esteem that of the Bermuda little inferior, if not superior to the noblest Lebanon; and next, that of Carolina for its many uses and lasting.

Having spoken of their several species, we come now to the culture. These are best raised from the seeds, since it would be difficult to receive any store from abroad. To begin with that of Mount Libanus: Those which seem of the greatest antiquity are indeed majestic, extending the boughs and branches, with their cones *sursum spectantia*, as by most we are told; though a late traveller* found them otherwise, *depending*, like other coniferous trees. The sturdy arms, though in smaller sprigs, grow in time so weighty as often to bend the very stem and main shaft, whilst that which is most remarkable, is the structure of the cones and seed receptacles, tacked and ranged between the branch-leaves in such order as nothing appears more curious and artificial, and at a little distance exceedingly beautiful. These cones have their bases rounder, shorter, or rather thicker, and with blunter points, the whole circumzoned, as it were, with pretty broad thick scales, which adhere together in exact series to the very top and summit, where they are somewhat smaller; but the entire lorication smoother couched than those of the Fir-kind. Within these repositories, under the scales, nestle the small nutting seeds, or rather kernels, of a pear-shape; which, how nourished and furnished from the central stile, with their other integuments, is admirably described by Mr. Ray, as that of the stalk of the clogs, thicker and longer, and so firmly knit to them, that it requires considerable force to part them from the branch without splitting the arm itself. We have said nothing concerning the leaves of this tree, which much resemble those of the Larix, but somewhat longer and closer set; they are erect and perpetually green, which those of the Larch are not.

The seeds drop out of the cones as the Fir and Pine kernels do when the air, sun, or moisture open and unglue the scales, which naturally it else does not in those of the Cedar till the second year; but which, after

all the preparations of burying in holes made in the earth and sand, in which they are apter to rot, may more safely be done by exposing the clogs discreetly to the sun, or before a soft and gentle fire, or, I think, best of all, by soaking them in warm water.

The lachrymæ, gum, and other transudations serve more for unguents and the chirurgeon's box, than for other medicaments, in which we find Pliny has little faith. But that which is more remarkable, is the virtue of the famous timber of this noble tree, being proof against all putrefaction of human and other bodies, above all other ingredients and composition of embalmers; and that by a pretty contradiction, giving life, as it were to the dead, and destroying the worms which are living, as it does where any goods are kept in chests and presses of the wood, excepting woollen cloth and furs, which it is observed they corrupt.— In the mean time, touching the manner of these operations, as it concerns the preservation of the dead, see more where we speak of Cypress; the effects being ascribed to the extreme bitterness of the resinous juices, whilst the odour is most grateful. The worthy Mr. Ray mentions the powder and saw-dust of Cedar to be one of the greatest secrets used by our pollinctors and mountebanks, who pretend to this embalming mystery; And indeed, that the dust and very chips are exitial to moths and worms, daily experience shows us; though none in mine, better than the dried leaves and stalks of Marum Syriacum, familiarly planted in our gardens. What, therefore, the late traveller, Dampier speaks of Cedar, which he has seen worm-eaten, could neither be that of Libanus or Bermudas, but haply of Barbadoes, Jamaica, or some other species.— Note, that the Cedar is of so dry a nature, that it does not well endure to be fastened with nails, from which it usually shrinks, and therefore pins of the same wood are better. Whatever other property this noble tree is deservedly famous for, it is said to yield an oil, which above all other, best preserves the monuments of the learned, books and writings; whence *Cedro Dignus* became one of the highest eulogies^b.

Touching the diuturnity of this material, it is recorded, that in the temple of Apollo at Utica, there were found sound beams of Numidian

^b — sic ex Cedro oleum, quod cedreum dicitur, nascitur: quo reliquæ res cum sunt unctæ, uti etiam libri, a tincis et a carie non leduntur. VITRUVIUS.

Cedar near twelve hundred years old ; and at Saguntum in Spain, in a certain Oratory consecrated to Diana, there were seen, in the days of Pliny, beams of Juniper, that had been placed there by the founders of the Temple, who came from Zant two centuries before the destruction of Troy. The great Sesostris, king of Egypt, built a vessel of Cedar of two hundred and eighty cubits, all over gilded without and within : And the statue of the goddess in the famous Ephesine Temple was said to be of this material also, as was most of the timber-work of that glorious structure. Though as to the idol, mentioned in the Acts, (when the mob rose up against the Apostle,) some will have it to be of Ebony, others, of a Vine-tree, the most unlikely of all the rest for the carver. The Shittim, mentioned in holy writ, is thought to have been a kind of Cedar, of which most precious utensils were formed.

As to the magnitude of Cedar-trees, we read of divers whose bodies eight or nine persons could not embrace, as we shall show hereafter ; not here to let pass what Josephus relates Solomon planted in Judea, who doubtless tried many experiments of this nature, none being more kingly than that of planting for posterity. I do not speak of those growing on the mountains of Lebanon, in the northern and colder tracts of Syria, or what store those forests of them then afforded. But, as we are informed by that curious traveller Rauwolfius*, since confirmed also * In Itin. by the Virtuoso Moncouys, there were not remaining above twenty-five of those stately trees ; and since they were there, but sixteen of that small number, as the ingenious Mr. Maundrell reports in his journey from Aleppo to Jerusalem : There was yet, says he, abundance of young trees, and a single old one of a prodigious size, twelve yards and six inches in the girth, and thirty-seven yards in the spread of its boughs.— I suppose the same described by the late traveller Bruyn, who, speaking of the shadow of this umbrageous tree, alludes to that of Hosea xiv. 5, which, it is not improbable, might be one of those yet remaining in the place, where that heroic Prince Solomon employed fourscore thousand hewers at work for the materials of only one temple and a palace ; a pregnant instance what time, negligence, and war will bring to ruin. But to return to what is said of their present number ; Le Bruyn, whom just now we mentioned, makes them thirty-five or thirty-six, for he could not exactly tell ; and pretends, like our Stonehenge on Salisbury plain, none could ever yet agree in their number.

BOOK II.

In short, upon reflection of what we have hitherto said concerning the universal waste and destruction of timber-trees, where due regard is not taken to propagate and supply them, whole countries have suffered as well as particular provinces. Thus the Apennines are stripped of their goodly Pine and Fir-trees, (which formerly the naturalist commends those mountains for,) to that degree, as to render not only the city of Florence, but Rome herself, so exposed to the nipping Tramontans, (for so they call the northern winds,) that almost nothing which is rare and curious will thrive without hyemation and art; so as, even through the most of those parts of Italy, on this side the kingdom of Naples, flanked by the Alpestral hills, (clad, as they perpetually are, with snow,) they are fain to house and retire their Orange, Citron, and other delicate and tender plants as we do in England. There remains yet one mountain among the Apennines, covered and crowned with Cypress, whereof some are of a considerable stature. Nor is all this indeed so great a wonder, if we find the entire species of some trees totally lost in countries, as if there never had been any such planted or growing in them. Be this applied to Fir and Pine, and several other trees, for want of culture, several accidents in the soil, air, &c. which we daily find produces strange alterations in our woods, the Beech almost constantly succeeding the Oak, to our great disadvantage, whilst we neglect new seminations. Herodotus, speaking of the Palms plentifully growing about Delos, says the whole species was utterly lost. More I might add on this subject; but perhaps I have been too long on these remarks—and long enough on cold Mount Libanus.

JUNIPER †.

1. Let it not seem unduly placed, if, after such giants, we bring this humble shrub (such as abound with us being so reckoned) to claim

† The real and distinct species of the JUNIPER are:

1. JUNIPERUS (*COMMUNIS*) foliis ternis patentibus mucronatis bacca longioribus.—
Lin. Sp. Plant. 1470. *Juniper with spreading sharp-pointed leaves placed by threes. Juniperus vulgaris fruticosa.* C. B. P. 488. *THE COMMON JUNIPER.*

Of the Common Juniper there are two sorts: 1. The English Juniper. 2. The Swedish Juniper.

1. The English Juniper, though naturally of our own growth, is very little known in many

affinity to the tallest Cedar; since, were not ours continually cropped, but maintained in single stems, we might perhaps see some of them rise to competent trees, fit for many curious works, such as tables, cabinets, coffers, inlaying, floors, carvings, &c. We read of some of these trees so large as to have made beams and rafters for a certain temple in Spain, dedicated to Diana; nor need we question their being

parts of England; for it grows naturally only in dry, chalky, sandy land; and where the soil is opposite to this, it is rarely found. Thus, in Leicestershire it is so little known, that when growing amongst other trees in a shrubbery, it is as much inquired after as any of the most rare and curious shrubs; and indeed, when properly raised from seeds, and planted in gardens, it is a pretty spreading evergreen. Those who have been used to see it in its wild state, on sandy, barren commons, &c. will have little inducement to plant it, as there they see it procumbent, seldom showing a natural tendency to aspire; but when planted in a good soil, it grows to the height of fifteen or sixteen feet, and produces numerous branches from the bottom to the top, forming a well-looking, bushy plant. These branches are exceedingly tough, and are covered with a smooth bark of a reddish colour, with a gentle tinge of purple. The leaves are narrow and sharp-pointed; they grow by threes on the branches; their upper surface has a greyish streak down the middle, but their under is of a fine green colour, and they garnish the shrub in great plenty. This shrub flowers in April and May. The flowers are small, of a yellowish colour, and make no figure. They are succeeded by berries, which are of a blueish purple when ripe.

2. The Swedish Juniper has a natural tendency to grow to a greater height, and consequently has more the appearance of a tree than the former. Sixteen or eighteen feet, however, is the highest it commonly grows to; and the plants raised from its seeds have, for the most part, a tendency to grow higher, and become more woody and branching. The leaves, flowers, and fruit grow in the same manner as the former, which shows it to be a variety only. Old botanists mention it as a distinct species: Caspar Bauhine asserts this, and calls one the Shrubby Juniper, and the other the Tree Juniper; he also mentions another sort, which he calls the Lesfer Mountain Juniper, with a broader leaf and a larger fruit.

2. JUNIPERUS (*OXYCEDRUS*) foliis undique imbricatis obtusis, ramis teretibus. Mill. Dict. *Juniper with obtuse leaves every where lying over each other, and taper branches.* Juniperus major, bacca rufescente. C. B. P. 489. *Greater Juniper with a brownish berry.* *Oxycedrus.* Clus. Hist. 1. *SPANISH JUNIPER.*

This sort grows rather higher than the Swedish in some soils. It will be feathered from the bottom to the top, if left untouched from the first planting, or if not crowded with other trees. The leaves are awl-shaped, and finely spread open. They are very short, sharp-pointed, and give the tree a fine look. The flowers of this shrub are succeeded by large reddish berries, which are very beautiful when ripe.

3. JUNIPERUS (*THURIFERA*) foliis quadrifariam imbricatis acutis. Lin. Sp. 1471.—*Juniper with acute leaves placed by fours, lying over each other.* Juniperus major bacca cærulea.—
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BOOK II. fit for other buildings; it is celebrated for its emulating the Cedar, though not in stature, yet in its lastingness; and such, I think, the learned Dr. Sloane mentions growing in Jamaica, little inferior to the Bermudas.

2. Of Juniper we have three or four sorts, male, female, dwarf; whereof one is much taller and more fit for improvement. The wood

C. B. P. *Greater Juniper with blue berries.* Cedrus Hispanica procerior, fructu maximo nigro. Tourn. Inst. SPANISH CEDAR.

The Spanish Cedar grows plentifully in the country from whence it derives its name, and is itself a regular growing tree, rising in a conical form, if the branches are untouched, to the height of thirty feet or more. The leaves are imbricated, and lie over each other four ways; they are acute, and of a fine green colour: From these properties only an idea of a fine tree may be had. The flowers are insignificant to a common observer, but they are succeeded by berries which make a good show when ripe; they are very large, and of a fine black colour, and adorn the young branches in great plenty.

4. JUNIPERUS (LYCIA) foliis ternis undique imbricatis ovatis obtusis. Lin. Sp. Pl. 1471. *Juniper with oval blunt leaves placed by threes, which every where lie over each other.* Cedrus, folio Cupressi, media, majoribus baccis. C. B. P. 487. *Middle Cedar, with a Cypress leaf and larger berries.* THE LYCIAN CEDAR.

The Lycian Cedar grows naturally in the country so called, and is as common in Spain as the former sort. It will rise to the height of about twenty-five feet. The branches have naturally an upright position, and their bark is of a reddish hue. The leaves are every where imbricated, obtuse, and of an oval figure. They resemble those of the Cypress, and are very beautiful. The flowers are succeeded by large oval berries, of a brown colour, and are produced in plenty from the sides of the younger branches all over the tree. The resinous gum, called Olibanum, is the produce of this tree: When burnt upon live coals, it sends forth a most agreeable smell, which induces me to think that it might be the frankincense of the Jews. The Thus, or frankincense of the shops, is a very different substance from this, being a concrete on the surface of the tercbinthinate juice of the Pine that produces the Terebinthina communis.

5. JUNIPERUS (PHÆNICIA) foliis ternis oblitteratis imbricatis obtusis. Lin. Sp. 1471. *Juniper with leaves placed by threes, which are oblitterate, obtuse, and lying over each other.* Cedrus folio Cupressi major, fructu flavescente. C. B. P. *Greater Cedar with a Cypress leaf and yellowish fruit.* THE PHÆNICIAN CEDAR.

The Phœnician Cedar seldom grows higher than twenty feet, and is a beautiful upright tree, forming a kind of pyramid, if untouched, from the bottom. It has both ternate and imbricated leaves; the under ones grow by threes, and spread open; and the upper ones are obtuse, and lie over each other like the Cypress. The flowers are produced from the ends of the branches; and the fruit that succeeds them is rather small, and of a yellow colour.—

is yellow, and being cut in March, sweet as Cedar, whereof it is accounted a spurious kind; all of them difficult to remove with success; nor prosper they being shaded at all, or over-dripped.—The Swedish Juniper, now so frequent in our modish gardens, and shorn into pyramids, is but a taller and somewhat brighter sort of the vulgar.

It is commonly called the Phœnician Cedar, though it is found growing naturally in most of the southern parts of Europe.

6 JUNIPERUS (*VIRGINIANA*) foliis ternis basi adnatis; junioribus imbricatis, senioribus patulis. Lin. Sp. Pl. 1471. *Juniper with leaves placed by threes adhering at their base, the young ones lying over each other, and the old ones spreading.* Juniperus maxima, cupressi folio minimo, cortice exteriore in tenues phyliras spirales ductili. Sloan. Jam. CEDAR OF VIRGINIA, or RED CEDAR.

The Virginia Cedar is a tree of great use and beauty. Its growth is upright. The branches form a beautiful cone; and if left unsprigged, the tree will be feathered to the very base. It grows to near forty feet high; and the timber is valuable for many excellent uses. It will continue sound and uncorrupt for many ages, being possessed of a bitter resin, which prevents the worms from attacking it. The wood may be converted into utensils of most sorts, as well as applied to a great part of the uses to which the Cypress is adapted. It is remarkable, however, for being of a very brittle nature, and is therefore not proper to be introduced into buildings where any great weight is to be lodged. Nevertheless, in Virginia and Carolina, where they abound, these trees are used in structures of all kinds, with this precaution; and the inhabitants prefer the timber for wainscoting their rooms and building of vessels. Those who are desirous of having variety of timber-trees in their plantations, will doubtless be inclined to allow this a place.

7. JUNIPERUS (*BERMUDIANA*) foliis inferioribus ternis, superioribus quadrifariam imbricatis. Mill. Dict. *Juniper with spreading under-leaves placed by threes, and the upper by fours, which lie close over each other.* Juniperus Bermudiana. H. L. CEDAR OF BERMUDAS.

The Cedar of Bermudas is a very tender plant, and requires not only a dry warm soil, and a well-sheltered situation, but open, mild winters, to make it continue through them; so that when a person is desirous of having an extensive collection, then, and then only, is this sort to be sought after. When planted abroad in the warmest places, sheds should be made for them of boards well closed, and these should be at hand for the gardener to cover the plants with at the first approach of frosty weather. The sheds are to be enlarged as the trees advance in height; for though they will more peculiarly want protection when young, yet a severe frost, with cutting black winds, will endanger very full-grown trees. This species grows to be a large timber-tree in America; and we used to receive the wood from thence in greater plenty than we do at present. It is possessed of a very sweet smell, which formerly recommended it for stair-cases, chests of drawers, and other pieces of furniture, but it is now universally neglected by our cabinet-makers. We never must expect to raise this tree to answer any purposes in the timber-way; the most we can expect is a few only in our

3. I have raised them abundantly of their seeds, neither watering nor dunging the soil, which in two months will peep; and being governed like the Cyprefs, are apt for all the employments of that beautiful tree. To make it grow tall, prune and cleanse it to the very stem; the male best. The discreet loosening of the earth about the roots also, makes it strangely to prevent your expectations, by suddenly

plantations, for variety. It is observable, as these trees advance in growth, their branches become cornered, and their leaves suffer a change in their nature. At first they are narrow, sharp-pointed, and produced by threes round the branches, spreading open in a pretty manner. The leaves afterwards grow shorter, and are produced by fours, without having any tendency to spread open. The flowers are produced nearly in the same manner as the Virginian kinds, and are succeeded by purplish berries.

5. JUNIPERUS (*BARBADENSIS*) foliis omnibus quadrifariam imbricatis, junioribus ovatis, senioribus acutis. Lin. Sp. Pl. 1471. *Juniper with all the leaves placed by fours, lying over each other, the young being oval, the older acute.* Juniperus Barbadosis, cupressi foliis, ramulis quadratis. Pluk. Alm. Commonly called *JAMAICA BERRY-BEARING CEDAR*.

This Cedar is a very large timber-tree in Jamaica and other islands where it grows naturally, and is much sought after for the building of ships, &c. The branches are spreading, many are cornered, and their bark is rough, and of a brown colour. The leaves grow by fours, and lie over each other. They are small; the older leaves are sharp-pointed, but the younger are more oval; and many are imbricated like the Cyprefs. Neither the male nor female flowers, which are found on different plants, make any figure; the last are succeeded by a small brownish berry. This is a very tender plant, though if it has a shed like the other, it may be nursed until it becomes a large tree. In very hard frosts, care must be taken to lay plenty of litter, &c. round the bottom of the shed to keep the frost from penetrating into the ground. The shed must always be taken off, and the litter removed from the stem, on the first return of fine open weather.

9. JUNIPERUS (*SABINA*) foliis oppositis erectis decurrentibus, ramis patulis. *Juniper with opposite, erect, running leaves, and spreading branches.* Sabina folio Cupressi. B. P. 487. *Savin with a Cyprefs leaf.* COMMON SAVIN.

Of this species there are three sorts: 1. Spreading Savin; 2. Upright Savin; 3. Striped Savin.

1. The spreading Savin is a low-spreading shrub; the branches have a natural tendency to grow horizontal, or nearly so; so that it must be ranked amongst the lowest growing shrubs; insomuch that unless it is planted against a wall, or supported in an upright position, we seldom have it higher than two feet. When it is to be planted and left to nature, room must be allowed for its spreading; for it will occupy a circle of more than two or three yards diameter, and will choke any other less-powerful shrub that is placed too near it. The bark on the older shoots is of a light brown colour; but on the younger, which are covered with leaves running into each other, it is of as fine a green as any shrub whatever. The leaves are erect and acute pointed. They are placed opposite, and grow a little like those of the

spreading into a bush fit for a thousand pretty employments ; for, coming to be much unlike that which grows wild, and subject to the treading and cropping of cattle, &c. it may be formed into most beautiful and useful hedges. My late brother having formerly cut out of one only tree, an arbour capable of receiving three persons to sit in ; it was at my last measuring seven feet square and eleven in height, and would certainly

French Tamarisk. This shrub seldom produces flowers or berries ; but when any berries do appear, they are small and of a blueish colour. It deserves a place amongst low-growing evergreens, on account of the fine strong green of its leaves both in winter and summer ; but it is valuable for nothing else ; for it produces neither ornamental flowers nor fruit, and is possessed of a very strong smell ; insomuch that when the branches and leaves are accidentally shook by a person's passing by, the whole atmosphere is immediately filled with a fetid scent, highly offensive and disagreeable. The juice of Savin, mixed with milk and honey, is said to be good to expel worms from children ; as well as, without that mixture, to destroy those in horses, for which purpose it is strongly recommended.

2. The Upright Savin is a delightful tree, and grows to the height of twelve or fourteen feet. The branches are numerous and slender, which gives the tree an elegant appearance. The leaves are nearly of the same nature with the other, but of a darker green. The flowers are produced in plenty, and are succeeded by numerous berries, which have a good effect. The upright tendency of this tree, with the very dark green colour of the leaves, which causes a good contrast with others that are lighter, together with its not being possessed of the strong disagreeable scent of the other sort, makes it a valuable shrub for Evergreen plantations.
3. The Striped Savin has not that tendency to spread like the Common, neither does it grow quite so erect as the Upright kind. It is a fine plant, and at present is rather scarce. The ends of several of the young shoots are of a fine cream-colour ; all the smaller branches appear often of that colour, and at a distance have the appearance of flowers growing on the tree. To those who are fond of variegated plants, this shrub has both beauty and scarcity to recommend it.

The JUNIPER is of the class and order *Dioecia Monadelphica*.

Having given a general account of the various species of this genus of plants, I shall now consider their propagation. They are raised from seeds which must be sown as soon as ripe, for when they are kept until spring, they do not come up until the second year. The ground in which the seeds of the *hardy* sorts are sown, should be fresh and light, but not dunged : being well dug and formed into beds, sow your seeds pretty thick, and sift some earth over them about half an inch thick ; the beds will require no farther care than only to keep them clear from weeds ; and toward the middle or latter end of April you will find some of the plants appear above ground, though, perhaps the greatest part of them will lie till the spring following before they come up ; therefore you should carefully clear the beds from weeds, and in very dry weather refresh them with some water, which will greatly promote the growth of those plants which are up, and also cause the other seeds to vegetate ; but if the beds in which these seeds are sown are much exposed to the sun, they should be shaded with mats in the day ; for when the plants come first up, they

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have been of a much greater altitude, and farther spreading, had it not continually been kept shorn : But what is most remarkable, is the little time since it was planted, being then hardly ten years, and then it was brought out of the Common, a slender bush of about two feet high. But I have experimented a proportionable improvement in my own garden, where I do mingle them with Cypress ; and they would perfectly

will not bear too much heat. In these beds they should remain till the second autumn, when you must prepare some beds to transplant them into, which should also be of light, fresh, undunged soil ; and having well dug and cleansed the ground from all noxious weeds and roots, you should make it level ; and then in the beginning of October, which is the proper season for removing these plants, raise up the young plants with a trowel, preserving as much earth as possible to their roots, and plant them into beds about five or six inches asunder each way, giving them some water to settle the earth to their roots ; and if it should prove very dry weather, you may lay a little mulch upon the surface of the ground round their roots, which will be of great service to the plants : But as many of the seeds will be yet left in the ground where they were sown, so the beds should not be disturbed too much in taking up the plants ; for I have known a bed sown with these berries, which has supplied plants for three years drawing, some of the berries having lain so long in the ground before they sprouted ; therefore the surface of the beds should be kept level, and constantly clear from weeds.

The plants may remain two years in the new beds, observing to keep them clear from weeds ; in the spring you should stir the ground gently between them, that their roots may strike into it with greater ease ; after which time they should be transplanted, either into a nursery, at the distance of three feet row from row, and eighteen inches asunder in the rows, or into the places where they are to remain for good. The best season to transplant them (as I before observed) is the beginning of October, when you should take them up carefully, preserving a ball of earth to their roots ; and when planted, the surface round their roots should be mulched ; all which, if carefully attended to, as also observing to refresh them with water in very dry weather, until they have taken new root, will preserve them from the danger of not growing ; and, being extremely hardy in respect to cold, they will defy the severest of our winters, provided they are not planted in a moist or rich soil.

In order to have these trees aspire in height, their under branches should be taken off, especially where they are inclined to grow strong, but they must not be kept too closely pruned, which would retard their growth ; for all these Evergreen trees do more or less abound with a resinous juice, which in hot weather is very apt to flow out from such places as are wounded ; so that it will not be advisable to take off too many branches at once, which would make so many wounds, from which their sap in hot weather would flow in such plenty, as to render the trees weak and unhealthy.

The Virginia Cedar grows to a prodigious height, and affords excellent timber for many uses ; but with us there are very few which are above thirty-five or forty feet high, though there can be no doubt of their growing larger ; for they thrive very fast after the

become their stations where they might enjoy the sun, and may very properly be set where *Cypripis* does not so well thrive, namely, in such gardens and courts as are open to the eddy-winds, which indeed a little discolours our Junipers when they blow easterly towards the spring, but they constantly recover again; and besides, the shrub is tonsile, and may be shorn into any form.—I wonder Virgil should

three first years, and resist the sharpest frosts of our climate exceedingly well. They will grow straight and regular, provided they are not suffered to shoot out too much at the bottom.

This species also is propagated by seeds, which must be procured from Virginia or Carolina, (for they rarely produce ripe seeds in England,) and sown as directed for the other Junipers; but as this seed cannot be procured in England till spring, so when sown at that season, it remains in the ground until the succeeding spring before the plants appear; therefore you must observe to keep the beds clear from weeds, and not suffer the seeds to be disturbed, which is often the fault of some impatient people, who think, because the plants do not rise the first year, that they will never come up, and so dig up the ground again, whereby the seeds are buried; but if they are suffered to remain, they seldom fail to grow, though sometimes it is two years after sowing before they appear. When the plants come up they must be carefully weeded, and in dry weather should be refreshed with water, which will greatly forward their growth: and the autumn following there should be a little rotten tan strewed upon them, to keep out the frost. In this bed the plants may remain till they have had two years growth; they should then be transplanted into other beds, as directed for the other sorts, observing to preserve a ball of earth to their roots; and after they are planted, if the season prove dry, they must be carefully watered, and the surface of the ground covered with mulch, to prevent the sun and wind from entering the earth to dry their fibres; but they should not be too much watered, which often proves injurious to these trees, by rotting their tender fibres soon after they are produced.

In these beds they may remain two years, observing to keep them clear from weeds; and in winter you should lay a little fresh mulch upon the surface of the ground round their roots, which will prevent the frost from penetrating to them, and effectually preserve them; for while the plants are so young, they are liable to be injured by hard frosts; but when they have attained a greater strength, they will resist the severest colds.

After two years, they should either be removed into the nursery, (as was directed for the common Juniper,) or transplanted where they are designed to remain; observing always to take them up carefully, otherways they are subject to fail upon transplanting; as also to mulch the ground, and water them as before directed, until they have taken root; after which they will require no farther care than keeping the ground clear about their roots, and pruning their side-branches to make them aspire in height.

The soil in which you plant these trees should be fresh and light, but must not be dunged, especially at the time when they are planted; for dung is very hurtful to them, if it be not quite rotted to mould; therefore the mulch which is laid upon the surface of

BOOK II. condemn its shade—*Juniperi gravis umbra*—I suspect him mis-reported.

3. The berries afford (besides a tolerable pepper) one of the most universal remedies in the world to our crazy forester. Being swallowed only, they instantly appease the wind-cholic; and, in decoction, they are

the ground should not be dung, but rather some old tanners' bark or sea-coal ashes, which will prevent the frost from penetrating deep into the ground.

The trees, thus managed, will, in a few years, rise to a considerable stature, and by the variety of their evergreen leaves and manner of growth, will greatly add to the beauty of the plantations, if rightly disposed, which indeed is what we seldom observe in any of the English gardens or wildernesses; for there are few people who minutely consider the different growths of the several trees with which they compose such plantations, so as to place the tallest growing trees the backwardest from sight, and the next degree to succeed them, and so gradually diminishing till we come to the common Juniper, and others of the like growth. In this manner all the trees will be seen, and the gradual declivity of their tops will appear like a verdant slope, and be much more agreeable to the sight, as also more advantageous to the growth of the trees, than to place shrubs of humble growth near such plants as will grow to the first magnitude, whereby the shrub is not only hid from sight, but will be overshadowed and destroyed; nor can the distance which each tree requires, be so justly proportioned any other way; for in this distribution, the largest trees being separated by themselves, may be placed at a due distance; and those of a middling growth succeeding, may be accordingly allowed sufficient room; and the smaller, which are next the sight, being placed much closer, will hide the naked stems of the larger trees, and produce a most agreeable effect.

The Bermudas Cedar being a native of that island, and also of the Bahama islands, is much tenderer than either of the former sorts, except that of Jamaica, so is not likely to thrive well in this country; for although many of these plants have lived several years in the open air in England, yet whenever a severe winter happens, it either kills them, or so much defaces them, that they do not recover their verdure for some years.

This Cedar is propagated by seeds in the same manner as the former, with only this difference, that the seeds should be sown in pots or tubs of earth, that they may be removed into shelter in the winter time, otherwise the young plants are often hurt by hard frosts; but they will require no other care, than being placed under a common hot-bed frame, where the glases may be constantly kept off in mild weather, when they cannot have too much free air, and only covered in the hard frosts. The seeds constantly remain in the ground until the second year before they come up, therefore the earth in the pots should not be disturbed; and in the summer time they should be placed in the shade, to prevent the earth from drying too fast: and in very dry weather they should be often watered, but do not give too much water to them at once, which would rot the seeds.

The spring following, when the young plants come up, they must be carefully cleared from weeds, and in dry weather refreshed with water; but should stand, during the summer season, in a place defended from strong winds; and in winter must be placed

most sovereign against an inveterate cough. They are of rare effect being steeped in beer; and in some northern countries they use a decoction of the berries as we do coffee and tea. The water is a most singular specific against the gravel in the reins; but all is comprehended in the virtue of the theriacle, or electuary, which I have often made for my poor neighbours, and may well be termed the forester's panacea

under frames, where they may be covered in hard frosty weather, but must have open air when the weather is mild. In April following, you should transplant them each into a small pot filled with fresh light earth, being careful to raise them up with a ball of earth, to their roots; and when they are planted, you should water them, to settle the earth to the roots; then place the pots in a warm situation, where they may be defended from sun and wind; but if you plunge the pots into a moderate hot-bed, it will greatly promote their taking new root; however, you must carefully defend them from the great heat of the sun, which is injurious to them when fresh removed; but when they have taken root, you may expose them by degrees to the open air. If you suffer the pots to remain plunged all the summer, it will preserve the earth therein from drying so fast as it would do, if they were set upon the ground.

In October, you should again remove these plants into shelter, or else plunge the pots into the ground under a warm hedge, where they may be protected from the cold north and east winds; and in the spring following you must shift the plants into pots of a size larger, taking away some of the earth from the outside of the ball, and adding some fresh, which will promote their growth; and so continue to manage them as was before directed, until you plant them out into the places where they are designed to remain; which should not be done till they are four or five years old, by which time they will be strong enough to bear the cold of our common winters.

The reason for my directing these plants to be preserved in pots until they are planted out for good is, because they are difficult to transplant, and being tender will require some shelter while young; and whoever observes the method here laid down, will find the plants so managed to gain two years growth in six, from those raised in the open air, and be in less danger of being destroyed; and as the trouble and expence in raising them this way is not great, so it is worth practising, since in a few years the trees will recompense the trouble.

The timber of the Bermudas Cedar is of a reddish colour; it has a sweet smell, and is commonly known in England by the name of Cedar Wood. It is chiefly employed in making pencils, but formerly they used it for chests and staircases. In the West-Indies it is employed in naval architecture, and it is reported that ships built with this timber are not liable to have their bottoms eaten by the worm.

The Jamaica Juniper is more impatient of cold than the Bermudas, it will not live through the winter in the open air in England, so the plants must be preserved in pots, and housed in the winter. This is propagated by seeds, in the same way as the Bermudas Cedar; but if the pots are plunged into a moderate hot-bed the second spring after

BOOK II.

against the stone, rheum, phthisic, dropsy, jaundice, inward imposthumes, nay, palsy, gout, and the plague itself. Of the extracted oil, with that of nuts, is made an excellent good varnish for pictures, wood-work, and to preserve polished iron from the rust. The gum is good to rub on parchment or paper to make it bear ink: And the coals, which are made of the wood, endure the longest of any; so as live embers, after being a year covered, have been found in the ashes. See St. Hierom ad Fabiolam, upon the expression *Kedar*, Psal. cxx. 4. If it arrive to full growth, spits and spoons, imparting a grateful relish, and very wholesome where they are used, are made of this wood, being well dried and seasoned: And the very chips render a wholesome perfume within doors, as do the dusty blossoms in spring without; for which purpose the wood should be cut about May, and the rasures well dried.


4. And since we now mention pepper, it is by the most prudent and princely care of his late Majesty Charles II. that I am assured of a late solemn act of council, enjoining the preserving of that incomparable spice, which comes to us from Jamaica under that denomination, though in truth it be a mixture of so many aromatics in one, that it might as well have been called Allspice, holding a near alliance to Cinnamon, Nutmeg, and Mace. And that there is not only prohibited the destruction of these trees, (for it seems some prodigals used to cut them down for the more easy gathering,) but order taken likewise for their

the seeds are sown, the plants will come up sooner, and they will have more time to strengthen before winter.

All the other sorts are hardy enough to live in the open air, so are very well worth propagating, as they will add to the variety of evergreen plantations; some of the sorts will rise to a very considerable height, so may prove to be useful timber, and may be adapted to such soils as will not suit many other trees.

The common Savin may be increased by slips, which, if planted almost at any time, or any how, will grow. The upright Savin also is to be increased by slips planted in moist weather, in August, and kept shaded and watered in dry weather afterwards. This is the best way of treating cuttings of the Upright Savin, though they will often grow if planted at any time, either in winter or summer. The Striped Savin also is to be increased this way: though care must be always used to take off those branches that are most beautifully variegated, and such as are entirely of a cream-colour; and this is the only method of continuing it in its variegated beauty. The Savin is also to be raised by berries; and by these the most upright and best plants are produced.

propagation, and that assays and samples be from time to time sent over, of what other fruits, trees, gums, and vegetables may there be found; and which I prognostic will at last also incite planters there to think of procuring Cinnamon, Cloves, and Nutmeg-trees indeed, from the East-Indies, and what other useful curiosities do not approach our northern Bear, and to plant them in Jamaica, and others of the western islands, as a more safe and frugal expedient to humble our enulous neighbours, since there is nothing in their situation, or defect of nature's benignity, which ought in the least to discourage us. And what if some of the trees of those countries, especially such as aspire to be timber, and may be of improvement amongst us, were more frequently brought to us likewise here in England: Since we daily find how many rare exotics and strangers, with little care, become endenized, and contented to live amongst us, as may be seen in the Platanus, Constantinople Chesnut, the Greater Glandiferous Ilex, Cork, Nux Vesicaria, (which is an hard wood fit for the turner,) the Styrax, Bead-tree, the famous Lotus, Virginian Acacia, Guaiacum Patavinum, Paliurus, Cypress, and sundry others, which grow already in our gardens, exposed to the weather; and so doubtless would many more. So judiciously observed is that of the learned author of the History of the Royal Society, part iii. sect. xxviii. "That whatever attempts of this nature have succeeded, they have redounded to the great advantage of the undertakers. The Orange of China being of late brought into Portugal, has drawn a great revenue every year from London alone. The Vine of the Rhine, taking root in the Canaries, has produced a far more delicious juice, and has made the rocks and sun-burnt ashes of those islands, one of the richest spots of ground in the world. And I will also instance in that which is now in a good forwardness; Virginia has already given silk for the cloathing of our King; and it may happen hereafter to give cloaths to a great part of Europe, and be a vast treasure to our Kings. If the silk-worms shall thrive there, of which there seems to be no doubt, the profit will be inexpressible. We may guess at it, by considering what numbers of caravans, and how many great cities in Persia are maintained by that manufacture alone, and what mighty customs it yearly brings unto the Sophi's revenue." Thus he. To which we might add, that not only the China Orange mentioned by the Doctor, but the whole race of Orange trees, were strangers in Italy, and unknown

BOOK II.  to Rome; nor grew they nearer than Persia, whence first they travelled into Greece, as Athenæus tells us. But to return to that of China, and give some account of its propagation in Europe: The first was sent for a present to the old Conde Mellor, then Prime Minister to the King of Portugal; but of that whole case that came to Lisbon, there was but one only plant which escaped the being so spoiled and tainted, that with great care it hardly recovered, to be since become the parent and progenitor of all those flourishing trees of that name, cultivated by our gardeners, though not without sensibly degenerating. Receiving this account from the illustrious son of the Conde, (successor in title and favour,) upon his being recalled, (then an exile at our court, where I had the honour to be known to him,) I thought fit to mention it in this place, for an instance of what the industry we have recommended would, questionless, in less than half an age, produce of wonders, by introduction, if not of quite different, yet of better kinds, and such variety for pulchritude and sweetness, that when, by some princely example, our late pride, effeminacy, and luxury, (which has, to our vast charges, excluded all the ornaments of timber, &c. to give place to hangings, embroideries, and foreign leather,) shall be put out of countenance, we may hope to see a new face of things, and the natural, wholesome, and antient use of timber restored, for the more lasting occasions, and furniture of our dwellings. And though I do not speak all this for the sake of joined-stools, benches, cup-boards, mafsy tables, and gigantic bedsteads, the hospitable utensils of our forefathers! yet I would be glad to encourage the carpenter and the joiner, and rejoice to see that their work and skill do daily improve; and that by the example and application of his Majesty's Universities, and Royal Society, the restoration and improvement of shipping, mathematical and mechanical arts, the use of timber grows daily in more reputation. And it were well if great persons only might be indulged to enrich and adorn their palaces with tapestry, damask, velvet, and Persian furniture, whilst by some wholesome sumptuary laws, the universal excess of those costly and luxurious moveables were prohibited meaner men for divers politic considerations and reasons, which it were easy to produce; but by a less influence than severer laws, it will be very difficult, if not altogether impossible, to recover ourselves from a softness and vanity, which will in time not only effeminate, but undec the nation.

CYPRESS^d.

CHAP. I.

1. This is either the Sative or Garden-tree, the most pyramidal and beautiful ; or that which is called the Male, though somewhat preposterously, which bears the small cones, but is of a more extravagant shape. Should we reason only from our common experience, even the Cypress-tree was, but within a few years past, reputed so tender and nice a plant, that it was cultivated with the greatest care, and to be found only

^d Of this GENUS there are four species :

1. CUPRESSUS (*SEMPERVIRENS*) foliis imbricatis, frondibus quadrangulis. Lin. Sp. Pl. 1422. Cupressus, C. B. P. 488. EVERGREEN UPRIGHT CYPRESS.

This tree is very common in most of our old gardens, but at present is rather neglected. It adds a considerable beauty to wilderiness and clumps of Evergreens, and is reported to be valuable on account of its wood. There is a variety of this tree, entitled, by Tournefort, *Cupressus ramos extra se spargens s. mas. Inst. 587*. It is commonly called the *Male spreading Cypress*, and is the most common timber in some parts of the Levant. It is considerably larger than the Upright sort. If planted upon a warm gravelly soil it will prosper wonderfully ; though not so finely shaped as the female, it makes up for that defect by its vigorous growth and strength, resisting all weathers. It is very proper to intermix with Evergreens of a second size next to Pines, to form clumps ; in which class it will keep pace with the trees of the same line, and be very handsome : Besides, the wood of this tree is very valuable, when grown to a size fit for planks.—In the islands of the Archipelago, as Mr. Evelyn informs us, it was customary, upon the birth of a daughter, to plant a *Cupressetum* or grove of Cypress-trees, to be given her for a portion. Hence every plantation of this kind was called *Dos Filie*, or a Daughter's Dower. Were Gentlemen in this country to imitate this practice with other trees, they might provide handsome fortunes for their younger children without incumbering their estates. This species of Cypress continues many years before it comes to decay. At this present time (1776) there are growing in the garden of the Palace of Generalife at Granada, several superb and lofty Cypresses, which it is well known were large trees in the reign of Audeli, the last Moorish King, three hundred years ago. These trees are still called *Los Cypresses de la Reyna Sultana*, from that Princess having been falsely accused of committing adultery under them with *Albin Hamet Abencerrage*, as we read in the *Guerras Civiles de Granada*.

2. CUPRESSUS (*DISTICHA*) foliis distichis patentibus. Lin. Sp. Pl. 1422. Cupressus Americana. Cat. Car. 1. Cupressus Virginiana, foliis acacie deciduis. Hort. Amst. i. p. 113. *THE DECIDUOUS CYPRESS.*

This kind of Cypress, if stationed in a place suitable to its nature, will grow to the height of sixty feet. It is very hardy in respect to cold. In Virginia and several parts of America, where this tree is a native, it is a real aquatic, being found growing to a very large size in places wholly covered with water ; and with us, if planted in watery places, by the edges of rivers, ponds, springs, &c. it will be more luxuriant, and will proportionally arise to a greater

amongst the curious ; whereas we see it now in every garden, rising to as goodly a bulk and stature as most which you shall find even in Italy itself: For such I remember to have once seen in his late Majesty's gardens at Theobalds, before that princely seat was demolished. I say, if we did argue from this topic, methinks it should rather encourage our countrymen to add yet to their plantations other foreign and useful trees,

height and bulk than if planted in a dry soil. This tree in the summer has the resemblance of an Evergreen, which is the chief inducement for its admision into the pleasure-ground.

3. CUPRESSUS (*THYOIDES*) foliis imbricatis, frondibus ancipitibus. Lin. Sp. Pl. 1422. *Cypress with imbricated leaves, and branches standing two ways.* Cupressus nana Mariana, fructu cæruleo parvo. Pluk. Mant. 61. *DWART MARYLAND CYPRESS, WITH A SMALL BLUE FRUIT.*

The branches of this tree are garnished with flat Evergreen leaves, resembling those of the Arbor Vitæ; and the cones are no larger than the berries of the Juniper, from which they are not easily distinguished at a little distance; but upon closely viewing, they are perfect cones, having many cells like those of the common Cypress.

4. CUPRESSUS (*JUNIPEROIDES*) foliis oppositis decusatis subulatis patulis. Lin. Sp. Plant. 1422. Cupressus foliis linearibus simplicibus cruciatim positis. Mill. Dict. *Cypress with narrow single leaves placed crossways.* *THE CAPE CYPRESS.*

The branches of this species are numerous, slender, and spread themselves all round. The leaves are narrow, awl-shaped, about an inch long, of a light green colour, and grow opposite to each other on the branches. The flowers come out from the sides of the branches like common Cypress, and are succeeded by black fruit; but the seeds never ripen in England.

The CYPRESS, in the Linnæan system, belongs to the class and order *Monocia Monadelphia.*

The manner of propagating the common Cypress is as follows: A warm border, or well-sheltered bed, should be prepared for the purpose, after having been well-worked, turned over, and mellowed by the frosts all winter. The soil of this border, or bed, should be sandy; and if it be not naturally so, some drift-sand may be brought to mix with it, and worked all over the bed, at least six inches deep. Having the border prepared, the mould being smooth and fine, let a small part, sufficient to cover the seeds, be taken out, and then let the bed be raked smooth and fine. After this, sow the seeds all over it moderately thin; for if they are sown too thick the roots get matted together, so that the plants cannot be removed out of the seed-bed into the nursery, without great danger. The seeds being now sown regularly over the bed, riddle the mould that was taken out, over them, not quite half an inch thick. The beginning of March is the best time for this work; and by the beginning of May, if the seeds were good, the plants will come up. If the month of April should prove very dry, as it often happens, the beds may have now and then a gentle watering, which will help to bring the plants up. After they have come up, if the summer should not prove very dry, they will require little watering; and even

and not in the least deter them, because many of them are not as yet become endenized amongst us: But of this I have said enough, and yet cannot but still repeat it.

2. We read that the Peach was at first accounted so tender and delicate a tree, as that it was believed to thrive only in Persia; and even in the

in the greatest drought twice a week will be sufficient for them, provided it be done in the evenings. This is the only care they will require the first summer, except being kept clean from weeds. If the place where they are sown be tolerably well sheltered, they will stand the winter very well, though it should prove severe; but where the situation is not well sheltered by plantations, to break the violence of the frosty black winds, they must be screened, otherwise many will be lost. It is the black frosts, attended by high winds, which destroy these plants; so that where there is not shelter enough to break their edge, the beds should be hooped over, and covered with mats during that severe weather.

The ensuing summer the plants may remain undisturbed, and they will require neither watering, nor farther care, except weeding. The spring following, being then two years old, they should be set out in the nursery, exactly at two feet square. In taking them out of the seed-bed, some earth should be taken up with the roots. The latter end of March is the most proper time for this work; and if the weather should prove dry and cold, as it often happens, the March winds blowing, the work must be deferred till rainy or cloudy weather; for without these precautions you will find this a difficult plant to remove. After they are planted out into the nursery they may be now and then watered in dry weather, and kept clean from weeds; thus they may stand till they are of a sufficient size to be planted out for good.

The ground intended for a *Cupressetum* may the preceding year bear a crop of grain, and, the winter before it is planted, should be ploughed with a strong plough, to destroy the weeds, and lay the best soil downwards.

After this, holes should be made all over it at two yards distance. The plants must be taken out of the nursery with as much mould to the roots as possible, and carefully planted in these holes. If the plants are designed for timber, when they get too close, they ought to be proportionably thinned, and should undergo a second thinning as often as they touch each other, till they arrive at their full size.

With regard to the Small Blue-berried and Cape Cypress, the seeds should be sown in pots or boxes. We receive them from abroad: They are very small, and seldom come up before the second spring; so that there will be less danger of their being lost if they are sown in pots or boxes, which may be set in the shade in summer, and removed into well-sheltered places during the winter. In the spring, the plants will come up; and after that, the Blue-berried Cypress may have the same treatment as the young seedlings of the common sort. With respect to the Cape Cypress, the plants must be set in pots, to be housed in winter, until they are grown to be a yard high. When they are put out into

BOOK II. days of Galen, it grew no nearer than Egypt, of all the Roman Provinces, but was not seen in the city till about thirty years before Pliny's time ; whereas there is now hardly a more common and universal tree in Europe. Thus likewise the Avellana travelled from Pontus in Asia, into Greece ; and from thence into Italy, to the city of Abellino in Campania. I might affirm the same of our Damasco Plum, Quince, Medlar, Fig, and most ordinary Pears, as well as of several other peregrine trees, fruit-bearers, and others ; for even the very Damask Rose itself, (as my Lord Bacon tells us, Cent. ii. Exp. 659.) is little more than an hundred years old in England : Methinks this should be of wonderful incitement. It was six hundred and eighty years after the foundation of Rome, before Italy had tasted a cherry of their own, which being then brought thither

the open air, they should have a dry, warm soil, and a well-sheltered place, and even then we cannot insure their safety.

The Cyprefs is a native of Crete ; and Theophrastus informs us that it grows spontaneously upon Mount Ida. Virgil properly calls it the Idæan Cyprefs :

————— nec Idæis Cyparissis.

GEORG. ii.

Branches of Cyprefs used antiently to be placed before the doors of the deceased, and Servius gives the reason, " quia hujus generis arbor excisa non renascitur." It not only was stationed before the doors, but also at the sepulchres and funeral pils :

Linquenda tellus, et domus, et placens
Uxor, neque harum, quas colis, arborum
Te, præter *invisas Cupressos*,
Ulla brevem dominum sequetur.

ÆNE.

Lucan informs us that the Cyprefs was only used at the funerals of persons of distinction ; and probably because it was *Diti Sacra*. He says,

Et non plebeios luctus testata *Cupressus*.

J.Æ. iii.

Virgil introduces the Cyprefs at the funeral of Polydore :

—————stant manibus ara,
Cæreleis mæste vittis atraque *Cupressos*.

ÆN. iii.

It is also mentioned at the funeral Pile of Misenus :

Ingentem struxere pyram : cui frondibus atris
Intexunt latera, et *ferales ante Cupressos*
Constituunt, decorantque super fulgentibus armis.

ÆN. vi.

out of Pontus, (as the above-mentioned Filberts were,) did, after one hundred and twenty years, travel *ad ultimos Britannos*.

3. We had our first Myrtles out of Greece, and Cyprefs from Crete, which was yet a mere stranger in Italy, as Pliny reports, and most difficult to be raised ; which made Cato to write more concerning the culture of it than of any other tree : Notwithstanding this, we have in our country no less than three sorts, which are all of them easily propagated, and prosper very well if they are rightly ordered ; and therefore I shall not omit to disclose one secret, as well to confute a popular error, as for the instruction of our gardeners.

4. The tradition is, that the Cyprefs, being a symbol of mortality, (they should say of the contrary,) is never to be cut for fear of killing it. This makes them to impale and wind them about like so many Egyptian mummies ; by which means the inward parts of the tree being heated, for want of air and refreshment, it never arrives to any perfection, but is exceedingly troublesome and chargeable to maintain ; whereas, indeed, there is not a more tonsile and governable plant in nature ; for the Cyprefs may be cut to the very roots, and yet spring afresh, as it does constantly in Candy : If not yielding suckers, as Bellonius affirms, I rather think it is produced by the seeds, which the mother-trees shed at the motion of the stem in the felling ; and this we find was the husbandry in the isle of Ænaria, where they used to fell it for copse. The Cyprefs being raised in the nursery from seeds sown in September, or rather March, and within two years after transplanted, should at two years standing more, have the master-stem of the middle shaft cut off some hand-breadths below the summit ; the sides and smaller sprigs shorn into a conic or pyramidal form, and so kept clipped from April to September, as oft as there is occasion ; and by this regimen they will grow furnished to the foot, and become the most beautiful trees in the world, without binding or stake ; still remembering to abate the middle stem, and to bring up the collateral branches in its stead, to what altitude you please. But when I speak of shortening the middle shoot, I do not intend the dwarfing of it ; and therefore it must be done discreetly, so as it may not over hastily advance, till the foot thereof be perfectly furnished. But there is likewise another expedient, no less commendable, to dress this

BOOK 11.

tree with all the former advantages ; if sparing the shaft altogether, you diligently cut away all the forked branches, reserving only such as radiate directly from the body, which being shorn, and clipt in due season, will render the tree very beautiful ; and though more subject to obey the shaking winds, yet the natural spring of it does immediately redress it, without the least discomposure ; and this is a secret worth the learning of gardeners, who subject themselves to the trouble of stakes and binding, which is very inconvenient. Thus may you form them into topiary works, limits and boundaries—*Metas imitata Cupressus*. You may likewise form them into hedges by sowing the seeds in a shallow furrow, and plucking up the supernumeraries, where they come too close and thick : for in this work it will suffice to leave them within a foot of each other ; and when they are risen about a yard in height (which may be to the half of your palisado) cut off their tops, as you are taught, and keep the sides clipped, that they may ascend but by degrees, and thicken at the bottom as they climb. Thus they will present you (in half a dozen or eight years) with incomparable hedges, because they are perpetually green, able to resist the winds better than most which I know, the Holly only excepted, which indeed has no peer.

5. For when I say winds, I mean their fiercest gusts, not their cold : For though it be said, *Brumæque illesa Cupressus*, and that indeed no frost impeaches them, (for they grow even on the snowy tops of Ida,) yet our cruel eastern winds do sometimes mortally invade those which have been late clipped, seldom the untouched, or that were dressed in the spring only. The March and April winds, (in the years 1663 and 1665,) accompanied with cruel frosts and cold blasts, for the space of more than two months, night and day, did not, amongst near a thousand Cypresses growing in my garden, kill above three or four, which, for being very late cut to the quick, (that is, the latter end of October,) were rav of their wounds, took cold, and gangrened ; some few others, which were a little smitten towards the tops, might have escaped all their blemishes, had my gardener capped them but with a wisp of hay or straw, as in my absence I commanded. As for the frost of those winters, (than which I believe there was never known a more cruel and deadly piercing one since England had a name,) it did not touch a Cypress of mine, till it joined forces with that destructive wind :

Therefore, for caution, clip not your Cypresses late in autumn, and clothe them, if young, against these winds; for the frosts they only discolour them, but seldom or never kill them, as by long experience I have found. Nor altogether despair of the resurrection of a Cypress subverted by the wind, for some have redressed themselves; and one (as Ziphilinus mentions) rose the very next day, which happening about the reign of the Emperor Vespasian, was esteemed an happy omen. But of such accidents more hereafter.

6. If you affect to see your Cypress in standard and grow wild, (which may in time come to be of a large substance, fit for the most immortal of timber, and indeed are the least obnoxious to the rigours of our winters, provided you never clip or disbranch them,) plant of the reputed male sort; it is a tree which will prosper wonderfully where the ground is hot and gravelly, though, as we said, he be nothing so beautiful; and it is of this that the Venetians make their greatest profit.

7. I have already showed how this tree is to be raised from the seed; but there was another method amongst the ancients, who, as I told you, were wont to make great plantations of them for their timber: I have practised it myself, and therefore describe it.

8. If you receive your seed in the roundish small nuts, which use to be gathered thrice a-year, but seldom ripening with us, expose them to the sun till they gape, or near a gentle fire, or put them in warm water, as was directed for those of Cedar, by which means the seeds will be easily shaken out; for if you have them open before, they do not yield you half their crop. About the beginning of April, or before, if the weather be showery, prepare an even bed, which being made of fine earth, clap down with your spade, as gardeners do for purslain seed; (of old they rolled it with a stone or cylinder;) upon this strew your seeds pretty thick, then sift over them some more mould, somewhat better than half an inch in height. Keep them duly watered after sun-set, unless the season do it for you; and after one year's growth, for they will be an inch high in little more than two months, you may transplant them where you please. If in the nursery, set them at a foot or eighteen inches distance in even lines, keeping them watered and moist till they

BOOK II. are rooted, and fit to be removed. In watering them I give you this caution, which may also serve you for most tender and delicate seeds, that you bedew them rather with a broom or spergitory, than hazard the beating them out with the common watering-pot; and when they are well come up, be but sparing of water. Be sure likewise that you cleanse them when the weeds are very young and tender, lest, instead of purging, you quite eradicate your Cyprefs. We have spoken of watering; and indeed, whilst young, if well followed, they will make a prodigious advance. When that long and incomparable walk of Cyprefs at Frascati, near Rome, was first planted, they drew a small stream by the foot of it, (as the water there is in abundance tractable,) which made the trees, as I was credibly informed, arrive to seven or eight feet height in one year, which does not agree with the epithet, *lenta Cuprefsus*; but with us we may not be too prodigal, since, being once well taken, they thrive best in our sandy, light, and warmest grounds; whence Cardan says, *juxta aquas arescit*; meaning in low and moorish places, stiff and cold earth, &c. where they never thrive.

9. There is also a Virginian Cyprefs, of an enormous height, beautiful and very spreading, the branches and leaves large and regular, with the clogs resembling the Cyprefs; and though the timber be somewhat coarse and cros-grained, it is, when polished, very agreeable, as I can show in a very large table made out of the planks of a Spur only; and have experience of its lastingness, though exposed both to the air and weather.

10. What the uses of this timber are, for chests and other utensils, harps, and divers other musical instruments, (it being a very sonorous wood, and therefore employed for organ-pipes, as heretofore for supporters of vines, poles, rails, and planks, resisting the worm, moth, and all putrefaction to eternity,) the Venetians sufficiently understood; who did every twentieth year, and oftener, (the Romans every thirteenth,) make a considerable revenue of it out of Candy: And certainly a very gainful commodity it was, when the fell of a Cuprefsetum was heretofore reputed a good daughter's portion, and the plantation itself called *Dos filie*. But there was in Candy a vast wood of these trees, belonging to the Republic, by malice or accident, (or perhaps by solar heat, as were many woods, seventy-four years after, even here in England,) set on fire,

which beginning *anno* 1400, continued burning for seven years before it could be quite extinguished, being fed for so long a space by the unctuous nature of the timber, of which there were to be seen at Venice planks of above four feet in breadth: And formerly the valves of St. Peter's church at Rome were framed of this material, which lasted from the great Constantine to Pope Eugenius's IVth's time (eleven hundred years) and then were found as fresh and entire as if they had been new. But this Pope would needs change them for gates of brafs, which were cast by the famous Antonio Philarete; not in my opinion so venerable as those of Cypres. It was in coffins of this material that (as Thucydides tells us) the Athenians used to bury their heroes: And the mummy-chests brought with those condited bodies out of Egypt, are many of them of this material, which, it is probable, may have lain in those dry and sandy Cryptæ many thousand years.

11. The timber of this wood was of infinite esteem with the antients. That lasting bridge built over the Euphrates by Semiramis, was made of this material; and it is reported, Plato chose it to write his laws on, before brafs itself, for the diuturnity of the matter. It is certain that it never rifts or cleaves but with great violence; and the bitterness of its juice preserves it from worms and putrefaction. To this day, those of Crete and Malta make use of it for their buildings, because they have it in plenty; and there is nothing outlasts it, or can be more beautiful, especially the root of the wilder sort, incomparable for its crisped undulations. Divers learned persons have conceived the Gopher mentioned in holy writ, Gen. vi. 14. (and of which the ark was built,) to have been no other than this *Κυπάρισσος*, Cupar, or Cuper, by the easy mutation of letters. Aben Ezra names it a light wood apt to swim; so does David Kimchi, which rather seems to agree with Fir or Pine, and such as the Greeks calls *ξύλα τετραγώνια* quadrangular trees, about which critics have made a deal of stir; but Isa. Vossius, on the LXX. cap. xi. has sufficiently made it out, that the timber of that denomination was of those sort of trees whose branches break out just opposite to one another at right angles, which makes it appear to have been Fir, or some sort of wood whose arms grow in an uniform manner; but surely this is not to be universally taken, since we find that Yew, and divers other trees, brittle, heavy, and unapt for shipping, do often put forth in that order. The same learned author will have Gopher to signify only pitch or

BOOK II. bitumen, as much as if the text had said, make an ark of resinous timber. The Chaldee paraphrase translates it Cedar; or, as Junius and Tremellius, *Cedrelaten*, a species between Fir and Cedar. Munster contends for the Pine, and divers able Divines endeavour to prove it Cypress; and, besides, it is known that in Crete they employed it for the same use in the largest contignations, and did formerly build ships of it: And Epiphanius Hæres. lib. i. tells us, some relicks of that ark, *circa Campos Sennaar*, lasted even to his days, and was judged to have been of Cypress. Some indeed suppose that Gopher was the name of a place, *à Cupressis*, as *Elon*, *à Quercubus*, and might possibly be that which Strabo calls *Cupressetum*, near Adiabene in Afsyria. But for the reason of its long lasting, coffins (as noted) for the dead were made of it, and thence it first became to be *Diti sacra*; and the valves, or doors, of the Ephesine Temple were likewise of it, as we observed, but now, were those of St. Peter at Rome. Works of Cypress-wood *permanent ad diuturnitatem*,^c says Vitruvius, lib. ii. And the poet,

————perpetua nunquam moritura Cupresso. MART. LIB. VI. 73.

The medicinal virtues of this tree, are for all affects of the nerves; astringent and refrigerating, for the hernia, applied outwardly; or, taken inwardly, for the dysentery, strangury, &c.

* The antients considered the Cypress as a wood not subject to decay. Martial, in the forty-ninth Epigram of the sixth Book, introduces Priapus, speaking of himself, as not being made of common wood, but of *incorruptible* Cypress:

Non sum de fragili dolatus ulmo,
Nec quæ stat rigida supina vena,
De ligno mihi quolibet columna est,
Sed viva generata de Cupresso:
Quæ nec sæcula centies peracta
Non longæ cariem timet senectæ.

This God was considered as the guardian of vineyards and gardens. He was cut out of any rough piece of wood into an extraordinary form; and being dressed up with reeds on his head, and a scythe in his right hand, (Virg. Georg. iv.) was placed in gardens to terrify birds and thieves. Horace thus describes him:

Olim truncus eram ficulnus, inutile lignum;
Cum faber, incertus scammum faceretne Priapum,
Maluit esse Deum. Deus inde ego, furum avinunque
Maxima formido: nam fures dextra coercet,
Obscuroque ruber porrectus ab inguine palus.
Ast importunas volucres in vertice arundo
Terret fixa, vetatque novis considerare in hortis

LIB. I. SAT. viii.

12. But to resume the disquisition, whether it be truly so proper for shipping, is controverted; though we find in Cæsiodorus Var. Op. l. v. epist. xvi. Theodoris writing to the Prætorio-præfectus that he had caused store of it to be provided for that purpose; and Plato, who, we told you, made laws and titles to be engraven on, nominates it, *inter arbores ναπηγησῆς utiles*, lib. iv. Leg. and so does Diodorus, lib. xix.— And, as travellers observe, there is no other sort of timber more fit for shipping, though others think it too heavy. Aristobulus affirms that the Afsyrians made all their vessels of it; and indeed the Romans praised it, when pitched with Arabian pitch. And so frequent was this tree about those parts of Afsyria, where the ark is conjectured to have been built, that those vast Armadas which Alexander the Great caused to be equipped and set out from Babylon, consisted only of Cypresses, as we learn out of Arrian in Alex. lib. vii. Strabo, lib. xvi. Plutarch. Sympos. lib. i. prob. c. ii. Paulus Colomesius, in his *Κεμήλια Literaria*, cap. xxiv. perstrings the most learned Isa. Vossius, that, in his *Vindicie pro LXX*. Interp. he affirms Cypresses not fit for ships, as being none of the *τετραγώνου*. But, besides what we have produced, Fuller, Bochartus, Lilius Gyraldus lib. de Navig. cap. iv. and divers others, sufficiently evince it, and that the vessel built by Trajan was of that material, lasting uncorrupt near 1400 years, when it was afterwards found in a certain lake; if it were not rather, as I suspect, that which Æneas Silvius reports to have been discovered in his time, lying under water in the Numidian Lake, crusted over with a certain ferruginous mixture of earth and scales, as if it had been of iron; but, as we have elsewhere noted, it was pronounced to be *Larix*, and not Cypresses, employed by Tiberius. Finally, not to forget even the very chips of this precious wood, which give that flavour to muscadines and other rich wines, I commend it for the improvement of the air, and a specific for the lungs, as sending forth most sweet, and aromatic emissions, whenever it is either clipped or handled; and the chips or cones being burnt, extinguish moths, and expel gnats and flies, &c. not omitting the gum which it yields, not much inferior to the Terebinthine or Lentisc.

We have often mentioned the virtue of these odoriferous woods for the improvement of the air, upon which I take occasion here to add what

BOOK II.



*Fumifugium.

have, some years since, already* published concerning the melioration of it, in and about this great and populous city, accidentally obnoxious to the effects of those nauseous vapours exhaling from those many unclean places, and tainting that dismal cloud of sulphureous, if not arsenical, smoke which we incessantly breathe in. I know the late terrible conflagration, by the care and industry of the magistrate in causing so many kennels, sinks, gutters, lay-stalls, and other nuisances (receptacles of a stagnant filth,) to be removed, must needs have exceedingly contributed to the purifying of the air, as I am persuaded would appear upon a political observation of the bills of mortality. But what I cannot yet but deplore, is, that when that spacious area was so long a *rasa tabula*, the churchyards had not been banished to the north walls of the city, where a grated inclosure of competent breadth, for a mile in length, might have served for an universal cemetery to all parishes, distinguished by the like separations, and with ample walks of trees; the walks adorned with monuments, inscriptions, and titles, apt for contemplation and memory of the defunct; and that wise and antient law of the Twelve Tables restored and revived. But concerning this and hortulan burying, see Book iv. Happy, in the mean time, had it been for the further purgation of this august metropolis, had they then banished and proscribed those hellish vulcanos, disgorging from lime-kilns, forges, glafs-houses, brew-houses, soap and salt boilers, chandlers, hat-makers, and other trades, one of whose funnels vomits more smoke than all the culinary and chamber fires of a whole parish, perniciously infecting the ambient air with a black melancholy canopy, to the detriment of the most valuable moveables and furniture of the inhabitants, and the whole country around. A bar of iron shall be more exeded and consumed with rust in one year in this city, than in thrice seven in the country.—Why might it not therefore be worth a severe and public edict to remove these vulcanos, and infernal houses of smoke, to a competent distance; some down the river; others, which require conveniency of fresh water, up the Thames, among the streams about Wandsworth, &c. their commodities and manufactures brought up to capacious wharfs on the bank, or London side, to the increase of a thousand watermen and other labourers, of whom we cannot have too many?

Now to demonstrate that the amoval of these insufferable nuisances would infinitely clarify the air and render it more wholesome, I shall

return to my subject of trees and plants. The reputation they have had for contributing to the health of whole countries and cities, frequently occurs in history. For instance, the island of Cyprus, abounding with the trees of that name, and other resinous plants, cures ulcerated lungs, &c. Sardinia, replanted with true Anticyran Hellebore, was famous for curing melancholy and madnefs; whilst Thusus (especially in summer,) brought almost all the inhabitants to lunacy and distraction for want of it. And what effects and benefits such plantations have produced, is conspicuous in one of the most celebrated cities of the east, the famous Ispahan, cleared of the pestilence since the surrounding it with the beautiful Platan, as I have already noted. To these add the Bay-tree for abating all such infections; of which see many famous instances in Chap. v. Book ii. to which I refer. Not that there are no nociferous trees, as well as saniferous, which by removing the one, and planting the other in their places, make sensible changes for the better. I shall give instances, when we speak of the Yew, and even that otherwise incomparably useful shrub, the Elder.

Upon what, therefore, has been produced of expedients for the melioration of the air by the plantations of proper trees, I cannot but wish, that since these precious materials may now be had at such tolerable rates, as certainly they might from Cape-Florida, the Bermuda, or other parts of the West Indies; I say, I cannot but suggest, that our more wealthy citizens of London, every day building and embellishing their dwellings, might be encouraged to make use of Cyprefs-wood in their shops, at least for shelves, counters, chests, tables, wainscot, veneerings, and mouldings; since, besides the everlastingnefs of the wood, enemy to worms and those other corruptions we have named, it would likewise greatly cure and reform the malignancy and corrosive-nefs of the air.

S A V I N E.

The SABINE, or, as we call it, SAVINE^f, is not for dignity to be named with the former; but as it is absolutely the best succedaneum to Cyprefs, (which the rigour of our climate is not benign to,) our gardeners would do well to increase and cultivate it for the other's defects, and bring up nurseries of them for pyramids, and other tonsile and topiary works. As to its other quality, it has indeed, an ill report, as most other things have when not rightly applied, whilst there is nothing more efficacious for the destruction of worms in little children, the juice being given in a spoonful of milk, dulcified with a little sugar, which brings them away in heaps, as it does in horses and other cattle, above all other remedies.

There is another berry-bearing Savine in warmer climates, which also resembles the Cyprefs, commonly taken for the Tarentine Cyprefs, so much celebrated by Cato, which grew to noble standards. But that, and the Melesian, worthy the culture, are rare with us, and indeed is as well supplied by the more hardy, as well as the Swedish Juniper, and other shrubs. The Sabine is easily propagated by slips and cuttings, sooner than by the seeds, which are sometimes found in the small squamous seed-cases.

T A M A R I S K.

The TAMARISK^g, (growing to a considerable tree,) for its aptness to be shorn, and governed like the Savine and Cyprefs, may be entertained, but not for its lasting verdure, which forsakes it in winter, though it is

^f The SAVIN is a species of Juniper, and has been described in the last chapter, under the title of JUNIPERUS (*SABINA*) *foliis oppositis erectis decurrentibus, ramis patulis*.

^g There are two species of this GENUS:

1. TAMARIX (*GALLICA*) *floribus pentandris*. Lin. Sp. Pl. 386. *Tamarisk with pentandrous flowers*. *Tamariscus Narbonensis*. Lob. Icon. 218. *FRENCH TAMARISK*.

This sort grows naturally in the South of France, in Spain, in Italy, where it arrives to a tree of middling size; but in England is seldom more than fourteen or sixteen feet high. The bark is rough, and of a dark-brown colour; it sends out many slender branches, most of

soon again restored. But it has other excellent properties; in particular, it is sovereign against the spleen, which as Camden* tells us, was therefore brought first into England by Grindal, Archbishop of Canterbury.— They also made cans of this wood to drink out of. It was of old counted *infelix*, and under malediction; and therefore used for wreaths to be put on the heads of malefactors.

CHAP. I.

* Elizab.

which spread out flat, and hang downward at their ends; these are covered with a Chesnut-coloured bark, and garnished with very narrow finely divided leaves, which are smooth, of a bright green colour, and have small leaves or indentures which lie over each other like the scales of fish. The flowers are produced in taper spikes at the end of the branches, several of them growing on the same branch. The spikes are about an inch long, and as thick as a large earth-worm. The flowers are set very close all round the spike; they are very small, and have five concave petals of a pale flesh colour, with five slender stamina terminated by roundish red summits. The flowers appear in July, and are succeeded by oblong, acute-pointed, three-cornered capsules, filled with small downy seeds, which seldom ripen in England.

2. TAMARIX (*GERMANICA*) floribus decandris. Lin. Sp. Pl. 387. *Tamarisk with decandrous flowers.* Tamariscus Germanica. Lob. Icon. 218. *GERMAN TAMARISK.*

This kind grows naturally in Germany, in moist land; It is rather a shrub than a tree, having several ligneous stalks arising from the same root, which grow erect, sending out many side-branches which are also erect; these have a pale green bark when young, which afterwards changes to a yellowish colour. The leaves are shorter, and set closer together than those of the other sort, and are of a lighter green, approaching to a grey colour; the flowers are produced in long loose spikes at the end of the branches, standing erect; they are larger than those of the former, and have ten stamina standing alternately. It flowers about the same time as the former. Both these sorts cast their leaves in autumn, and it is pretty late in the spring before the young leaves push out, which renders them less valuable. They are now frequently planted in gardens for ornament, and, when mixed with other shrubs, make a pretty variety.

This GENUS of plants is of the class and order *Pentandria Trigynia*.

The culture of both sorts of Tamarisk is very easy. Every cutting will grow that is set in winter, and will be a good plant by the autumn following. The increasing them by layers has been recommended; but that is bad advice, not only as being unnecessary trouble, but because layers of this tree very often will not strike root at all. The best time for the work is October, though any time of the winter will do. The cuttings should be of the last summer's shoot; and a moist part of the garden is most eligible for them to be planted in. In two years they will be good plants for the wilderness or shrubbery, and may be planted out in almost any soil, though they best like a light moist earth, especially the German sort; for in countries where the Tamarisk naturally grows, it is generally found in low watery grounds.

T H U Y A ^h.

This tree, by some called ARBOR VITÆ, (brought from Canada) is of moderate stature, bearing a ragged leaf not unlike the Cypress, only somewhat flatter, and not so thick set and close. It is of a hardy green all the winter, and delights in the shade, where the roots running shallow, the stem needs support. The leaf being bruised between the

^h Of the THUYA there are two species :

1. THUYA (*OCCIDENTALIS*) strobilis lavibus; squamis obtusis. Lin Sp. Pl. 1421.—*Thuya with smooth cones and obtuse scales.* Thuya Theophrasti. C. B. P. 488. *THE COMMON ARBOR VITÆ.*

This sort grows naturally in Canada, Siberia, and other northern countries, and has been long cultivated in the English gardens. In some of these gardens, which have not been altered, there are a few of these trees which are of a large size. The Thuya has a strong woody trunk, which rises to the height of thirty feet or more. The bark, while young, is smooth, and of a dark-brown colour; but, as the trees advance, the bark becomes cracked and less smooth. The branches are produced irregularly on every side, standing almost horizontal, and the young slender shoots frequently hang downward; these branches stand but thin, and the younger branches only are garnished with leaves, so that when the trees are grown large, they make but an indifferent appearance, being so thinly clothed with leaves. The young branches are flat, and the small leaves are placed over each other like the scales of fish; the flowers are produced from the sides of the young branches, pretty near to the foot-stalk; the male flowers grow oblong catkins, and between these the female flowers are collected in form of cones. When the former have shed their farina, they soon after drop off, but the female flowers are succeeded by oblong cones, having obtuse smooth scales, containing one or two oblong seeds. It flowers early in the spring, and the seeds ripen in September. The leaves of this tree have a rank oily scent when bruised. Professor Kalm informs us, that the Thuya is not seen farther south than Saratoga in the province of New York; this place is forty-two degrees and ten minutes north latitude. The Canadians call it *Cedro blanc*. In its natural state it seems to prefer swamps, marshes, and other wet places. In Canada the tallest trees do not exceed thirty-six feet.

2. THUYA (*ORIENTALIS*) strobilis squarrosis, squamis acuminatis reflexis. Lin. Sp. Pl. 1422. *Thuya with ragged cones, and acute-pointed reflexed scales.* Thuya strobilis uncinatis, squamis reflexo-acuminatis. Flor. Leyd. Prod. 87. *THE CHINA ARBOR VITÆ.*

This kind grows naturally in the northern parts of China, where it rises to a considerable height. The seeds were first sent to Paris by some of the Missionaries, and there are some of the trees growing in the gardens of some curious persons there, which are more than twenty feet high. The branches of this sort grow closer together, and are much better adorned with leaves; these are of a brighter green than the other, so make a much better appearance. Being very hardy, it is esteemed much preferable to most of the evergreen trees with small leaves, for ornament in gardens. The branches of this tree cross each other at right angles; the leaves are flat, but the single divisions of the leaves are slender, and the

fingers, emits a powerful scent, not easily conquered, seeming to breathe something of a sanative ointment, and (as I am told,) makes one of the best for the closure of green and fresh wounds. To this we might add (not for their verdure only) other more rare exotics, *Styrax Arbor* and *Terebynth*; noting, by the way, that the Larch is the only tree from which the true turpentine is obtained, whilst apothecaries substitute that which extils from the Fir-tree instead of it: All of them minding me

scales are smaller, and lie closer over each other than those of the first sort. The cones are also much larger, and of a beautiful grey colour; their scales end in acute reflexed points.

In the Linnæan system this tree is of the class and order *Monocotyledonæ*. The flowers come out early in the spring, but make a mean appearance.

The *Arbor Vitæ* is propagated by seeds, layers, and cuttings. The first makes the best trees, though the latter methods are generally practised.

The celebrated Professor Kalm, in his travels into North America, observes of the Occidental *Arbor Vitæ*, that it is reckoned the most durable wood in Canada: "Inclosures of all kinds are made of it. All the posts which are driven into the ground, are of the Thuya wood. The palisades round the forts in Canada are likewise made of the same wood. The planks in the houses are made of it; and the thin narrow pieces of wood, which form both the ribs and the bottom of the bark-boats, commonly made use of here, are taken from this wood, because it is pliant enough for the purpose, especially whilst it is fresh, and likewise because it is very light. The Thuya-wood is reckoned one of the best for the use of lime-kilns. Its branches are used all over Canada for besoms; and the twigs and leaves of it being naturally bent together, seem to be very proper for the purpose. The Indians make such besoms, and bring them to the towns for sale; nor do I remember having seen besoms of any other wood. The fresh branches have a peculiar scent, which is strongly perceived in houses where they make use of besoms of this tree.

"This Thuya is made use of for several medicinal purposes. The Commandant of Fort St. Frederic, M. de Lusignan, could never sufficiently praise its excellence for rheumatic pains. He told me he had often seen it tried, with remarkable success, upon several persons, in the following manner: The fresh leaves are pounded in a mortar, and mixed with hog's grease, or any other grease. This is boiled together till it becomes a salve, which is spread on linen, and applied to the part where the pain is. The salve gives certain relief in a short time. Against violent pains, which move up and down in the thighs, and sometimes spread all over the body, they recommend the following remedy: Take of the leaves of a kind of Poly-pody* four-fifths, and of the cones of the Thuya one-fifth, both reduced to a coarse powder by themselves, and mixed together afterwards. Then pour milk-warm water on it, so as to make a poultice, which spread on

* *Poly-podium fronde pinnata, pinnis alternis ad basin superne oppositissimis.*

BOOK II. again of the great opportunities and encouragement we have of every day improving our stores with so many useful trees from the American plantations; for which I have the suffrage of the often-cited Mr. Ray, who is certainly a very able judge. Might we not therefore attempt the more frequent Locust, Sassafras, and that sort of Maple, or Sugar-tree, whose juice yields that sweet? Also the *Halymus Latifolius*, and several others for encouragement. But, I produce not these particulars, and other *amana vircta* already mentioned, as signifying any thing to timber, the main design of this treatise, (though I read of some Myrtles so tall, as to make spear-shafts) but to exemplify in what may be farther added to ornament and pleasure, by a cheap and most agreeable industry.

“ linen, and wrap it round the body; but as the poultice burns like fire, they commonly lay a cloth between it and the body, otherwise it would burn and scorch the skin.—
 “ I have heard this remedy praised beyond measure, by people who said they had experienced its good effects. An Iroquese Indian told me, that a decoction of *Thuya* leaves was used as a remedy for the cough. In the neighbourhood of Saratoga, they use this decoction in the intermitting fever.

“ This tree has, in common with many other American trees, the quality of growing freely in marshes and thick woods, which may be with certainty called its native places.
 “ However, there is scarce a single *Thuya*-tree in those places which bears seeds; if, on the other hand, a tree accidentally stands on the outside of a wood, on the sea-shore, or in a field, where the air can freely come at it, it is always full of seeds. I have found this to be the case with the *Thuya*, on innumerable occasions.”



The Mulberry Tree

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John Miller del. et sculp.

C H A P. II.

The M U L B E R R Y.

MORUS, the MULBERRYⁱ. It may possibly be wondered by some why we should insert this tree amongst our forest inhabitants; but we shall soon reconcile our industrious planter when he comes to understand the incomparable benefit of it, and that for its timber, durableness, and

CHAP. II.

ⁱ Of this GENUS there are six species :

1. MORUS (*NIGRA*) foliis cordatis scabris. Lin. Sp. Pl. 1393. *Mulberry with rough heart-shaped leaves.* Morus fructu nigro. C. B. P. 459. *Mulberry with a black fruit. THE BLACK MULBERRY.*

This is the common Black Mulberry-tree, which is cultivated for the delicacy of its fruit.—

It grows naturally in Persia, from whence it was first brought to the southern parts of Europe, but is now become common in every part of Europe, where the winters are not very severe; for in the northern parts of Sweden these trees will not live in the open air; and in several parts of Germany they are planted against walls, and treated in the same way as the Peach, and other tender fruits, in this country.

2. MORUS (*RUBRA*) foliis cordatis subtus villosis, amentis cylindricis. Lin. Sp. Plant. 1399. *Mulberry with heart-shaped leaves, which are hairy on their under side, and cylindrical catkins.* Morus Virginiensis arbor, loti arboris instar ramosa, foliis amplissimis. Pluk. Phyt. tab. 246. *Virginian Mulberry, branching like the Nettle-tree, having very large leaves. THE VIRGINIAN MULBERRY.*

This tree will grow to the height of thirty or forty feet. It sends forth many large branches; and the bark of the young shoots is of a blackish colour. The leaves are larger than the common Mulberry, and rougher, though in other respects they somewhat resemble them. It produces plenty of catkins, in shape like those of the Birch-tree; and the female flowers are succeeded by a dark reddish fruit. This is a scarce plant at present, notwithstanding it bears the severity of our climate extremely well.

3. MORUS (*ALBA*) foliis obliquè cordatis levibus. Lin. Sp. Pl. 1398. *Mulberry with oblique, smooth, heart-shaped leaves.* Morus fructu albo. C. B. P. 459. *Mulberry with a white fruit. THE WHITE MULBERRY.*

This tree will grow to a large size, and is very proper for walks and avenues, or for clumps or standards, either in fields or parks. The leaves are of a clear light green, and the fruit is of a paler colour than any of the other sorts, which makes it take the name of the White Mulberry. This tree possesses the peculiar property of breeding no vermine, either when growing or cut down; neither does it harbour any caterpillar, the silk-worm excepted.— This species is cultivated for its leaves in France and Italy to feed silk worms; and, when

use for the joiner and carpenter, and to make hoops, bows, wheels, and even ribs for small vessels, instead of Oak, &c. though the fruit and the leaves have not the due value with us, which they deservedly enjoy in other places of the world.

2. But it is not here I would recommend our ordinary black fruit-bearer, though that be likewise worth the propagation, but that kind

raised for that use, the tree should not be suffered to grow tall. The leaves should be shorn off along with the tender twigs, which injures the plant much less than pulling them by the hand. This kind should be raised from seeds procured from Italy or the south of France.

4. MORUS (*TINCTORIA*) foliis obliquè cordatis acuminatis hirsutis. *Mulberry with oblique, heart-shaped, acute-pointed, hairy leaves.* Morus fructu viridi, ligno sulphureo tinctorio. Sloan. Hist. Jan. 2. p. 3. *Mulberry with a green fruit, whose wood dyes a sulphur colour. FUSTICK WOOD.*

This tree is better known by the title of Fustick, which is given to the wood, than by its fruit, which is of no estimation. It grows naturally in most of the islands in the West-Indies, but more plentifully in the Bay of Campeachy, where it abounds greatly. This wood is one of the commodities exported from Jamaica, where it grows in greater plenty than in any other of the British islands. This tree, in the countries where it grows naturally, rises to the height of sixty feet and upward. The bark is of a light-brown colour, with some shallow furrows. The wood is firm, solid, and of a bright yellow. It sends out many branches on every side, covered with a white bark, and garnished with leaves about four inches long, which are broad at their base, and indented at the foot-stalk, where they are rounded; but one side is broader than the other, so that they are oblique to the foot-stalk; these diminish gradually, and end in acute points; they are rough like those of the common Mulberry, of a dark green, and stand upon short footstalks. Toward the end of the young branches come out short catkins of a pale herbaceous colour; and in other parts of the same branches the fruit is produced, growing upon short foot-stalks. The fruit is as large as a nutmeg, of a roundish form, full of protuberances like the common Mulberry, green within and on the outside, and of a luscious sweet taste when ripe. This species is too tender to thrive in this country, unless preserved in a warm stove. There are several of the plants now growing in the Chelsea garden, which were raised from seeds sent from Jamaica by William Williams, Esq. with many other curious sorts, which are natives of that island. The seeds of this plant come up freely on a hot-bed; and when the plants are fit to remove, they should each be planted in a separate small pot, filled with fresh light earth, and plunged into a hot-bed of tanner's bark, and shaded from the sun till they have taken new root. Let them be treated in the same way as other plants from those hot countries, always keeping them in the tan-bed in the stove, where they will make good progress. These plants retain their leaves great part of the year in the stove.

5. MORUS (*PAPYRIFERA*) foliis palmatis, fructibus hispidis. Lin. Sp. Plant. 1399. *Mulberry with hand-shaped leaves and prickly fruit.* Morus sativa, foliis urticæ mortuæ, cortice

which is called the White Mulberry, which I have had sent me out of Languedoc; one of a broad leaf, found there and in Provence, whose seed being procured from Paris, where they have it from Avignon, should be thus treated in the seminary.

CHAP. II.

3. In countries where they cultivate them for the silk-worm and other uses, they sow the perfectly mature berries of a tree, whose leaves have

papyrifera. Kæmp. Amœn. 471. *Cultivated Mulberry, with leaves like the Dead Nettle, and of whose bark paper is made.* THE PAPER MULBERRY.

This sort grows naturally in China and Japan, where the inhabitants make paper of the bark. They cultivate the trees for that purpose on the hills and mountains, much after the same manner that Osiers are cultivated here, cutting down the young shoots in December. These being divided into rods of three feet in length, or shorter, are gathered into bundles to be boiled. If, by delaying the boiling, the shoots are dried, they must be previously softened in common water for twenty-four hours. The bundles are boiled very closely together, and placed erect in a large copper properly closed; the boiling being continued until the separation of the bark displays the naked wood. Then the stalks are loosed out of the bundles, and allowed to cool; after which, by a longitudinal incision, the bark is stripped off. This, being the material of the paper, is dried, (the wood being rejected) and, when dried, is kept to undergo the farther preparation when convenient; which consists in purification and selection. To be purified, the bark is put three or four hours in water; when, after being sufficiently softened, the cuticle, which is of a dark colour, together with the greenish surface of the *liber*, or inner bark, is pared off; a knife being used for that purpose, which they call Kaadsj Kusâggi; that is, the Razor of Kaadsj, or the Paper Mulberry. At the same time, the stronger bark is separated from the more tender; the former of which makes the whitest and best paper; the latter a dark, weak, and inferior kind. If any bark appear that is old, it is likewise set aside for a thicker kind, and of worse quality. By the same operation, they throw together into this last class the knotty parts of the bark, and those which have any fault or blemish. The bark thus purified, and divided into classes, according to its quality, is boiled in any lye that is clear and strained; care being taken to stir the substance as soon as it begins to boil, with a strong reed, and to pour in of the lye gradually as much as is necessary for stopping the evaporation, and restoring the liquor that is lost. The boiling is to be given over when the materials can be split, by a slight touch of the finger, into fibres and down. The lye employed in the process in question, is made of any kind of ashes, in this manner. Two pieces of wood are placed cross-ways over a vessel: Upon this cross is laid straw, and over the straw wet ashes; over which is poured boiling water; and this imbibing the salt of the ashes, is permitted to flow into the vessel placed under it, and is termed Lye. To the boiling succeeds the washing, which is a thing of some moment; as, if washed a shorter time than it ought, the paper will be strong, indeed, but rougher, and of an inferior quality; if a longer time, it will be whiter, but of a fat consistence, lax, and less fit for writing. Being sufficiently washed, the materials are put upon a thick, smooth, wooden-table, and stoutly beaten together by two or three slaves with battons, made of a hard wood called Kus-no-ki, (the Camphire-tree) into a pulp, resembling macerated paper; which, being put in water, separates like the grains of meal. Thus prepared, it is put into a narrow vat; an infusion of Rue, and a mucous water of the infusion of

not been-gathered. These they shake down upon an old sheet spread under the tree, to protect them from gravel and ordure, which will hinder you from discerning the seed. If they be not ripe, lay them to mature upon shelves, but by no means till they corrupt; to prevent which, turn them daily; then put them in a fine sieve, and plunging them in water, bruise them with your hand: Do this in several waters, then change them in other clear water, and the seed will sink to the bottom, whilst the

Oreni being added to it. These three are to be mixed and agitated together with a clean and slender reed, until reduced into a liquor that is homogeneous, and of a due consistence. This succeeds best in a narrow vessel. The prepared liquor is poured into a larger vat; from whence the sheets, or folios, are poured out one by one, and placed in heaps upon a table covered with a double mat; a small thread of reed being interjected betwixt the sheets at the margin, which, projecting a little from the leaves, serves to distinguish them, so that they may be taken up singly when wanted. The heaps are covered with a single piece of wood, adapted to the size and form of the paper, upon which stones are placed, at first of a light weight, lest, being wet, the sheets should coalesce; but afterwards larger and heavier, that all the aqueous humour may be expressed by degrees. The following day, the weights being removed, each sheet is taken up by itself, and the operation finished.

A few years ago there were several plants of the paper mulberry raised in the gardens of his Grace the Duke of Northumberland from seed; and when removed into the open air, bore the weather without shelter. The tree makes very strong vigorous shoots, but seems not to be of tall growth, for it sends out many lateral branches from the root upward. The leaves are large, some of them are entire, others are deeply cut into three, and some into five lobes, especially while the trees are young, dividing in form of a hand. They are of a dark green, and rough to the touch; but of a pale green on their under side, and somewhat hairy, falling off on the first approach of frost in autumn, as do those of the common Mulberry.

6. MORUS (*INDICA*) foliis ovato oblongo utrinque æqualibus, inæqualiter serratis. Lin. Sp. Pl. 1399. *Mulberry with oval oblong leaves, which are equal on both sides, but unequally sawed.* Tinda-parua Hort. Mal. *THE INDIAN MULBERRY.*

This kind grows naturally in India, where it becomes a large tree. It has a soft, thick, yellowish bark, with a milky juice like the Fig, which is astringent. The branches come out on every side, and are garnished with oblong oval leaves, standing upon short foot-stalks. Both sides of these leaves are equal, but their edges are unequally sawed. They are rough, of a dark green on their upper side, but pale on their under, standing alternately on the branches. The flowers come out in round heads, at the foot-stalks of the leaves on each side of the branches; they are of an herbaceous white colour; the male flowers have four stamina; the female flowers are succeeded by roundish fruit, which at first is green, afterwards white, and when ripe of a dark red colour.—The plants are too tender to live out of a stove in this country.

The MULBERRY is of the class and order *Monœcia Tetrandria*, which contain those plants that have male and female flowers at separate distances upon the same plant, the male flowers having four stamina.

pulp swims, and must be taken off carefully. This done, lay the seed to dry in the sun upon a linen cloth, for which one hour is sufficient; then fan and sift it from the husks, and reserve it till the season. This is the process of curious persons; but the sowing of ripe Mulberries themselves is altogether as good; and from the excrement, of hogs, and even dogs, that will frequently eat them, they will rise abundantly. Note, That in sowing of the berries, it is good to squash and bruise them with fine

It is generally observed that the old Mulberry-trees are not only more fruitful than the young, but their fruit is much larger and better flavoured; so that where there are any of these old trees, it is the best way to propagate from them, and to make choice of those branches which are most fruitful. These trees may be propagated by laying down their branches, which will take root in one year, after which they should be separated from the old trees; but the best way is to propagate them by cuttings, which, if skilfully managed, will generally succeed. The cuttings should be the shoots of the former year, with one joint of the two years wood to their bottom; they should not be shortened, but planted their full length, leaving two or three buds above ground. The best season for planting them is in March, after the danger of hard frosts is over. They should be planted in light rich earth, pressing the ground pretty close about them; and if they are covered with glasses, it will forward their putting out roots; but where there is not such conveniency, the ground about them should be covered with moss to prevent its drying; and where this is carefully done, the cuttings will require but little water. If the cuttings succeed well, and make good shoots, they may be transplanted the following spring into the nursery, where they should be regularly trained to stems by fixing down stakes, to which the principal shoots should be fastened; and most of the lateral branches should be closely pruned off, leaving only two or three of the weakest to detain the sap, for the augmentation of the stem; for when they are quite divested of their side-shoots, the sap is mounted to the top, so that the heads of the trees grow too fast for the stems, and become too weighty for their support. After four years growing in the nursery, they will be fit to transplant where they are to remain; for these trees are transplanted with greater safety while young, than when of a large size.

If the cuttings are planted in a bed, fully exposed to the sun, it will be proper to arch the bed over with hoops, that they may be shaded with mats in the heat of the day during the spring, till they have put out roots; after which, the more they are exposed to the sun, the better they will succeed, provided the ground be covered with moss to prevent its drying; for the sun will harden the shoots, whereby the plants will be in less danger of suffering by the early frosts in autumn; for when these are in a shady situation, they are apt to grow vigorously in summer; and, being full of moisture, the early frosts in October frequently kill their tops. If the following winter prove severe, they are often killed to their roots, and sometimes are entirely destroyed. Mr. Miller recommends the cuttings to be planted on a hot-bed; and he informs us that he was led to this improvement by observing some sticks of Mulberry trees which were cut for forks, and thrust into a hot-bed to fasten down the vines of cucumbers; which although they had been cut from the

sifted mould; and if it be rich, and of the old bed, so much the better. They should be interred, well moistened, and covered with straw, and then rarely watered till they peep; or you may squeeze the ripe berries in ropes of hair or bast, and bury them, as is prescribed for Hips and Haws. The earth in which you sow them should be fine mould, and as rich as for melons, raised a little higher than the area, as they make the beds for ordinary pot-herbs, to keep them loose and warm; and in such beds you may sow the seeds as you do purslane, mingled with some fine earth, and thinly covered, and then for a fortnight strewed over with straw to protect them both from sudden heat and from birds. The season is April or May, though some forbear even till July and August, and in the second quarter of the moon, the weather calm and serene.— At the beginning, keep them moderately fresh, not over wet, and clean weeded, secured from the rigour of frosts. The second year of their growth, about the beginning of October, or early spring, draw them gently out, prune the roots, and, dipping them in pond-water, transplant them into a warm place or nursery. It is best ranging them in drills two feet large and one in depth, each drill three feet distant, and each

tree a considerable time, yet many of them put out roots and shot out branches; so that when any person is in haste to propagate these trees, if the cuttings are planted on a moderate hot-bed, they will take root much sooner than in the common ground.

All the kinds of Mulberry may be raised by sowing the seeds in a warm border, or upon a hot-bed, moderately heated; but this method of propagation is not to be recommended when the trees are intended for fruit, as the seeds will not always come of the desired kinds. When a large quantity of trees is desired for their leaves *only*, it is a good method to raise them from seeds.

The Mulberry delights to grow in a light rich earth, such as is seen in most of the old kitchen gardens about London; for in some of those gardens there are trees of a very great age, which are very healthy and fruitful, and their fruit is larger and better flavoured than that of younger trees. I have never yet seen any of these trees which were planted in a very stiff soil, or on shallow ground, either upon clay, chalk, or gravel, which have been healthy or fruitful; their stems and branches are generally covered with moss, so that the little fruit which they produce is small, ill tasted, and late before it ripens.

If these trees are planted in a situation where they are defended from the strong south and north-west winds, it will preserve their fruit from being blown off; but this shelter, whether it be trees or buildings, should be at such a distance as not to keep off the sun; for where the fruit has not the benefit of his rays to dissipate the morning dews, it turns mouldy and rots upon the trees.

It often happens that old trees either become bad bearers, or cast their fruit before it comes to maturity. In either of these cases, let a trench be cut about two feet deep,

plant two; and if thus the new earth be somewhat lower than the surface of the rest, it will the better receive the rain. Being planted, cut them all within three inches of the ground. Water them not in winter but in extreme necessity, and when the weather is warm, and then do it in the morning. In this cold season, you will do well to cover the ground with the leaves of trees, straw, or short litter, to keep them warm; and every year you should give them three dressings or half-diggings, viz. in April, June, and August; this, for the first year, still after rain. The second spring, after transplanting, purge them of all superfluous shoots and cions, reserving only the most towardly for the future stem: This to be done yearly as long as they continue in the nursery; and if, of the principal stem so left, the frost mortify any part, cut it off, and continue this government till they are near six feet high; after which suffer them to spread into heads, by discreetly pruning and fashioning them: But if you plant where cattle may endanger them, the stem had need be taller, for they are extremely liquorish of the leaves.

4. When they are about five years growth, you may transplant them

round the tree, and about four feet from the bole. Let this trench be filled with fresh mould, enriched with cow-dung; and as the large roots may be raised without inconvenience, let the compost be put under them so as to make the bed, over which the tree stands, as rich as possible. At the same time, let the old wood be cut from the head of the tree, in order that the young wood may have space to grow in. These operations being judiciously conducted, you will, in a few years, have an old tree converted into a young one. Let it also be observed that, if you expect plenty of fruit, you must never permit the ground to be cropped near the tree, for by the spade, the feeding fibres of the roots will be cut off at the time when the fruit requires the utmost nourishment.

The Mulberry is remarkable for putting out its leaves late, so that when they appear, the gardener may take it for granted, that all danger from frosts is over: He may then expose his Greenhouse Plants. *Cum germinare videris Morum, injuriam postea frigoris timere solito.*—PLIN.

Ovid, on account of the blood-red appearance of its fruit, has chosen the Mulberry-tree for the scene of his affecting story of Pyramus and Thisbe; and indeed, no other tree could have given so much assistance to the imagination of the poet. Horace advises us to finish our dinner with ripe Mulberries:

Ille salubres
Æstates peraget, qui nigris prandia Moris
Finiet, ante gravem quæ legerit arbore solem.

without cutting the root, provided you eradicate them with care, only trimming the head a little. The season is from September to November, in the new moon; and if the holes, or pits, you set them in were dug and prepared some months before, it would much secure their taking. Some cast horns, bones, shells, &c. into them, the better to loosen the earth, which should be rich, and well refreshed all summer. A light and dry mould is best, well exposed to the sun and air, which above all things this tree affects, and hates watery low grounds. In sum, being a very lasting tree, it thrives best where Vines prosper most, whose society it exceedingly cherishes; nor does it less delight to be amongst Corn, no way prejudicing it with its shade. The distance of these standards should be twenty or twenty-four feet every way, if you would design walks or groves of them; if the environs of fields, banks of rivers, highways, &c. twelve or fourteen feet may suffice, but the farther distant the better: The White spreads its roots much farther than the Black, and likes the valley more than the higher ground.

5. Another expedient to increase Mulberries, is by layers from the suckers at the foot; this should be done in spring, leaving not above two buds out of the earth, which you must diligently water, and the second year they will be rooted. They will also take by passing any branch, or arm, slit and kept a little open with a wedge, or stone, through a basket of earth, which is a very sure way. Nay the very cuttings will strike in spring; but let them be from shoots of two years growth, with some of the old wood, though of seven or eight years; these set in rills, like vines, having two or three buds at the top, will root infallibly, especially if you twist the old wood a little, or at least hack it; though some slit the foot, inserting a stone, or grain of an oat to suckle and entertain the plant with moisture.

6. They may also be propagated by grafting them on the Black Mulberry in spring, or inoculated in July, taking the cions from some old tree that has broad, even, and round leaves, which causes it to produce very ample and tender leaves, of great emolument to the silkmaster.

7. Some experienced husbandmen advise to poll our Mulberries every three or four years, as we do our Willows; others not till eight years;

both erroneously. The best way is yearly to prune them of their dry and superfluous branches, and to form their heads round and natural.— The first year of removal where they are to abide, cut off all the shoots to five or six of the most promising; the next year, leave not above three of these, which dispose in triangle as near as may be, and then disturb them no more, unless it be to purge them (as we taught,) of dead seawood and extravagant parts, which may impeach the rest; and if afterward any pruned branch shoot above three or four cions, reduce them to that number. One of the best ways of pruning, is what they practice in Sicily and Provence, to make the head hollow and like a bell, by cleansing them of their inmost branches; and this may be done either before they bud, viz. in the new moon of March, or when they are full of leaves in June or July, if the season prove any thing fresh. Here I must not omit what I read of the Chinese culture, and which they now also imitate in Virginia, where they have found a way to raise these plants of the seeds, which they sow and cut like a crop of grafs, which sprout and bear leaves again in a few months. They likewise in Virginia have planted them in hedges, as near together as we do gooseberries and currants, for their more convenient clipping, which they pretend to do with scissors.

8. The Mulberry is much improved by stirring the mould at the root, and Letation.

9. We have already mentioned some of the uses of this excellent tree, especially of the White, so called because the fruit is of a paler colour, which is also of a more luscious taste and less than the Black; the rind likewise is whiter, and the leaves of a mealy clear green colour, far tenderer, and sooner produced by at least a fortnight, which is a marvellous advantage to the newly-disclosed silk-worm; also they arrive sooner at their maturity, and the food produces a finer web. Nor is this tree less beautiful to the eye than the fairest Elm, very proper for walks and avenues. The timber, amongst other properties, will last in the water as well as the most solid Oak, and the bark makes good and tough bast ropes. It suffers no kind of vermine to breed on it, whether standing or felled, nor dare any caterpillar attack it, save the silk-worm only. The loppings are excellent fuel; but it is for the leaves that this tree is in greatest and most worthy esteem, which, besides the silk-worm, nourish

cows, sheep, and other cattle, especially young porkers, being boiled with a little bran. The fruit is excellent to feed poultry. In sum, whatever eats of them will with difficulty be reduced to endure any thing else, as long as they can come by them. To say nothing of their other sovereign qualities, as relaxing of the belly, being eaten in the morning, and curing inflammations and ulcers of the mouth and throat, mixed with mel rosarum, in which receipt they do best when taken before they are over ripe. As for drink, the juice of the berry, mixed with cyder-apples, makes an excellent liquor both for colour and taste.

10. To proceed with the leaf, for which the Mulberry is chiefly cherished, the benefit of it is so great, that they are frequently let to farm for vast sums; so as one sole tree has yielded the proprietor a rent of twenty shillings per annum for the leaves only, and six or seven pounds of silk, worth as many pounds sterling, in five or six weeks, to those who kept the worms. We know that, till after Italy had made silk above a thousand years, they received it not in France, it being hardly yet an hundred since they betook themselves to this manufacture in Provence, Languedoc, Dauphine, Lionois, &c. and not in Orleanois till Henry the Fourth's time; but it is incredible what a revenue it now amounts to in that kingdom. About the same time, or a little after, it was that King James did, with extraordinary care, recommend it to this nation by a book of directions, acts of council, and all other princely assistance.— But this did not take any more than the proposal of Henry the Fourth, about the environs of Paris, who filled the highways, parks, and gardens of France with the trees, beginning in his own gardens for encouragement. Yet I say this could not be brought into example till this present great monarch, by the indefatigable diligence of Monsieur Colbert, (superintendent of his Majesty's manufactures,) so successfully revived it, that it is prodigious to consider what an happy progress they have made in it; to our shame be it spoken, who have no other discouragements from any difficulty whatever, but our sloth and want of industry; since wherever these trees will grow and prosper, the silk-worms will do so also; and they were likewise averse, and from the very same suggestions, where now that manufacture flourishes in our neighbour countries.— It is demonstrable, that Mulberries in four or five years may be made to spread all over this land; and when the indigent and young daughters in proud families are as willing to gain three or four shillings a day

for gathering silk, and busying themselves in this sweet and easy employment^k, as some do to get fourpence a day for hard work at hemp, flax, and wool, the reputation of Mulberries will spread in England and our plantations. I might say something like this of Saffron, which

^k From this passage it appears that Mr. Evelyn was much dissatisfied with the education of women in his days. The following extract from his *Mundus Muliebris*, published in 1690, will serve as a picture of the times, in which the manners of both sexes are painted in strong colours:

“The refined lady expects her servants and humble admirers should court her in the forms and decencies of making love in fashion. In order to this you must often treat her at the play, the park, and the music; present her at the raffle; follow her to Tunbridge at the season of drinking the waters, though you have no need of them yourself. You must improve all occasions of celebrating her shape, and how well the mode becomes her, though it be never so fantastical and ridiculous; that she sings like an angel; dances like a goddeffs; and that you are charmed with her wit and beauty.— Above all, you must be sure to find some fault or imperfection in all other ladies of the town, and to laugh at the fops like yourself. With this a little practice will qualify you for the conversation and mystery of the Ruelle; and if the whole morning be spent between the glass and the comb, that your peruke sit well and cravat strings be adjusted, as things of importance; with these and the like accomplishments you'll emerge a consummate *beau*, Anglicè a *coxcomb*. But the dancing-master will still be necessary to preserve your good wien and fit you for the winter ball. Thus you see, young sparks, how the style and method of wooing is quite changed, as well as the language, since the days of our forefathers, (of unhappy memory, simple and plain men as they were!) who courted and chose their wives for their modesty, frugality, keeping at home, good housewifery, and other œconomical virtues then in reputation. And when the young damsels were taught all these in the country, and their parents' houses, the portion they brought was more in virtue than money, and she was a richer match than one who could have brought a million, and nothing else to commend her. The presents which were made when all was concluded, were a ring, a necklace of pearl, and perhaps another fair jewel, the *bona parsophernalis* of her prudent mother, whose nuptial kirtle gown and petticoat lasted as many anniversaries as the happy couple lived together, and were at last bequeathed with a purse of old gold, rose nobles, spur-royals, and spankers, as an heir-loom to her granddaughter. They had cupboard of ancient useful plate, whole chests of damask for the table, and store of fine Holland sheets (white as the driven snow, and fragrant of rose and lavender) for the bed, and the sturdy oaken bed-stead and furniture of the house lasted one whole century; the shovel-board and other long tables both in hall and parlour were as fixed as the freehold; nothing was moveable save joint-stools, the black-jacks, silver tankards, and bowls. And though many things fell out between the cup and the lip, when Nappy Ale, March Beer, Metheglin, Malnsey, and Old Sherry got the ascendant amongst the blue-coats and badges, they sung *Old Simon* and *Cheriot Chase*, and danced *Brave Ardur*, and were able to draw a bow that made the proud Monsieur

BOOK II. we yet too much neglect the culture of; but which, for all this, I do not despair of seeing re-assumed when that good genius returns¹. In order to this hopeful prognostic, we will add a few directions about the gathering of the leaves, to render this chapter one of the most accomplished, for certainly one of the most accomplished and agreeable works in the world.

14. The leaves of the Mulberry should be collected from trees of seven or eight years old; if of such as are very young, it impairs their growth neither are they so healthful for the worms, making them hydropical and apt to burst; as do also the leaves of such trees as be planted in a too waterish or over rich soil, or where no sun comes; and all sick and yellow leaves are hurtful. It is better to clip, and let the leaves fall upon a subtended sheet or blanket, than to gather them by hand; and to gather them, than to strip them, which mars and galls the branches, and bruises the leaves that should hardly be touched. Some there are

“tremble at the whizze of the grey-goose feather. ’Twas then antient hospitality was kept up in town and country, by which the tenants were enabled to pay their landlords at punctual day; the poor were relieved bountifully; and charity was as warm as the kitchen, where the fire was perpetual. In those happy days, *Surefoot*, the grave and steady mare, carried the good knight and his courteous lady behind him to Church, and to visit the neighbourhood, without so many hell carts, rattling coaches, and crew of *dammé lacqueys*, which a grave livery servant or two supplied, who rid before and made way for his worship. Things of use were natural, plain, and wholesome; nothing was superfluous; nothing necessary wanting; and men of estate studied the public good, and gave example of true piety, loyalty, justice, sobriety, charity, and the good neighbourhood composed most differences. Perjury, suborning witnesses, alimony, avowed adulteries, and misès (publicly owned,) were prodigies in those days, and laws were reason not craft, when men’s titles were secure, and they served their generation with honour; left their patrimonial estates improved to an hopeful heir, who passing from the free-school to the college, and thence to the inns of court, acquainting himself with a competent tincture of the laws of his country, followed the example of his worthy ancestors; and if he travelled abroad, it was not to count steeples, and bring home feather and ribbon, and the sins of other nations, but to gain such experience as rendered him useful to his prince and country upon occasion, and confirmed him in the love of both of them above any other. The virgins and young ladies of that golden age *quesiverunt lanam* and *linum*; put their hands to the spindle, nor disdained they the needle; were obsequious and helpful to their parents; instructed in the managery of the family, and gave presages of making excellent wives; nor then did they read so many romances, see so many plays and smutty farces,

who lop off the boughs, and make it their pruning; and it is a tolerable way, so it be discreetly done in the over-thick parts of the tree; but these leaves, gathered from a separated branch, will die, and wither much sooner than those which are taken from the tree immediately, unless you set the stem in water. Leaves gathered from boughs cut off, will shrink in three hours; whereas those you take from the living tree will last as many days; and, being thus a while kept, are better than over-fresh ones. It is a rule never to gather in a rainy season, nor cut any branch whilst the wet is upon it; and therefore against such suspected times you are to provide before-hand, and to reserve them in some fresh but dry place. The same caution you must observe for the dew, though it do not rain; for wet food kills the worms. But if this cannot be altogether prevented, put the leaves between a pair of sheets, well dried by the fire, and shake them up and down till the moisture be drunk up in the linen; and then spreading them to the air a little, on another dry cloth, you may feed with them boldly. The top-leaves and oldest, should

“ set up for visits, and have their day of audience and idle pastime. Honest *Gleik, Ruff* and *Honours*, diverted the ladies at Christmas, and they knew not so much as the names of *Ombre, Comet, and Basset*. Their retirements were devout and religious books, and their recreations in the distillatory, the knowledge of plants and their virtues, for the comfort of their poor neighbours, and use of the family, which wholesome plain diet and kitchen physic preserved in perfect health. In those days, the scurvy, spleen, &c. were scarce heard of, till foreign drinks and mixtures were wantonly introduced. Nor were the young gentlewomen so universally afflicted with hysterical fits, nor, though extremely modest, at all melancholy, or less gay, and in good humour; they could touch the lute and virginals, sing “*Like to the damask rose*;” and their breath was as sweet as their voices.— They danced the *Canarys, Spanish Pavan, and Sillenger’s Round* upon sippets, with as much grace and loveliness as any *Isaac, Monsieur, or Italian* of them all can teach with his top-calls, and apish postures.”

¹This seems a prophetic expression, as Saffron is now cultivated very largely at Saffron-Walden, in Essex. The English Saffron is greatly superior to that which grows in France or Spain. Its cultivation employs a number of women and children; and it were to be wished that every encouragement was given to the culture of such plants as employ the hands of the feeble poor. In this excellent chapter upon the Mulberry-tree, Mr. Evelyn endeavours to prove that silk may be produced in this country to a great national advantage. The food of the silk-worm certainly grows with great luxuriance in every part of this island, and, from many accurate experiments made upon every branch of this business, we may venture to conclude that the manufacture of raw silk may be successfully, and profitably, conducted in all the southern counties of Great Britain.

BOOK II. be gathered last of all, as being most proper to repast the worms with, towards their last change. The gatherer must be neat, have his hands clean and his breath sweet, and not poisoned with onions or tobacco, and be careful not to press the leaves, by crowding them into the bags or baskets. Lastly, That they gather only, unless in case of necessity, leaves from the present, not from the former year's sprigs, or old wood; which are not only rude and harsh, but are annexed to stubbed stalks, which injure the worms, and spoil the denudated branches. One note more let me add, That in first hatching, the eggs sometimes disclose earlier than there is provision for them on the tree, in which case the tender leaves of Lettuce, Dandelion, or Endive may supply the defect, so they feed not on them too long or over much, which gives them the lask.

12. This is what I thought fit to premonish concerning the gathering of the leaves of this tree for silk-worms, as I find it in Monsieur Isnard's instructions, and in that exact discourse of his published some years since, and dedicated to Monsieur Colbert, (who has, it seems, constituted this industrious and experienced person surveyor of this princely manufacture about Paris,) because the book itself is rare, and known by very few. I have no more to add but this, for our encouragement, and to encounter the objections which may be suggested about the coldness and moisture of our country, that the spring is in Provence no less inconstant than is ours in England; that the colds at Paris are altogether as sharp; and that in May, when it has continued raining for nine-and-twenty days successively, Monsieur Isnard assures us he proceeded in his work without the least disaster; and in the year 1664, he presented the French King, his master, with a considerable quantity of better silk than Mefina or Bononia could produce, which he sold raw at Lyons for a pistole the pound, when that of Avignon, Provence, and Dauphine, produced little above half that price. But you are to receive the complete history of the silk-worm from that incomparable treatise which the learned Malpighius has lately sent out of Italy, and dedicated to the Royal Society, as a specimen and noble effect of its universal correspondence, and concerns for the improvement of useful knowledge. To this I add that beneficial passage of the learned Dr. Beal, communicated in the twelfth volume of the Philosophical Transactions, No. 133, p. 816, where we find recommended the promotion of this tree

in England, from its success in several northern countries, and even in the moist places of Ireland. He shows how it may be improved by grafting on the Fig, or the larger Black Mulberry on that of the smallest kind: Also of what request the Diamoron, made of the juice of this fruit, was with the antients, with other excellent observations. What other incomparable remedies the fruit of this tree affords, see Pliny's Natural History, lib. xxiii. chap. vii. There is a Mulberry-tree brought from Virginia, not to be contemned, upon which they find silk-worms, which would exceed the silk of Persia itself, if the planters of nauseous tobacco did not hinder the culture. Sir Jo. Berkley, who was many years governor of that ample colony, told me he presented the King (Charles II.) with as much silk made there, as made his Majesty a complete suit of apparel.

Lastly, Let it not seem altogether impertinent if I add one premonition to those less-experienced gardeners, who frequently expose their Orange, and like tender furniture-trees of the green-house, too early: That the first leaves putting forth of this wise tree (*Sapientissima*, as Pliny calls it,) is a more infallible note when those delicate plants may be safely brought to the air, than any other prognostic or indication^m. For other species, vid. *Raii Dendr.* p. 12.

^m Pliny, in the most engaging manner, has pointed out to us the advantages that the husbandman may reap from an attention to the common objects that surround him; and indeed we ought not to look upon this harmonious idea, otherwise than as the chain that links the created to his CREATOR. Jam Vergilius in Cælo notabiles cætera fecerat: Non tamen his contenta, terrestres fecit alias, veluti vociferans: Cur cælum intuearis Agricola? cur sidera quæris Rustice? Jam te brevior somno fessum premunt noctes. Ecce tibi inter herbas tuas spargo peculiarias stellas, easque Vespere et ab opere disjuncti ostendo: ac ne possis præterire, miraculo sollicito. Videsne ut fulgor igni similis alarum compressu tegatur, secumque lucem habeat et nocte? Dedi tibi herbas horarum indices; et ut ne sole quidem oculos tuos a terra avoces, heliotropium ac lupinum circumaguntur cum illo. Cur etiam nunc altius spectas, ipsumque cælum scrutaris? Habes ante pedes tuos ecce Vergilius. In certis eæ in diebus proveniunt, durantque fœdere sideris hujusce: partumque eas illius esse certum est. Proinde quisquis æstivos fructus ante illas severit, ipse frustrabitur sese. Hoc intervallo et apicula procedens fabam florere indicat: fabaque florens eam evocat. Dabitur et aliud finiti frigoris Indicium, Cum geminare videris Morum, injuriam postea frigoris timere nolito. Lib. xviii.

The PLATANUS, LOTUS, and ACACIA.

PLATANUS^a. This beautiful and precious tree, antiently sacred to Helena, (and with which she crowned the Lar and Genius of the place,) was so doated on by Xerxes, that Ælian and other Authors tell us he made halt, and stopped his prodigious army of seventeen hundred

^a Of this TREE there are only two Species :

1. PLATANUS (*ORIENTALIS*) foliis palmatis. Lin. Sp. Pl. 1417. *Plane-tree with hand-shaped leaves.* Platanus Orientalis verus. Park. Theat. 1427. *THE TRUE EASTERN PLANE-TREE.*

This kind grows naturally in Asia, where it becomes a very large shady tree; the stem is tall, erect, and covered with a smooth bark; it sends out many side-branches, which are generally a little crooked at their joints; the bark of the young branches is of a dark brown, inclining to a purple colour; they are garnished with leaves, placed alternate; their foot-stalks are an inch and a half long; the leaves are seven inches long, and eight broad, deeply cut into five segments, and the two outer are slightly cut again into two more; these segments have many acute indentures on their borders, and have each a strong midrib, with many lateral veins running to the sides; the upper side of the leaves is of a deep green, and the under side pale.—Dionysius, the geographer, compares the form of the Morea, or ancient Peloponnesus, to the leaves of this tree, making the foot-stalks the Isthmus by which it is joined to Greece. The flowers come out upon long foot-stalks, hanging downward, each sustaining five or six round balls of flowers; the upper, which are the largest, are more than four inches in circumference; these sit very close to the foot-stalks. The flowers are so small as scarcely to be distinguished without glases; they come out a little before the leaves, which is in the beginning of June; in warm summers the seeds ripen late in autumn, and, if left upon the trees, will remain till spring, when the balls fall to pieces; the bristly down which surrounds the seeds, helps to transport them to a great distance.

2. PLATANUS (*OCCIDENTALIS*) foliis lobatis. Lin. Sp. Pl. 1418. *Plane-tree with lobated leaves.* Platanus Occidentalis s. Virginicensis. Park. Theat. 1427. *OCCIDENTAL or VIRGINIA PLANE-TREE.*

This sort is naturally produced in most parts of North-America; it grows to a considerable size, with a straight stem of equal girt most part of the length: the bark is smooth, like that of the other; the branches extend wide on every side; the young ones have a brownish bark, but on the old ones it is grey; the foot-stalks of the leaves are three inches long; the leaves are seven inches long, and ten broad; they are cut into three lobes or angles, and have several acute indentures on their borders, with three longitudinal midribs, and many strong lateral veins. The leaves are of a light green on their upper side, and paler on their under. The flowers grow in round balls like the former, but are smaller. The



The Oriental Plane Tree.

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J. Miller del. Sc. Sculp.



The Occidental Plane Tree?

Ulmus glaberrimus L. Moench & W. G. as the tree flowers.

L. Miller del. Scrup.

thousand soldiers, which even covered the sea, exhausted rivers, and thrust mount Athos from the continent, to admire the pulchritude and procerity of one of them; and became so fond of it, that, spoiling both himself, his concubines, and great persons of all their jewels, he covered it with gold, gems, necklaces, scarfs and bracelets, and infinite riches: In sum, was so enamoured of it, that for some days neither the concernment of his grand expedition, nor interest of honour, nor the necessary motion of his portentous army, could persuade him from it: He styled it his Mistrefs, his Minion, his Goddefs; and when he was forced to part

leaves and flowers come out at the same time with the former, and the seeds ripen in autumn.

The PLATANUS is of the class and order *Monocia Polyandria*.

The flowers come out late in the spring, and are so small as scarcely to be visible to the naked eye. The buds of the leaves of the oriental sort, begin to swell about the fourteenth of April, and the leaves are generally out by the latter end of the same month.

Besides the two species already described, there are two varieties: 1. The Spanish Plane-tree; 2. The Maple-leaved Plane-tree.

1. The Spanish Plane-tree has larger leaves than either of the other sorts; they are more divided than those of the Occidental, but not so much as the Eastern. Some of the leaves are cut into five and others into three lobes; these are sharply indented on the edges and are of a light green; the foot-stalks are short, and covered with a short down. This is by some called the Middle Plane-tree, from its leaves being shaped between those of the two other sorts. It grows rather faster than either of the other kinds.

2. The Maple-leaved Plane-tree differs from the two genuine species, in having its leaves not so deeply cut as the Eastern, nor lobed as the Western kind. The foot-stalks of the leaves are much longer than those of the above sorts, and the upper surface of the leaves is rougher.

The Oriental and Spanish Plane-trees are propagated from seeds, when they can be procured. The ground proper for the seminary should be moist and shady, well dug, and raked till the mould is fine; then, in the autumn, soon after the seeds are ripe, let them be scattered over this ground, and the seeds raked in, in the same manner as turnip-seed. In the spring many of the young plants will come up, though you must not expect the general crop till the second year; the succeeding spring they may be taken out of the seminary, and planted in the nursery in rows one yard asunder, and at one foot and a half distance in the rows. Here they may remain with the usual care of digging between the rows and keeping them clean, till they are of sufficient size to plant out for good.

Where the seeds of these trees cannot be procured, layering must be the method of propagation. For this purpose a sufficient number must be planted out for stools on a spot of earth double dug; After they have stood one year, they should be cut down, in order

BOOK II. from it, he caused the figure of it to be stamped on a medal of Gold, which he continually wore about him. Wherever they built their sumptuous and magnificent colleges for the exercise of youth in gymnastics, as riding, wrestling, running, leaping, throwing the discus, &c. and where the graver philosophers also met to converse together, and improve their studies, they planted walks of Platans, to refresh and shade the Palæstritæ, as you have them described by Vitruvius, lib. v. cap. xi. and as Claudius Perrault has assisted the text with a figure, or ichnographical plot. These trees the Romans first brought out of the Levant, and cultivated with so much industry and cost, for their stately and proud heads only, that the great orators and statesmen, Cicero and Hortensius, would exchange now and then a turn at the bar, that they might have the pleasure to step to their villas, and refresh their Platans, which they would often irrigate with wine instead of water: *Crevit et affuso latior*

to make them throw out young wood for layering. The autumn following, these should be laid in the ground, with a little nick at the joint; and by that time twelvemonths they will be trees of a yard high, with good roots ready to be planted out in the nursery, where they may be managed as the seedlings; and as the stools will have shot up fresh young wood for a second operation, this treatment may be continued as long as you please.

The Occidental Plane-tree is propagated by cuttings; which if they are taken from strong young wood, and planted early in the autumn, in a moist good mould, will seldom fail. They are generally planted thick, and then removed into the nursery-ground, as the layers of the other sort: But if a large piece of moist ground was ready, the cuttings may be placed at such a distance as not to approach too near each other before they are of a sufficient size to plant out for good; and this would save the expense and trouble of a removal. The Oriental Plane-tree will grow from cuttings, but not so certainly as this; and whoever has not the conveniency of proper ground for the cuttings, must have recourse to layers with this tree also; which, indeed, is the surest and most effectual method.

The Plane-tree delights in a moist situation, especially the Occidental sort. Where the land is inclined to be dry, and Plane-trees are desired, the two varieties are to be preferred.

At Ribston, the seat of Sir Henry Goodrick, Bart. there is now growing a most beautiful Platannus, the principal limb of which extends forty four feet from the bole; and what is very remarkable, this tree grows close to the original Apple-tree, known by the name of the RIBSTON PIPPIN, from whose stock have sprung a numerous progeny, bearing a most delicious fruit.

At Shadwell-Lodge, in the County of Norfolk, the seat of John Baxton, Esq. there may be seen a Plane-tree, which is remarkable for its speedy growth. When planted in April

umbra mero. And so prized was the very shade of this tree, that when afterwards they transplanted it into France, they exacted a *Solarium*, by way of tribute, of any of the natives who should presume but to put his head under it. Whether for any extraordinary virtue in the shade, or other propitious influence issuing from the tree, a worthy Knight, who staid at Ispahan in Persia, when that famous city was infected with a raging pestilence, told me, that since they have planted a greater number of these noble trees about it, the plague has not come nigh their dwellings. Pliny affirms there is no tree whatsoever which so well defends us from the heat of the sun in summer, nor that admits it more kindly in winter. And, for our encouragement, I do, upon experience, assure you, that they will flourish and abide with us, without any more trouble than frequent and plentiful watering, which, from their youth, they excessively delight in, and gratefully acknowledge by their growth

1744, it was eight feet high; and when measured in April, 1775, the following were its dimensions :

	<i>Fet.</i>	<i>Inches.</i>
Height	65	9
Circumference at half a foot from the ground	7	9
At Five feet	5	6
At Ten feet	5	0
At Sixteen Feet	4	8½
At Twenty Feet	4	6

The Oriental Plane-tree was greatly respected by the antients for its cooling shade :

Jamque ministrantem Platanum potantibus umbram.

VIRG.

And so great was their veneration for it, that in the height of their enthusiasm they used to refresh its roots with wine instead of water. “Tantumque postea honoris increvit, “ut mero infuso enutriantur: compertum id maxime professe radicibus: docuimusque “etiam arbores vina potare.”—PLIN.

In the Academia, or School of Plato, the Philofophers used to walk and converse together under the shade formed by these delightful trees; to which custom Horace alludes :

Atque inter Silvas Academi querere verum.

LIB. ii. EP. ii.

Pliny informs us, that this tree was first brought over the Ionian Sea, into the Island of Diomedes, for a monument to that Hero: thence it passed into Sicily, and so into Italy, where it has continued ever since to give coolness and refreshment to the inhabitants in the height of summer.

Volume II.

I

BOOK II. accordingly; so as I am persuaded that, with very ordinary industry, they might be propagated to the incredible ornament of the walks and avenues to great men's houses. The introduction of this true Plane among us is, perhaps, due to the great Lord Chancellor Bacon, who planted those (still flourishing ones) at Verulam; as to mine, I owe it to that Honourable Gentleman, the late Sir George Crook, of Oxfordshire, from whose bounty I received an hopeful plant, now growing in my Villa.

There was lately at Basil, in Switzerland, an antient goodly Platanetum, and now in France they are come again in vogue: I know it was antiently accounted *ἄκκρπος*; but they may with us be raised of their seeds with care, in a moist soil, as here I have known them. But the reason of our little success is, that we very rarely have them sent us ripe; these should be gathered late in autumn, and brought us from some more Levantine parts than Italy. They come also of layers abundantly, affecting a fresh and feeding ground; for so they plant them about their rivulets and fountains. The West-Indian Plane is not altogether so rare, but it rises to a goodly tree, and bears a very ample and less jagged leaf. That the Turks use their Platanus for the building of ships, I learn out of Ricciolus Hydr. lib. x. cap. xxxvii. And Pliny informs us that canoes and vessels for the sea have been excavated out of their prodigious trunks.

L O T U S^o.

I have the same opinion of the LOTUS ARBOR, (another lover of the water,) which in Italy yields both an admirable shade, and timber

• Of this TREE there are three species:

1. *CELTIS (AUSTRALIS) foliis lanceolatis, acuminatis, serratis, nervosis.* Mill. Dict. *Nettle-tree with spear-shaped pointed leaves, which are veined and sawed on their edges.* *Celtis fructu nigricante.* Tourn. Inst. 612. *Lotus-tree with a black fruit.* Lotus s. Celtis. Cam. epit. 135. Lotus Arbor. Lob. I. 186. *THE COMMON NETTLE-TREE.*

This sort grows naturally in the south of France, in Spain and Italy, in which countries it grows to a tree of considerable size; in England it is not so common as the second kind. It rises with an upright stem to the height of forty or fifty feet, sending out many slender branches upward, which have a smooth dark-coloured bark, with some spots of grey; these are garnished with leaves placed alternately, which are near four inches long, and about two broad in the middle, ending in long sharp points, and deeply sawed on their edges, having several transverse veins which are prominent on their under side. The flowers come out from the wings of the leaves all along the branches; they have a male and an hermaphrodite

immortal, growing to a vast tree, where it comes spontaneously; but its fruit seems not so tempting as it is storied it was to the companions of Ulysses. The first who brought the Lotus out of Virginia, was the late industrious Tradescant. Of this wood are made pipes and wind

flower generally at the same place, the male flowers being situated above the others: These have no petals but a green herbaceous empalement, so make no figure; they come out in the spring, at the same time when the leaves make their first appearance, and generally decay before the leaves have grown to half their size. After the flowers are past, the germen of the hermaphrodite flowers becomes a round berry about the size of a large pea, which is black when ripe.

2. *CELTIS (OCCIDENTALIS) foliis obliquè ovatis, serratis, acuminatis.* Lin. Sp. Pl. 1478. *Nettle-tree with oblique, oval-pointed leaves, which are sawed on their edges.* *Celtis fructu obscure purpurascente.* Mill. Dict. *Lote-tree with a dark purple fruit.* Lotus Arbor Virginiana, fructu rubro. Raii Hist. 1917. *THE OCCIDENTAL NETTLE-TREE.*

This grows naturally in North-America, and delights in a moist rich soil, in which it becomes a very large tree. It rises with a straight stem, which in young trees is smooth and of a dark colour, but as they advance it becomes rougher, and of a lighter green. The branches are much diffused on every side, and are garnished with oblique oval leaves, ending in points, and sawed on their edges; they are placed alternately on the branches, with pretty long foot-stalks. The flowers come out opposite to the leaves upon pretty long foot-stalks, the male-flowers standing above the hermaphrodite, as in the other species; after these decay, the hermaphrodite flowers are succeeded by roundish berries, which are smaller than those of the first sort, and, when ripe, are of a dark purple colour. This tree flowers in May, and the seeds ripen in October. Of this sort there are several pretty large trees in the English gardens, some of which produce great quantities of fruit annually, which, in favourable seasons, come to maturity, so that from these seeds there have been plants raised; and there are few years in which there is not fruit of this sort sent from America, whereby this species is now become pretty common in the English nurseries.

3. *CELTIS (ORIENTALIS) foliis ovato cordatis, denticulatis, petiolis brevibus.* Mill. Dict. *Nettle-tree with oval heart-shaped leaves, slightly indented, and short foot-stalks.* *Celtis orientalis minor, foliis minoribus et crassioribus, fructu flavo.* Tourn. *Smaller Eastern Lote-tree, with smaller and thicker leaves, and a yellow fruit.* *THE ORIENTAL NETTLE-TREE.*

This sort was discovered by Dr. Tournefort in Armenia; from whence he sent the seeds to the Royal Garden at Paris, where they succeeded, and the trees, which were there raised, have produced fruit for several years; so that most of the curious gardens in Europe have been furnished with it from thence. It rises with a stem about ten or twelve feet high, dividing into many branches, which spread horizontally on every side, having a smooth greenish bark, garnished with leaves about an inch and a half long, and near an inch broad, inclining to a heart-shape, but are oblique, one of the ears of the base being smaller and lower than the other; they are of a thicker texture than those of the common sort, and of a paler green, placed alternate on the branches, and have short foot-stalks. The flowers come out from the foot-stalks of the leaves, in the same manner as the former, and are succeeded by oval yellow berries, which when fully ripe, turn to a darker colour. The wood of this tree is very white.

BOOK II. instruments; and of its root, hafts for knives and other tools. The offer of Domitian to Craesus for half a dozen of these trees, growing about

The CELTIS is of the class and order *Polygamia Monœcia*.

These trees are all propagated by seeds, which should be sown soon after they are ripe, when they can be procured at that season; many of them will come up the following spring; whereas, those which are sown in the spring, will not come up till a twelvemonth after. It is the best way to sow them in pots or tubs, that they may be easily removed; those sown in the spring should be placed in a shady situation in summer, and constantly kept clean from weeds; but, if in autumn, they should be placed in a warm situation, plunging the pots into the ground; and if they are covered over with a little tan from a decayed hot-bed, it will prevent the frost from penetrating the earth to injure the seeds; if these pots are placed on a gentle hot-bed in the spring, it will greatly forward the vegetation of the seeds, whereby the plants will have more time to get strength before the winter: but when the plants appear above ground they must have a large share of air admitted to them, otherwise they will be drawn up weak; and as soon as the weather is warm, they must be exposed to the open air, and in summer they must be constantly kept clean from weeds; if the season prove dry, they will require water two or three times a week. In autumn, it will be proper to remove the pots, and place them under a hot-bed frame, to shelter them in winter from severe frost: or, where there is not that conveniency, the pots should be plunged into the ground near a wall or hedge; and as the plants, when young, are full of sap, and tender, the early frosts in autumn frequently kill the upper parts of the shoots; therefore the plants should be either covered with mats, or a little straw, or peasehaulm laid over to protect them.

In the following spring the plants should be taken out of the seed-pots, and planted in the full ground: This should be done about the latter end of March, when the danger of frost is over; therefore a bed or two should be prepared (according to the number of plants raised) in a sheltered situation, and, if possible, in a gentle loamy soil. The ground must be well trenched, and cleared from the roots of bad weeds, and, when levelled, should be marked out in lines at one foot distance; then the plants should be carefully turned out of the pots and separated, so as not to tear their roots, and planted in the lines at six inches asunder, pressing the earth down close to the roots. If the ground be very dry when they are planted, and there is no appearance of rain soon, it will be proper to water the beds, to settle the ground to the roots of the plants; and after this, if the surface of the ground be covered with some old tan or rotten dung, it will keep it moist, and prevent the drying winds from penetrating to the roots of the plants.

The following summer the necessary care must be to keep them constantly clean from weeds; but after the plants are pretty well established in the ground, they will not require any water, especially toward the latter end of summer; for that will occasion their late growth, whereby they will be in great danger of suffering by the autumn frosts; for the more any of these young trees are stopped in their growth by drought towards autumn, the firmer will be their texture, which will enable them to bear the severity of winter.

The plants may remain in the nursery two years, by which time they will have obtained sufficient strength to be transplanted where they are designed to remain; for as these plants extend their roots wide every way, if they stand too long in the nursery, their

a house of his in Rome, testifies in what esteem they were had for their incomparable beauty and use. CHAP. III.

roots will be cut in removing, which will be a great prejudice to the future growth of the trees.

All the kinds are hardy enough to thrive in the open air in England, after they are become strong; but for the two first winters after they come up from seeds, they require a little protection, especially the third sort, which is tenderer than either of the former.—The young plants of this kind frequently have variegated leaves.

The wood of the Lotus-tree was antiently used for flutes and other musical instruments :

—et horrendo lotos adunca sono. OVID. *Fast.*

Mr. Evelyn judges very properly when he supposes that the fruit of the *Lotus Arbor* could not be the same that was feasted upon by the companions of Ulyses. The enchanting fruit, described by the antients, is produced in Barbary upon a shrub which Linnæus calls Rhamnus (*Lotus*) aculeis geminatis; altero recurvo, foliis ovato oblongis. Tournefort calls it *Zizyphus Sylvæstris*. Dr Shaw, in his Travels into Barbary, had frequent opportunities of examining the shrub in question: He says, “This shrub, which is very common in the *Jereeb*, and other parts of Barbary, has the leaves, prickles, flower and fruit of *Zizyphus*, or *Jubeb*; only with this difference, that the fruit is here round, smaller, and more luscious, and at the same time the branches, like those of the *Palurus*, are neither so much jointed nor crooked. The fruit is in great repute, tastes something like gingerbread, and is sold in the markets all over the southern districts of these kingdoms. The Arabs call it *Aneb ena el Secdra*, or the *Jubeb* of the *Secdra*, which Olaus Celsius had so high an opinion of, that he has described it as the *Dudaim* of the “Sacred Scriptures.” This word has occasioned much controversy: In our translation of the Bible, it is rendered *Mandrake*. Ludovicus thinks it was the Mushroom, and Rudbeckius describes it as the *Rubus Idæus*, or Raspberry. But as the *Mandrake* (*Mandragora*) was antiently supposed to remove barrenness in women, it seems a plant very likely to be anxiously asked for by Rachel, who wanted to have a child. Genesis, ch. xxx. The shrub described by Dr. Shaw is mentioned by Homer. It gave name to a race of people described in the ninth *Odysey*:

They went, and found an hospitable race:
Not prone to ill, nor strange to foreign guest,
They eat, they drink, and Nature gives the feast;
The trees around them all their food produce,
Lotus the name, divine, nectarous juice!
(Thence call'd *Lotoplagi*) which whoso tastes,
Insatiate riots in the sweet repasts;
Nor other home, nor other care intends,
But quits his house, his country, and his friends.

POPE.

It will be proper to distinguish between the *Rhamnus Lotus*, and an *Arb* often mentioned by the antients, under the name of *Lotus*. Homer speaks of it as being fed upon by the horses of Achilles: and Virgil mentions it as proper for sheep, to increase their milk:

At cui lactis amor, cytismum, *lotosque* frequentes
Ipse manu, falsasque serat præsepibus herbas. GEORG. III.

ACACIA.

The ACACIA^p, together with that from Virginia, deserves a place among our avenue trees, (could they be made to grow upright,) adorning our walks with their exotic leaf and sweet flowers, very hardy against the pinching winter, but not so proof against its blustering winds, though it be armed with thorns; nor do the roots take such hold of the ground,

THE TRIPLE-THORNED ACACIA is titled, *Gleditsia spinis triplicibus axillaribus*. In the Upsal Catalogue it is termed simply, *Gleditsia*; in the *Hortus Cliffortianus*, *Cæsalpinoides foliis pinnatis ac duplicato-pinnatis*. Micheli calls it *Melilobus*; Duhamel, *Gleditsia spinosa*; Plukenet, *Acacia Americana, Abrux folio, triacanthos*; and Catesby, *Acacia, Abrux folio, triacanthos, capsula ovali unicum semen claudente*.

GLEDITSIA is of the class and order *Polygamia Dioecia*.

The growth of the Acacia is naturally upright, and its trunk is guarded by thorns three or four inches in length. These thorns have also others coming out of their sides at nearly right angles: Their colour is red. The branches are smooth, and of a white colour.—These are likewise armed with red thorns, that are proportionally smaller: They are of several directions, and at the ends of the branches often stand single. The young shoots of the preceding summer are perfectly smooth, of a reddish green, and retain their leaves often until the middle of November. Although there is a peculiar oddity in the nature and position of the spines, yet the leaves constitute the greatest beauty of these trees: They are doubly pinnated, and of a delightful shining green. The pinnated leaves that form the duplication, do not always stand opposite by pairs on the middle rib; the pinnæ of which they are composed are small and numerous; no less than ten or eleven pair belong to each of them; and as no less than four or five pair of small leaves are arranged along the middle rib, the whole compound leaf consists often of more than two hundred pinnæ of this fine green colour: They sit close, and spread open in fine weather; though at the approach of bad weather they will droop, and their upper surfaces nearly join, as if in a sleeping state. The flowers are produced from the sides of the young branches in July: They are a greenish catkin, and make little show; many are succeeded by pods, that have a wonderful effect; for these are exceedingly large, more than a foot, and sometimes a foot and a half in length, and two inches in breadth, and of a nut-brown colour when ripe.

There is a variety of this species, with fewer thorns, smaller leaves, and oval pods. It has nearly the resemblance of the other; but the thorns being less frequent, and the pods smaller, each containing only one seed, this sort loses that singular effect which the other produces by their means.

The culture of these beautiful and noble trees is not very difficult. We receive the seeds from America in the spring, which keep well in the pods, and are for the most part good. They generally arrive in February; and, as soon after as possible, they should

insinuating, and running more like liquorice, and apt to emaciate the soil: I will not therefore commend it for gardens, unless for the variety, of which there are several, some without thorns. They love to be planted in moist ground. CHAP. III.

One thing there is, which (for the use and benefit which these and the like exotics afford us,) I would take hold of, as upon all occasions I

be sown in a well-sheltered warm border of light sandy earth. If no border is to be found that is naturally so, it may be improved by applying drift sand, and making it fine. The seeds should be sown about half an inch deep; and they will, for the most part, come up the first spring. If the summer should prove dry, they must be constantly watered; and if shade could be afforded them in the heat of the day, they would make stronger plants by the autumn. A careful attention to this article is peculiarly requisite: for as the ends of the branches are often killed, if the young plant has not made some progress, it will be liable to be wholly destroyed by the winter's frost, without protection; and this renders the sowing the seeds in a warm border, under an hedge, in a well-sheltered place, so necessary; for there these shrubs will endure our winters, even when seedlings, and so will require no farther trouble; nay, though the tops should be nipped, they will shoot out again lower, and soon recover themselves.

It will be proper to let them remain two years in the seed-bed, before they are planted out in the nursery. The spring is the best time for the work. Their distance should be one foot by two. The earth between the rows should be dug every winter; and, being weeded in summer, the plants may remain, with no other particular care, until they are set out for good. These trees are late in the spring before they exhibit their leaves, but keep shooting late in the autumn. They should not only join in wilderneck-quarters, with others of their own growth, but some of them should be planted singly in opens, where their triple spines, fine leaves, and large pods, will be seen to advantage.

The False ACACIA is titled *Robinia (PSEUDO-ACACIA) racemis pedicellis unifloris, foliis impari-pinnatis, stipulis spinosis*. Sp. Pl. 1043. Tournefort calls it, *Pseudo-acacia vulgaris*; Ray names it, *Acacia Ampicana, siliquis glabris*; and Catesby, *Pseudo-acacia hispida, floribus roseis*. THE LOCUST TREE.

It is of the Class and Order *Dialypchia Decandria*.

This tree is also a native of North America. Its branches are armed with strong crooked thorns, and garnished with winged leaves, composed of eight or ten pair of oval lobes, terminated by an odd one. They are of a bright green, and sit close to the midrib. The flowers come out from the sides of the branches in pretty long bunches, hanging downward like those of the Laburnum, each flower standing on a slender foot-stalk: These are of the Butterfly, or Pea-blossom kind; are white, and smell very sweet. They appear in June, and when the trees are full of flowers, they make a fine appearance; but they are

BOOK II. do in this work ; namely, to encourage all imaginable industry of such as travel into foreign countries, and especially Gentlemen who have concerns in our American plantations, to promote the culture of such plants and trees, especially timber, as may yet add to those we find already agreeable to our

of short duration, seldom continuing more than a week in beauty. After the flowers fade, the germen becomes an oblong compressed pod, which in warm seasons comes to perfection in England; these ripen late in autumn.

The leaves come out late in the spring, and fall off early in the autumn, which renders this tree less valuable than it would otherwise be.

The False Acacia is best propagated by seeds, which should be sown in a bed of light earth about the latter end of March, or the beginning of April; and if the bed has a warm exposure, the plants will appear in six weeks, requiring no other care than keeping them clear from weeds. In this bed the plants should remain till the following spring, when they should be transplanted into the nursery about the end of March, placing them in rows at three feet distance, and a foot and a half asunder in the rows. In this nursery they should remain two years, by which time they will be of size for transplanting into the places where they are designed to grow. As these trees, when they stand long unremoved, send forth long tough roots, it will be advisable to cut them off when they are transplanted. This operation, however, sometimes occasions their miscarrying.

These trees will grow well almost upon any soil, but they prefer a light sandy ground, in which they have been known to shoot six feet in one year. While the trees are young, they make a fine appearance, being well furnished with leaves; but when old, they are rather unsightly, from the branches being frequently broken by high winds, especially when they happen to stand in an exposed situation. In America this tree is called the Locust Tree. My excellent friend Joseph Harrison, Esq. of Bawtry, has favoured me with the following observations, in a letter dated July 25, 1782. "The first experiment that I know of, respecting the application of the timber of the Locust Tree, to any purposes in ship-building, was in Virginia, where I resided some time about the year 1733: And, there, happening to be acquainted with an ingenious ship-wright, that had been sent over by some merchants of Liverpool, to build two large ships, I had frequent conversations with him, respecting the qualities of the several principal timber-trees of that country. Being a person of observation, he had made many useful remarks on that subject; which the nature of his employment afforded many opportunities of doing with advantage. He reckoned the Oaks, Elms, Ashes, and many other timber-trees common to both countries, much inferior to the same sorts in England: But frequently spoke of the Locust-tree, as of extraordinary qualities both for strength and duration*; and used often to say, if a sufficient quantity could be had, it would be the best timber he had ever met with for building of ships. After he had completed his engagements with his employers at Li-

* DURATION. This property has been well ascertained by some pieces of Locust-tree, still continuing firm and sound in some old houses in New England, that were built when the country was first settled.

climate in England. What we have said of the Mulberry, and the vast emolument raised by the very leaves, as well as wood of that only tree, were sufficient to excite and stir up our utmost industry. History tells us, the noble and fruitful country of France was heretofore thought so

“ verpool, he set a small vessel on the stocks for himself; but unluckily, not having a sufficient quantity of iron for the purpose, and none being to be had at that time in the country, he was obliged to put a stop to the work, till he bethought himself of the following succedaneum. He had formerly (as hinted above) observed the extraordinary strength and firmness of the Locust-tree, and on this occasion took it into his head that Trenails* of that timber might be substituted for Iron Bolts† in many places where least liable to wrench, or twist, as in fastening the floor-timbers to the keel, and the knees to the ends of the beams, which two articles take up a large proportion of the iron used in a ship, purposing, when he arrived in England, to bore out the Locust Trenails, and drive iron bolts in their stead. When he first informed me of this scheme, I must own I thought the experiment very hazardous: However, as necessity has no law, he put it in practice. The ship was built in that manner, loaded, and sailed for Liverpool, where she arrived safe; and though they met with some blowing weather on the passage, she never made so much water, but that one pump could easily keep her free. She returned back to Virginia the next year, when I had an opportunity of being informed by the builder himself (who was then captain of her) of what had been the result of his project: He said, that during the passage, especially in blowing weather, he was very attentive in examining the Water-ways‡, as, at that place, weak ships are most liable to work and strain, but that he could not perceive any thing more than is usual in other vessels. When unloaded, she was hauled a-shore upon the bank, in order to be searched both outside and inside; when, on the strictest examination, it was found that the Locust Trenails, that had been substituted instead of Iron Bolts, seemed (to all appearance) to have effectually answered the purpose intended; however, it was thought prudent to take several of them out, and put in Iron Bolts in their room: And this operation afforded another proof of their extraordinary strength and firmness; as they

* TRENAILS, or TREE-NAILS, are wooden pins, that fasten the planks to the ribs or timbers;—and to prevent drawing, or the planks starting, they are wedged at both ends, inside and out, so that the strength of a ship depends much on the goodness of the Trenails; and if they are not made of wood that is both hard and tough, they will not endure driving so tight as to bear the strain that lies upon them; for in fact it is the Trenails that hold together the several pieces of which a ship is composed.

† BOLTS are round iron pins, used to fasten the floor-timbers to the keel, and the beams that support the decks to the sides of the ship, and on all other occasions where Trenails are not strong enough to bear the strain that is to be supported.

‡ The WATERWAY is that part of a ship's deck that is next to the sides of the ship; this seam, or joint is very difficult to keep tight, and in weak vessels will open and shut in carrying sail when it blows hard.

steril and barren, that, nothing almost prospering in it, the inhabitants were quite deserting it, and with their wives and children going to seek some other more propitious abode; when some of them happening to come into Italy, and tasting the juice of the delicious grape, the rest of their countrymen took arms, and invaded the territories where those' vines grew, which they transplanted into Gallia, and have so infinitely improved since, that France alone yields more of that generous liquor, than not only Italy and Greece, but all Europe and Asia beside: Who almost would believe that the austere Rhenish, abounding on the fertile banks of the Rhine, should produce so soft and charming a liquor, as does the same

“ endured to be backed* out with a Set-bolt, just as well as though they had been Iron; where-
 “ as Oak Trenails are usually bored out with an auger. The next voyage the ship made, was
 “ to the West Indies, where the Captain died, and with him ended (for the present) any
 “ further prosecution of this matter: For though the success of the above experiment was
 “ known to many, yet (as is frequently the case with new discoveries) none, that I ever
 “ heard of, made any use of Locust Trenails in ship-building, till many years after;
 “ though on the goodness of that article greatly depends the strength and durableness of a
 “ ship. I frequently recommended it, when opportunities offered, but all to no purpose,
 “ till about twenty years ago, when I was settled in trade at Rhode-Island, I persuaded
 “ some ship-builders to try the experiment; but notwithstanding all my endeavours, the
 “ use of Locust Trenails still continued to be little practised or known, till it happened to
 “ be adopted by a builder of some eminence at New York, and of late years has been
 “ introduced into general use there, and in some parts of New England: But as yet the
 “ use of the Locust-tree, in ship-building, is confined to the article of Trenails, on account
 “ of its scarcity; for, was it near as plentiful as Oak, it would be applied to more purposes,
 “ such as knees †, floor-timbers ‡, foot-hooks ||, &c. being much superior to it, both as to
 “ strength and duration; and from its spreading into branches, affords full as large a pro-
 “ portion of crooks, or compafs-timber, as the Oak.

“ The growth of the Locust-tree has of late been much encouraged in North America:
 “ And here, in England, several Gentlemen have propagated great quantities of it, parti-

* BACKING out a Bolt, or Trenail, is driving it out by means of a tool called a Set-bolt, which is an Iron Punch, something smaller than the Bolt, or Trenail, to be taken out, against which it is driven, with a heavy blacksmith's sledge or hammer: But Oak Trenails, except such as are very hard and sound, will seldom bear this operation; in which case, they are obliged to bore them out with an auger.

† KNEES are those crooked pieces, that, by means of Iron Bolts, fasten the ends of the beams to the sides of the ship.

‡ FLOOR-TIMBERS are those ribs or timbers that lie across the keel, and are bolted into it.

|| FOOT-HOOKS are those circular ribs or timbers that form the body of the ship from the floor to the top-timbers: And all pieces of timber that are not straight, are called crooks or compafs-timber.

vine, planted among the rocks and pumices of the so remote and mountainous Canaries ?

This for the encouragement and honour of those who improve their countries with things of use and general benefit : now, in the mean time, how have I beheld a florist, or meaner gardener, transported at the casual discovery of a new little spot, double-leaf, streak or dash extraordinary in a Tulip, Anemonie, Carnation, Auricula, or Amaranth ! cherishing and calling it by his own name, raising the price of a single bulb to an enormous sum, till a law was made in Holland to check that *Tulipomania* ;

“cularly Sir George Savile, who has many thousands now growing in his plantations at Rufford; so that in the next generation, it is probable there may be sufficient for the article of Trenails, which alone would be a considerable improvement in the building of Ships. At present, the choicest pieces only of the very best Oak Timber are applied to that purpose; and as the Oaks of Sufsex are generally reckoned the best in England, most ship-wrights (even those in the north) have their Trenails from thence: And the demand for them is so great, that Trenail making is there become a considerable manufacture.

“The Locust-tree is not only valuable on account of the excellence of its timber, but its leaves also are useful, and afford wholesome food for cattle *. I knew a Gentleman in New England that sowed several acres for that purpose, which proved a good summer pasture for cows; it is excellent in that country, where the grass is very apt to fail, from being burnt up by the summer droughts.—Hogs are extremely fond of it, and horses seem to like it.

“The method of propagating the Locust-tree in New England is by seeds, suckers, or sets, as Willows are here; but the first method is the best, as those plants raised from seeds are found to thrive better and produce larger trees than the others. The seeds are first sown in a nursery, and then planted out young into the places where they are to remain.

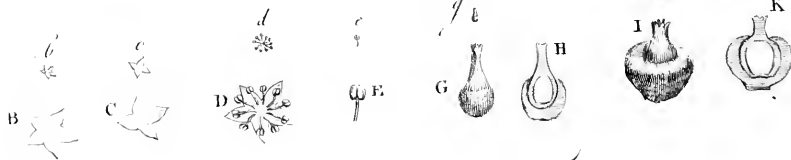
“Jonathan Acklom, Esq. of Wiseton, has now in his garden a Locust-tree, which, at three feet from the ground, is four feet ten inches in circumference, and sixty feet high: Also another of nearly the same height, but not so thick; and in his nursery are several young plants from the seeds of these trees. They are both, at this time, [July 1782] full of flowers, and likely to produce many seeds, if the remainder of the summer prove favourable. They were raised from seeds brought from North Carolina in 1742, so are now just forty years old.”

* There is a dissertation upon this property of the Acacia in one of the foreign Literary Journals; I think it is the Memoirs of the Imperial Academy at Vienna.

BOOK II.

the florist, in the mean time, priding himself as if he had found the Grand Elixir, performed some notable achievement, or discovered a new country.

This for the defects, (for such are those variegations produced by practice, or mixture, manganisms, and starving the root,) of a fading flower: How much more honour then were due in justice to those persons, who bring in things of much real benefit to their country? especially trees for fruit and timber; the Oak alone, (beside the shelter it afforded to our late Sovereign Charles II.) having so often saved and protected the whole nation from invasion, and brought it in so much wealth from foreign countries. I have been told there was an intention to have instituted an Order of the Royal Oak; and truly I should think it to become a Green Ribbon, next to that of St. George, superior to any of the romantic badges to which is paid such veneration abroad, deservedly to be worn by such as have signalized themselves by their conduct and courage, in the defence and preservation of their country. Bespeaking my reader's pardon for this digression, we now proceed to other useful Exotics.



The Cork Tree

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J. Miller del. J. Deak. sculp.

C H A P. IV.

The CORK, ILEX, ALATERNUS, CELASTRUS, LIGUSTRUM, PHILLYREA, MYRTLE, LENTISCUS, OLIVE, GRANATUM, SYRINGA, and JASMINE.

WE do not exclude this useful tree from those of the glandiferous and forest. And being inclined to gratify the curious, I have been induced to say something farther of such *semper virentia*, as may be made to sort with those of our own. CHAP. IV.

SUBER. The CORK-TREE³. Of this there are two sorts, one of a narrow, or less jagged leaf, and perennial; the other of a broader, and falling in winter. It grows in the coldest parts in Biscay, in the north of New-England, in the south-west of France, especially the second

³ QUERCUS (*SUBER*) foliis ovato-oblongis indivisis serratis subtus tomentosis, cortice rimoso fungoso. Lin. Sp. Pl. 1412. *Oak, with oval, oblong, undivided leaves, which are sawed and woolly on their under-side, and with a fungous cleft bark. Suber latifolium sempervirens.*—C. B. P. 424. THE CORK-TREE.

It is of the class and order *Monoccia Polyandria*.

This is a timber-tree in Portugal and Spain, and other southern parts of Europe, where it grows naturally. In the plantations made here, it should be placed near the middle of the largest quarters; and a few also should be planted singly in opens, that the fungous bark may be in view; not that there is any great beauty merely in the sight, but with us it is a curiosity, being the true Cork, and of the same nature with what comes from abroad. The bark on the trunk and main branches is rough and spongy; but on the young shoots it is smooth and grey, and on the youngest, white and downy. The leaves are of an oblong oval figure with sawed edges. Their upper surface is smooth and of a strong green colour, but their under is downy. They grow alternately on the branches, on very short, though strong foot-stalks, and indeed differ in appearance very little from many sorts of the *Ilex*. The flowers of this species of Oak make no show, and the acorns when ripe, are long, smooth, and of a brown colour.

There is a variety of this tree called the Narrow-leaved Cork-tree. Its leaves are smaller, which qualifies it for a place in our plantations, where variety is required.

The best Cork is taken from the oldest trees, the bark on the young trees being too porous for use. They are, nevertheless, barked before they are twenty years old; and

BOOK II. species, fittest for our climate ; and in all sorts of ground, dry heaths, stony and rocky mountains, so as the roots will run even above the earth, where they have little to cover them ; all which considered, methinks we should not despair. We have said where they grow plentifully in France ; but by Pliny, (Nat. Hist. l. xvi. c. viii.) it should seem they were since transplanted thither ; for he affirms there were none either there or in Italy in his time : But I exceedingly wonder that Carolus Stephanus and Cursius should write so peremptorily that there were none in Italy, where I myself have travelled through vast woods of them about Pisa, Aquin, and in divers tracts between Rome and the kingdom of Naples, and in France. The Spanish Cork is a species of Enzina, differing chiefly in the leaf, which is not so prickly, and in the bark, which is frequently four or five inches thick. The manner of decortication thereof, is once in two or three years to strip it in a dry season, otherwise the intercutaneous moisture endangers the tree, and therefore a rainy season is very pernicious ; when the bark is off, they unwarpe it before the fire, and press it even, and that with weights upon the convex part, and so it continues, being cold.

The uses of Cork are well known amongst us, both at sea and land, for its resisting both water and air ; the fishermen who deal in nets, and

this operation is necessary, to make way for a better bark to succeed ; it being observable that, after every stripping, the succeeding bark increases in value. They are generally peeled once in ten years, with an instrument for that purpose ; and this is so far from injuring the trees, that it is necessary, and contributes to their being healthy ; for without it they thrive but slowly ; nay, in a few years they will begin to decay, and in less than a century, a whole plantation will die of age ; whereas those trees that have been regularly peeled, will last upwards of two hundred years.

The bark of this tree was formerly used for making bee-hives ; and Varro says, that those which are made of this material are the best : “ Optimæ sunt corticæ, deterrimæ fitiles, quod et frigore hyeme, et æstate calore vehementissime hic commoventur.”—Virgil, speaking of providing commodious habitations for his bees, says

Ipsa autem, seu *corticibus* tibi suta cavitis,
Seu lento fuerint alvearia vimine texta,
Angustos habeant aditus.

GEORG. IV.

The bark of the Cork-tree was by the antients called *Cortex*, by way of eminence : “ Tu cortice levior.” And Pliny says, the Greeks not inelegantly called this tree the Bark-tree : “ Non infacete Græci corticis arborem appellant.”

all who deal in liquors, cannot be without it; antient persons prefer it before leather for the soles of their shoes, being light, dry, and resisting moisture; whence the Germans name it Pantoffel-holts, (slipper-wood,) perhaps from the Greek *παῦρος* et *πέλλος*; for I find it first applied to that purpose by the Grecian ladies, whence they were called light-footed: I know not whether the epithet do still belong to that sex; but from them it is likely the Venetian dames took it up for their monstrous choppines; affecting or usurping an artificial eminency above men, which nature has denied them. Of one of the sorts of Cork are made pretty cups, and other vessels, esteemed good to drink out of for hectical persons. The Egyptians made their coffins of it, which, being lined with a resinous composition, preserved their dead incorrupt. The poor people in Spain lay broad planks of it by their bed-side to tread on, (as great persons use Turkey and Persian carpets,) to defend them from the floor, and sometimes they line or wainscot the walls and inside of their houses built of stone, with this bark, which renders them very warm, and corrects the moisture of the air; also they employ it for bee-hives, and to double the insides of their contemplores and leather-cases, wherein they put flâsqueras with snow to refrigerate their wine. This tree has beneath the Cortex, or Cork, two other coats, or libri, of which one is reddish, which they strip from the bole when it is felled only, and this bears a good price with the tanner; the rest of the wood is very good firing, and applicable to many other uses of building, palisade-work, &c. The ashes drunk, stop the bloody-flux.

I L E X.

ILEX' major Glandifera, or, Great Scarlet OAK, of several species, and various in the shape of their leaf, pointed, rounder, longer, &c.

* QUERCUS (*ILEX*) foliis ovato-oblongis indivisis serratisque petiolatis subtus incanis, cortice integro. Lin. Sp. Pl. 1412. Ilex arborea. Bauh. Hist. i. p. 95. THE EVERGREEN OAK.

The ILEX is of the class and order *Monocia Polyandria*.

This is a well-known evergreen, of which there are several varieties differing greatly in the size and shape of their leaves; but these will all arise from acorns of the same tree; nay, the lower and upper branches of the same tree are frequently garnished with

BOOK II. (a devoted tree of old, and therefore *incædua*,) thrives manifestly with us, witness his Majesty's Privy Garden at Whitehall, where once flourished a goodly tree, of more than fourscore years growth; and there was lately a sickly imp of it remaining: And now very many raised by me have thriven wonderfully, braving the most severe winters, planted either in standards or hedges, which they most beautifully become. The only difficulty is in their being dextrously removed out of the nursery, with the mould adhering to their roots, otherwise they are apt to miscarry; and therefore it is best trusting to the acorn for a goodly standard, which may be removed without prejudice. Trials should be made by grafting the Ilex on the Oak stock, taken out of our woods, or better, grown from the acorn to the bigness of one's little finger.

By what I have touched in the chapter of the Elms, concerning the peregrination of that tree into Spain, (where even in Pliny's time there were none, and where now they are in great abundance,) why should we not more generally endeavour to propagate the Ilex amongst us; I mean that which the Spaniards call the Enzina, and of which they have such woods and profitable plantations? They are an hardy sort of tree, and familiarly raised from the acorn, if we could have them sound, and well put up in earth or sand, as I have found by experience.

The wood of these Ilexes is serviceable for many uses, as stocks of tools, mallet-heads, mall-balls, chairs, axle-trees, wedges, beetles, pins, and above all, for pallisadoes used in fortifications: Besides, it affords so good fuel, that it supplies all Spain almost with the best and most lasting of charcoals in vast abundance. Of the first kind is made the painters' lac, extracted from the berries; to speak nothing of that noble confection alkermes, and that noble scarlet dye the learned Mr. Ray

leaves very different in size and shape from each other: those on the lower branches being much broader, rounder, and their edges indented and set with prickles; but those of the upper are long, narrow, and entire. The leaves of the Ilex are from three to four inches long, and one broad near the base, gradually lessening to a point; they are of a lucid green on their upper side, but whitish and downy on their under, and are entire, standing upon pretty long foot-stalks; these remain green all the year, and do not fall till they are thrust off by the young leaves in the spring. The acorns are smaller than those of the common Oak, but of the same shape.

gives us the process of at large, in his chapter of the *Ilex*. To this add that most accurate description of this tree, and the *Vernicula*, (see *Quiqueranus*, l. ii. de *Laud. Provinciae*, 1550,) naturally abounding about *Alost*. The acorns of the *Coccigera*, or Dwarf Oak, yield excellent nourishment for rustics, sweet, and little, if at all, inferior to the Chesnut: and this, and not the *Fagus*, was doubtless the true *Esculus* of the antients, the food of the Golden Age. The wood of the *Enzina*, when old, is curiously chambletted and embroidered with natural vermiculations, as if it were painted. Note, That the *Kermes-tree* does not always produce the *Coccum*, but near the sea, and where it is very hot; nor indeed when once it comes to bear acorns; and therefore the people do often burn down the old trees, that they may put forth fresh branches, upon which they find them. This (as well as the Oak, Cork, Beech, and *Corylus*,) is numbered amongst the felices and lucky trees; but for what reason the *Alaternus*, which, I shall next speak of, together with the *Aquifolium*, (*Holly*) Pines, *Salix*, &c. should be excommunicated, as infelices, I know not, unless for their being dedicated to the infernal Deities; of which *Macrob. Sat. lib. ii. c. xvi.* In the mean time take this for a general rule, that those were called infelices only, which bore no fruit; for so *Livy, lib. v. Nulla felix arbor, nihil frugiferum in agro relictum.* Whence that of *Phædrus, lib. iii. Fab. upon Jupiter's Esculus,*

O nata, merito sapiens dicere omnibus:
Nisi utile est quod facimus, stulta est gloria.

Reciting the antient trees sacred to the Deity, the most desirable being those that were fruitful, and for use.

ALATERNUS*.

THIS tree, which we have lately received from the hottest parts of *Languedoc*, (and that is equal with the heat of almost any country in Europe,) thrives with us in *England*, as if it were an indigene and

* RHAMNUS (*ALATERNUS*) inermis, floribus dioicis, stigmatè triplici, foliis serratis.—*Lin. Sp. Pl.* 481. COMMON ALATERNUS. It is of the class and order *Pentandria Monogynia*.—Of this evergreen shrub there are many varieties, all of which are naturalized to our climate.

BOOK II. natural; yet sometimes yielding to a severe winter, followed with a tedious eastern wind in the spring, of all the enemies of our climate, the most hostile and cruel; and therefore to be artificially and timely provided against with shelter.

I have had the honour to be the first who brought it into use and reputation in this kingdom, for the most beautiful and useful of hedges and verdure in the world, the swiftness of the growth considered, and propagated it from Cornwall even to Cumberland: The seeds grow ripe with us in August, and the honey-breathing blossoms afford an early and marvellous relief to the bees.

CELASTRUS^c and LIGUSTRUM^d

OF these shrubs I shall say no more, than that they are flexible and accommodated for topiary works.

PHILLYREA.

THE PHILLYREA^e (of which there are five or six sorts, and some variegated,) is sufficiently hardy, especially the *Serratifolia*, which makes

^c CELASTRUS (*BULLATUS*) *inermis, foliis ovatis integerrimis.* Lin. Sp. Pl. 285.—*SMOOTH STAFF-TREE.* It is of the class and order *Pentandria Monogynia*. Of this shrub there are five species; but this and the *Celastrus Scandens* are the only ones that can bear the severity of our winters.

^d LIGUSTRUM (*VULGARE*) Lin. Sp. Pl. 10. *PRIVET.* Of this shrub there is a variety which is an evergreen. *Ligustrum* is of the class and order *Diandria Monogynia*. Both kinds make a close and handsome hedge.

^e Of this GENUS there are only three real species: All of which are hardy evergreens, and deserve a place in all shrubberies:

1. PHILLYREA (*MEDIA*) *foliis ovato-lanceolatis subintegerrimis.* Lin. Sp. Pl. 10.—*OPAL-LEAVED PHILLYREA.*

2. PHILLYREA (*ANGUSTIFOLIA*) *foliis lineari-lanceolatis integerrimis.* Lin. Sp. Pl. 10.—*NARROW-LEAVED PHILLYREA.*

me wonder to find the *Angustifolia* planted in cases, and so charily set into stoves, amongst the Oranges and Lemons; when, by long experience, I have found it equalling our Holly, in suffering the extremest rigours of our cruel frosts and winds, which, doubtless, of all our English trees, is the most insensible and stout.

They are (both *Alaternus* and this) raised of the seeds, (though those of the *Phillyrea* will be long under ground,) and being transplanted for espalier hedges or standards, are to be governed by the sheers, as oft as there is occasion: The *Alaternus* will be up in a month or two after it is sown. I was wont to wash them out of the berry, and, drying them in a piece of cloth, commit them to the nursery-bed. Plant them out at two years growth, and clip them after rain in the spring, before they grow sticky, and whilst the shoots are tender; thus will they form an hedge, (though planted but in single rows, and at two feet distance,) of a yard in thickness, twenty feet high, if you desire it, and furnished to the bottom: But for an hedge of this altitude it would require the friendship of some wall, or a frame of lusty poles, to secure against the winds one of the most delicious objects in nature: But if we could have store of the *Phillyrea folio leviter serrato*, (of which I have raised some very fine plants from the seeds,) we might fear no weather; the verdure is incomparable, and all of them tonsile, fit for cradle-work and *Umbracula frondium*.

MYRTLE⁷.

THE vulgar Italian wild MYRTLE (tho' not indeed the most fragrant) grows high, and supports all weathers and climates. They thrive abroad

3. PHILLYREA (*LATIFOLIA*) foliis cordato-ovatis serratis. Lin. Sp. Pl. 10. BROAD-LEAVED PHILLYREA. *Phillyrea* is of the class and order *Diandria Monogynia*.

The *Phillyrea* and *Alaternus* appear so much alike, that they are frequently mistaken for each other by many gardeners; but it may be proper to observe, that the number of Stamina are different; the flowers of the *Alaternus* having five Stamina with their Anthers, whilst the flowers of the *Phillyrea* have only two. They not only therefore belong to different classes, but another obvious difference presents itself, and that is, the leaves of the *Phillyrea* stand opposite on the branches by pairs, whereas those of *Alaternus* stand singly, and are produced in an alternate manner.

⁷ Of this most delicately looking shrub there are thirteen Species described by Linnaeus.

BOOK II.

in Brittany, in places cold and very sharp in winter; and are observed no where to prosper so well as by the sea-coasts, the air of which is more propitious to them, as well as to oranges and lemons, than the inland air. I know of one near eighty years old, which has been continually exposed, unless it be that, in some exceedingly sharp seasons, a little dry straw has been thrown upon it; and where they are smitten, being cut down near the ground, they put forth and recover again; which many times they do not in pots and cases, where the roots are very obnoxious to perish with mouldiness. The shelter of a few mats and straw secured very great trees, both leaf and colour in perfection, this last winter also, which were planted abroad, whilst those that were carried into the Conserve were most of them lost. Myrtles, which are of six or eight sorts, may be raised of seeds; but with great caution, and after all, seldom prove worth the pains, being so abundantly multiplied of suckers, slips, and layers. The double-flower, which is the most beautiful, was first discovered by the incomparable Fabr. Peyresc; a mule having cropt it from a wild shrub. Note, That you cannot give those plants too much compost or refreshing, nor clip them too often, even to the stem, which will grow tall, and prosper in any shape; so as arbours have been made of single trees of the hardy kind, protected in the winter with sheds of straw and reeds. Both leaves and berries refrigerate, and are very astringent and drying, and therefore seldom used within, except in fluxes:

The common kind is called *Myrtus floribus solitariis: involucro diphylo*. Sp. Pl. 673.
THE BROAD-LEAVED MYRTLE.

It is of the class and order *Icosandria Monogynia*.

The common broad-leaved Myrtle is the hardiest of all the kinds. The leaves are an inch and a half long and one inch broad, of a lucid green, and stand upon short foot-stalks. The flowers are larger than the other sorts, and come out from the sides of the branches, on pretty long foot-stalks: These are succeeded by oval berries of a dark purple colour, inclosing three or four hard kidney-shaped seeds. It flowers in July and August, and the berries ripen in winter. This, by some, is called the Flowering Myrtle. Of this Species there are many varieties, all of which require the shelter of a green-house in winter. By sowing the seeds of the common Myrtle, new kinds may be obtained. Myrtles are easily propagated by slips, cuttings, and layers. The practice is well known.

Amongst the antients every tree had its Protector. The Myrtle was favoured by Venus; but whether from the delicacy and elegance of its form, or its love to the sea-shore, "amantes littora Myrtos," or from any other cause, I shall not take upon me to decide.

The berries mitigate inflammations of the eyes, and consolidate broken bones: A decoction of the juice, leaves, and berries, dyes the hair black, *et enecat Vitiligines*, as Dioscorides says, lib. i. cap. cxxviii. There is an excellent sweet water extracted from the distilled leaves and flowers.

The varieties of this rare shrub, when furnishing the gardens and porticoes as long as the season and weather suit, and even, in the severest winters, when placed in the Conclave, may be cut and contrived into various figures: They are of divers variegations, most likely to be produced by seeds, as our learned Mr. Ray believes, rather than by layers, suckers, or slips, or from any difference of species. In the mean time, let gardeners make such trials, whilst those most worth the culture are the Small and Broad-leaved, the Tarentine, the Belgick, the Double-flowered, and several more among the curious. The Myrtle, of old, was sacred to Venus, and so called from a virgin (Myrsine) beloved of Minerva. Garlands of the leaves and blofsoms impaled the brows of *incruentous* victors at Oventions*.

CANDLEBERRY-TREE².

AND now if here, for the name only, I mention the MYRTUS BRABANTICA, or CANDLEBERRY SHRUB, (which our plantations in Virginia and other places have in plenty,) let it be admitted: It bears a berry which, being boiled in water, yields a suet or pinguid substance, of a green colour; after being scummed and taken off, they make candles

* A Myrtle crown was worn by the General to whom an OVATION was decreed; but at a TRIUMPH the Victor always wore a Laurel one. The reason of this is given by Plutarch in the Life of Marcellus, viz. That as an OVATION was decreed for some remarkable success obtained by treaty, or without much blood-shed, it was proper that the General at his public appearance should be crowned with the tree sacred to Venus, who, of all the Deities, was supposed to be the most averse to the horrors of war.

² This is the MYRICA (*CERIFERA*) foliis lanceolatis subseriatis, caule arborascente. Lin. Sp. Pl. 1453. THE CANDLEBERRY-TREE.

It is of the class and order *Diocia Tetrandria*.

This tree grows naturally in Carolina, Virginia, and Pennsylvania. Kalm says that it thrives best near the sea, never having seen it at any distance from the shore. From it is obtained a green wax, with which the Americans make candles. For the method of preparing the wax consult Catesby's History of Carolina.

BOOK II. with this, in the shape of such as we use of tallow, or wax rather; giving not only a very clear and sufficient light, but a very agreeable scent. The candles are now frequently brought hither to us, and also the tree itself of which I have seen a thriving one.

L E N T I S C U S ^b.

THIS is a very beautiful Evergreen, and refuses not our climate when protected with a little shelter; it is propagated by suckers and layers. Of this tree are made the best tooth-pickers in the world, and the mastick, or gum, produced from it, is of excellent use in fastening the teeth.

O L I V E ^c.

As the Lentise, so may the OLIVE be admitted, though it produce no other fruit than the verdure of the leaf; nor will it kindly breathe our air; nor the lefs tender Oleaster^d, without the indulgent winter-house, take them in.

^b PISTACIA (*LENTISCUS*) foliis abrupte pinnatis: foliolis lanceolatis. Lin. Sp. Pl. 1455. THE MASTICK-TREE. From this tree is obtained the Gum Mastick.

It is of the class and order *Diœcia Pentandria*.

Martial observes of this tree, that it makes excellent tooth-picks;

Lentiscum melius; sed si tibi frondea cuspis
Defuerit, dentes penna levare potest.

L. 14. Ep. 22.

^c Of this GENUS there are two Species:

1. OLEA (*EUROPÆA*) foliis lanceolatis. Lin. Sp. Pl. 11. *Olive with spear-shaped leaves.* Olea Sativa. Bauh. Pin. 472. THE OLIVE-TREE.

2. OLEA (*CAPENSIS*) (foliis ovatis. Lin. Sp. Pl. 11. *Olive with oval leaves.* THE CAPE OLIVE.

The Olive is of the class and order *Diandria Monogynia*.

It will be unnecessary to give any directions concerning the cultivation of those trees, as neither of them can stand the cold of our climate. The first is a native of the southern parts of Europe, from the fruit of which is expressed an oil of general use. The other is a native of the Cape of Good Hope.

^d The title of the OLEASTER, or Wild Olive, is, *Elaeagnus foliis lanceolatis*. In the *Hortus Cliffortianus* it is termed simply, *Elaeagnus*. Caspar Bauhine calls it, *Olea sylvæstris, foliis molli-*

GRANATUM°. *MALUS PUNICA*.

THIS is nothing so nice. There are of this glorious shrub three sorts, easily enough educated under any warm shelter, even to the raising hedges of them, nor indeed affects it so much heat, as plentiful watering. They supported a very severe winter in my garden, 1663, without any trouble or artifice; and if they present us their blushing double flowers for the pains of resection and well pruning, (for they must diligently be purged of superfluous wood,) it is recompense enough; when placed in a very benign aspect, they have sometimes produced a pretty small pome. It is a *Perdifolia* in winter, and growing abroad, requires no extraordinary rich earth, but that the mould be loosened and eased about the root, and hearty compost applied in spring and autumn: Thus cultivated, it will rise to a pretty tree, though of which there is not in nature so adulterous a shrub. It is best increased by layers, approach and inarching, as they

incano. It grows naturally in Bohemia, Spain, Syria, and Cappadocia. It is of the class and order *Tetrandria Monogynia*.

This tree will grow to near twenty feet in height. The branches are smooth, and of a brown colour. The preceding year's shoots are white and downy, and the silvery leaves are placed irregularly on them: These are of a spear-shaped figure, about two, and sometimes three inches long, and three quarters of an inch broad, and are as soft as Satin to the touch. They continue on the tree great part of the winter. The flowers appear in July, but make no figure: They are small, and come out at the foot-stalks of the leaves; their colour is white, and they are possessed of a strong scent. The fruit that succeeds them much resembles a small Olive. Of this shrub there is a variety with yellow flowers.

* Of this GENUS there are two Species:

1. *PUNICA (GRANATUM) foliis lanceolatis, caule arboreo*. Lin. Sp. Pl. 676. *Pomegranate with spear-shaped leaves, and a tree-like stem*. *Malus Punica Sativa*. B. P. 438. *THE POMEGRANATE*.

This tree is now pretty common in the English gardens, where formerly it was nursed up in cases, and preserved in green-houses with great care, (as was also the double flowering kind;) but they are both hardy enough to resist the severest cold of our climate in the open air; and, if planted against warm walls in a good situation, the first sort will often produce fruit, which in warm seasons will ripen tolerably well; but as these fruits do not ripen till late in the autumn, they are seldom well tasted in England, for which reason the sort with double flowers is commonly preferred. Of this species there are the following varieties:—1. The Wild Pomegranate with single and double flowers.—2. The Sweet Pomegranate.—3. The

BOOK II. term it, and is said to marry with Laurels, the Damson, Ash, Almond, Mulberry, Citron; too many I fear to hold. But, after all, they do best being cased, the mould well mixed with hogs' rotten dung, its peculiar delight, and kept to a single stem, and treated like other plants in the winter shelter; they open the bud and flower, and sometimes with a pretty small fruit; the juice whereof is cooling, and the rest of an astrigent quality. The rind may also supply the gall for making ink, and will tan leather.

L I L A C †.

THE LILAC is easily propagated by suckers and layers. Of this there are two sorts, one with a white, and another with a pale purple flower. Besides these, there is another with purple flowers and small spear-shaped leaves, by our botanists called Persian Jasmine, which leads me to the other Jasmines.

Small Flowering Pomegranate with single and double flowers.—4. The Pomegranate with striped flowers.

The double flowering kind is most esteemed in this country for the sake of its large, fine, double flowers, which are of a most beautiful scarlet colour; and, if the trees are well supplied with nourishment, they will continue to produce flowers for two months successively, which renders it one of the most valuable flowering-trees yet known. The Balaustia of the shops are the impalements of the flowers of this kind.

2. PUNICA (*NANA*) foliis linearibus, caule fruticoso. Lin. Sp. Pl. 676. *Pomegranate with linear leaves and a shrubby stem* Punica Americana nana s. humillima. Tourn. Inst. 636. *THE AMERICAN DWARF POMEGRANATE.*

This sort grows naturally in the West Indies, where the inhabitants plant it in their gardens to form hedges. It seldom rises more than five or six feet high in those countries, so may be kept within compass, and there the plants keep flowering great part of the year. The flowers of this kind are much smaller than those of the common sort; the leaves are shorter and narrower, and the fruit is not larger than a nutmeg, and has little flavour, so it is chiefly propagated for the beauty of its flowers.

The POMEGRANATE is of the class and order *Icofandria Monogynia*.

† Though the varieties of LILAC are numerous, the real distinct Species are only two.

1. SYRINGA (*VULGARIS*) foliis ovato-cordatis. Lin. Sp. Pl. 11. *Syringa with oval heart-shaped leaves.* *THE COMMON LILAC.*

J A S M I N E *.

CHAP. IV.

This, especially the Spanish larger flower, far exceeds all the other sweet-smelling shrubs for the use of the perfumer, on account of its agreeable odour. The common White and Yellow will flower plentifully in our groves, and climb about the trees, being as hardy as any of our Periclimena and Honey-suckles.

How it is increased by submersion and layers, every gardener skills; and were it as much employed for nosegays, &c. with us as it is in Italy and France, they might make money enough of the flowers; one sorry tree in Paris, where they abound, has been worth to a poor woman near a pistole a year.

There is no small curiosity and address in obtaining the oil, or essence, as we call it, of this delicate and evanid flower, which I leave to the Chymist and the Ladies, who are worthy the secret.

2. SYRINGA (*PERSICA*) foliis lanceolatis. Lin. Sp. pl. 11. *Syringa with spear-shaped leaves.* Commonly called *PERSIAN JASMINE.*

SYRINGA is of the class and order *Diandria Monogynia.*

Both these kinds, together with their varieties, are best propagated by suckers and layers. The first sort may be raised from seeds, which ripen in autumn.

* Of the JASMINE there are six Species; but there are only three adapted to our hardy plantations:

1. JASMINUM (*OFFICINALE*) foliis oppositis pinnatis. Lin. Sp. Pl. 9. *Jasminum vulgatum, flore albo.* C. B. *THE COMMON WHITE JASMINE.*

This plant, though so common and hardy with us, is a native of India.

2. JASMINUM (*FRUTICOSA*) foliis alternis ternatis simplicibusque, ramis angulatis. Lin. Sp. Pl. 9. *THE SHRUBBY YELLOW JASMINE.*

It grows common in the Southern parts of Europe, and is able to resist the severity of our climate.

3. JASMINUM (*HUMILE*) foliis alternis ternatis pinnatisque, ramis angulatis. Lin. Sp. Pl. 9. *Jasminum humile luteum.* Bauh. Pin. 397. *THE DWARF YELLOW JASMINE*

It grows common in Italy, and is able to resist the frosts of our climate

JASMINE is of the class and order *Diandria Monogynia.*

Volume II.

M

C H A P. V.

The ARBUTUS, LAUREL, and BAY.

ARBUTUS^b. The STRAWBERRY-TREE. This is, I think, too much neglected by us, making that a rarity which grows so common and naturally in Ireland: It is indeed with some difficulty raised by seeds,

^b Of this GENUS there are five species:

1. ARBUTUS (*UNEDO*) foliis glabris serratis, baccis polyspermis, caule arboreo.—
Lin. Sp. Pl. 566. *Strawberry-tree with smooth sawed leaves, berries having many seeds, and a tree-like woody stem.* Arbutus folio serrato. C. B. P. 460. Arbutus. Cam. Epit. 168.—
THE STRAWBERRY-TREE.

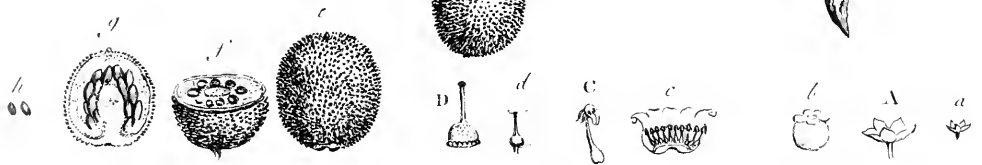
This sort grows naturally in Italy, Spain, and also in Ireland, and is now very common in the English gardens. It produces the following varieties, viz. one with an oblong flower and oval fruit; another with a double flower; and a third with red flowers.

2. ARBUTUS (*ANDRACHNE*) foliis glabris integerrimis, baccis polyspermis, caule arboreo. Lin. Sp. Pl. 566. *Strawberry-tree with smooth entire leaves, berries full of seeds, and a tree-like woody stem.* Arbutus folio non serrato. C. B. P. 460. Andrachne Theophrasti. Clus. Hist. 1. p. 48. *THE ORIENTAL STRAWBERRY-TREE.*

This kind grows naturally in the East, particularly about Magnesia, where it is so common, as to be the principal fuel used by the inhabitants of the country. It grows to a middle-sized tree; the branches are irregular, and are garnished with large oval leaves, somewhat like those of the Bay-tree, but not quite so long; these are smooth and entire, having no serratures on their edges; the flowers are shaped like those of the common Arbutus, but grow thinly on the branches. The fruit is oval, and of the same colour and consistence with the common sort, but the seeds of this are flat, whereas those of the common sort are pointed and angular.

3. ARBUTUS (*ACADIENSIS*) caulis procumbentibus, foliis ovatis subserratis, floribus sparsis, baccis polyspermis. Lin. Sp. Pl. 566. *Arbutus with trailing stalks, oval leaves, somewhat indented, flowers growing loosely, and berries with many seeds.* Vitis idæa Acadiensis, foliis Alaterni. Tourn. Inst. 608. *THE ACADIAN STRAWBERRY-TREE.*

This sort grows naturally in Acadia, and other northern parts of America, upon swampy land, which is frequently overflowed with water; it is a low bushy shrub, with slender trailing branches, which are garnished with oval leaves, a little sawed on their edges; the flowers come out from the wings of the leaves, growing in thin loose bunches. This sort



The Strawberry Tree.
 Published under the authority of the Trustees of the British Museum, by W. Woodcut, 1825, as the Art directs.

J. Miller del. et Sculp.

but easily propagated by layers; if skilfully pruned, it grows to a goodly tree, patient of our climate, unless the weather be very severe, it may be contrived into most beautiful palisades, and is ever verdant: I am told the tree grows to a huge bulk and height on Mount Athos, and in other countries. Virgil reports its inoculation with the nut. Bauhinus com-

never produces fruit in England, and it is with difficulty that the plants themselves are kept alive in this country.

4. ARBUTUS (*ALPINA*) caulibus procumbentibus, foliis rugosis serratis. Lin. Sp. Pl. 566. *Arbutus with trailing stalks and rough serrated leaves.* Vitis idæa foliis oblongis albicantibus.—C. B. P. 470. Vitis idæa Clus. Hist. *ALPINE STRAWBERRY-TREE.*

This grows naturally on the Alps and the Helvetian mountains. It never rises high, but sends out from the root many slender branches, which trail upon the ground, and are garnished with oblong rough leaves of a pale green colour; the flowers are produced from the wings of the leaves, upon long slender foot-stalks, and are succeeded by berries about the size of the common black Cherry, which are first green, afterwards red, and when ripe are black. These are of a pleasant taste, so are frequently eaten by the inhabitants of those countries where they grow naturally. This is a very difficult plant to keep alive in gardens, for it is an inhabitant of bogs, growing among moss, where the ground is never dry. Mr. Lightfoot discovered it growing in great abundance in the north of Scotland between Loch Broom and Loch Mari.

5. ARBUTUS (*UVA URSI*) caulibus procumbentibus, foliis integerrimis. Lin. Sp. Pl. 566. *Arbutus with trailing stalks and entire leaves.* Uva Ursi. Clus. Hist. *TRAILING ARBUTUS, OR BEARBERRY.*

This grows naturally upon the mountains in Spain, and in most of the northern parts of Europe. The branches trail on the ground, and are closely garnished with smooth thick leaves of an oval form, placed alternately; the flowers are produced in small bunches toward the extremity of the branches, which are shaped like those of the common sort, but smaller; and are succeeded by berries, of the same size with those of the former sort, which are red when ripe. The leaves of this species of Arbutus have been greatly celebrated in calculous, and nephritic complaints, and other disorders of the urinary passages: The dose is half a drachm of the powder of the leaves, every morning, or two or three times a day. De Haen relates, after great experience of this medicine in the hospital of Vienna, that suppurations though obstinate and of long continuance, in the kidneys, ureters, bladder, urethra, scrotum, and perinæum, where there was no venereal taint or evident marks of a calculus, were in general completely cured by it: That of those who had a manifest calculus, several found permanent relief, so that, long after the medicine had been left off, they continued free from pain, or inconvenience in making water, though the Catheter showed that the calculus still remained: That others, who seemed to be cured, relapsed on leaving off the medicine, but were again relieved on repeating its use, and this for several times successively; while others obtained from it only temporary and precarious relief, the complaints being

BOOK II. mends the coal for the goldsmiths' work ; and the poet celebrates it for country work :

Arbutæ crates, et mystica Vannus Iacchi.

GEORG. I.

Arbutean harrows, and the mystick Van.

often as severe during the continuance of the medicine as when it was not used. The trials of the Uva Ursi, made in this country, have by no means answered expectation.

ARBUTUS is of the class and order *Decandria Monogynia*.

The common Strawberry-tree is well known, being at present in most of the English gardens, and one of their greatest ornaments in the months of October and November, that being the season when the trees are in flower, and the fruit of the former year is ripe, for the fruit is a whole year in growing to perfection; so that the fruit which is produced from the flowers of one year, does not ripen till the blossoms of the succeeding year are fully blown. When there is plenty of fruit and flowers upon the trees they make a fine appearance, at a season when most other trees are past their beauty :

————— pomoque onerata rubenti
Arbutus.

OVID.

Those trees which have large oval fruit make the greatest figure, their flowers being larger and oblong. The sort with double flowers is a curiosity; but as the flowers have only two orders of leaves, they make no great appearance; nor do the trees produce fruit in any plenty, therefore the other is preferable. The sort with red flowers makes a pretty variety, when intermixed with the other; for the outsides of them are of a fine red colour at their first appearance, and afterwards they change to purple before they fall off. The fruit of this is the same with the common sort. All these varieties are preserved by inarching or grafting them upon the common Arbutus; for the seeds of either do not produce the same kind; though from the seeds of the oval fruit, there are generally many more of the same produced, than from the seeds of the common sort.

The best method to propagate the Arbutus is by seeds; therefore when the fruit is perfectly ripe, it should be gathered and mixed with dry sand, to preserve it till the time for sowing: the surest method of raising the plants, is to sow the seeds in pots, which should be plunged into an old bed of tanners' bark, which has lost its heat, covering the bed with glaises, &c. to keep out the frost; this should be done in December.— If the seeds are good, and, as the spring advances, the pots are refreshed with water, the plants will come up the beginning of April, when they should be frequently, but sparingly watered, and constantly kept clean from weeds. As the summer advances, if the plants are shaded in the heat of the day, it will greatly promote their growth; but in warm weather they must be exposed all night to receive the dew; so should only be covered in the middle of the day: with this management, the plants will rise to the height of five or six inches the first summer. In October, they should be removed into the green-house,

L A U R E L ¹.

CHAP. V.

LAURO-CERASUS. The CHERRY-BAY. From the use we commonly put this shrub to, it seems as if it had been only destined for hedges, and to cover bare walls: Being planted upright, and kept to the

or placed under shelter, to protect them from the severity of the approaching winter.—When planted out where they are to grow, little regard need be paid to soil or situation.

The fruit of the *Arbutus* is said to have constituted part of the food of mankind in the early ages, “*Arbuteos fetus montanaque fragra legebant;*” though, of all the wild fruits, it must have been the most disgusting. The ancients themselves named it *Unedo*; and Pliny gives the reason, “*cui nomen ex argumento sit unum tantum edendi.*” However disagreeable the fruit may have been, its shade was thought inviting: Horace says of it,

Nunc viridi membra sub *Arbuta* stratus.

Virgil mentions the leaves of this tree as peculiarly agreeable to goats in the winter season:

Post hinc digressus jubeo frondentia capris
Arbuta sufficere.

GEORG. iii.

¹ This tree was formerly called LAURO-CERASUS, but Linnæus has now made it a species of the *Prunus*. In the Sp. Pl. it is titled PRUNUS (*LAURO-CERASUS*) floribus racemosis, foliis sempervirentibus dorso biglandulosis. In Hort. Cliff. 185, it is called *Padus foliis sempervirentibus lanceolato-ovatis*. THE COMMON LAUREL, or CHERRY BAY.

It is of the class and order *Icosandria Monogynia*.

The young leaves of the Laurel begin to open about the twelfth of March, and are generally out by the middle of April. The flowers are white; and though small, yet being clustered together, they make a tolerable appearance: But the berries afford the greatest beauty, being large, and when ripe very black.

This tree is a native of the East, and grows naturally about the Black Sea. It was first brought into Europe by Clusius, in the year 1576: and being easily propagated, is now spread over Italy and the greatest part of Europe.

The Laurel is propagated both by seeds and cuttings. If the former method is practised, the seeds must be gathered from the trees when they are full ripe: This will be known by their being quite black, which is generally about the beginning of October. These seeds should be sown directly in beds of light earth, half an inch deep, which must be afterwards hooped over, to be covered in very severe frosts. A hedge of furze bushes should be made around them, to break the force of the freezing black winds, and secure the seeds, together with the mats, from being destroyed. This is a much safer

BOOK II.

standard, by cutting away the collateral branches, and maintaining one stem, it will rise to a very considerable tree, resembling (for the first twenty years,) the most beautiful-headed Orange in shape and verdure, and arriving in time to emulate even some of our lusty timber-trees; so as

method than covering the beds with litter, which, if neglected to be taken off when the frost is over, will retain the rains which generally succeed such weather, sodden the beds, and make them so wet as frequently to destroy the whole of the expected crop. The seeds being sown, and preserved with the above care, will appear in the spring. During the following summer they should be kept clear of weeds, as well as watered in dry weather; and all the ensuing winter they must remain untouched in their beds, the furze hedge still standing till the frosty weather is past; for if these young seedlings are planted out in the autumn, the major part of them will be in danger, before the winter is expired, of being thrown out of the ground by the frost; and not only so, but of being really killed by it, as they are not very hardy at one year old. In the spring therefore, when the bad weather is over, let them be planted out in the nursery-ground, in rows two feet asunder, and the plants a foot and a half distant in the rows, where they may stand till they are planted out for good.

Trees raised from seeds generally grow more upright, and seldom throw out so many lateral branches as those raised from cuttings; nevertheless, as the expectation of a crop from seeds has so often failed, notwithstanding great care has been used, and as the difficulty of procuring the seeds, and preserving them from the birds, has been very great, the most certain and expeditious method of raising quantities of these trees is by cuttings, and is as follows:

In the month of August, the cuttings should be gathered, about a foot and a half in length. They will thrive the better for having a bit of the last year's wood at the end, though without this they will grow exceedingly well. The under-leaves should be cut off a foot from the thick end of the cutting, which must all be planted about a foot deep in the ground; the other half foot, with its leaves, being above it. No distance need be observed in planting these cuttings, which may be set as thick as you please, though the ground for raising them should be sheltered, lest the winds, which are frequently high, at this time of the year, or soon after, should loosen the plants just when they are going to strike root.

When the cuttings are to be planted, the weather should be either rainy or cloudy; and if no showers should fall in August, the work must be deferred till they do; for if cuttings are planted in August when the weather is parching and dry, they will be burnt up, without great care and trouble in shading and watering. Neither is cloudy or rainy weather only to be recommended in planting these cuttings, but a shady situation also, either under a north-wall, or in beds which are covered the greatest part of the day with the shade of large trees. The shady situation is very necessary for them; since, though the weather be rainy and cloudy when they are planted out, yet should it prove fair afterwards, the sun will soon dry up the moisture at that season, and endanger the plants,

I dare pronounce it to be one of the most proper and ornamental trees for walks and avenues of any growing.

Pity it is they are so abused in the hedges, where the lower branches

if they are not constantly watered and protected with a shade; which at once shows the expediency of pitching on a spot where such a conveniency is natural.

If these cuttings are planted in August, they will take root before winter, especially if they have shade, and water in dry weather; but they should remain undisturbed till the spring twelvemonth following, in order to acquire strength to be planted in the nursery.— During the summer, they will require no other trouble than watering in dry weather, and keeping clean from weeds, and by the autumn they will have made a shoot of perhaps a foot or more in length. In the beds, nevertheless, they should remain till the spring, when they should all be carefully taken out, and planted in the nursery, as was directed for the seedlings.

When these trees are intended to form a large plantation, any time during the winter will be proper for the work, though I would recommend the month of October as the most favourable season. The ground ought to be prepared for their reception by ploughing; and they should be planted in holes made all over it, at one yard asunder. When they begin to touch each other, do not immediately thin them, but suffer them to remain unthinned two or three years longer; by which means they will draw one another up to regular stems. When you begin to thin them, it must be done sparingly, and in small quantities, only casting out a weakly plant here and there, to make room for the more vigorous shooting of the others, lest the cold, entering the plantation too much at once, should retard its growth, if not wholly destroy it.

The danger of losing these plants is only when they have been used to grow close, and the cold is suffered to rush in upon them all of a sudden; when planted on bleak or exposed places singly, they seldom suffer from the cold. Let the plantations therefore be thinned with caution.

The Laurel is now so naturalized to us, as to grow well in almost any of our soils or situations; so that plantations of this tree may be made in any place where there is a conveniency. In Italy there are numerous woods consisting entirely of these trees; and though England at present cannot boast of many plantations of this kind, yet his Grace the Duke of Bedford has set a noble example to men of fortune, at Woburn, where he has planted one hill solely with Laurels, which thrive exceedingly: as do those also which are mixed in great quantities with the other evergreens, throughout his whole plantations.

A water distilled from the leaves of this tree is one of the most speedy and deadly poisons in nature, as appears from the experiments of the ingenious *Abbé FONTANA*, inserted in the 70th vol. of the Phil. Trans. of London.

Besides the common Laurel, there is another kind entitled by *Tournefort*, *Inst.* 623,

BOOK II.

growing sticky and dry, by reason of their frequent and unseasonable cuttings (the genius of the tree being to spend much in wood,) they never succeed after the first six or seven years; but are to be new planted again, or abated to the very roots for a fresh shoot, which is best, after which they soon furnish the places. In a word; as to the pruning of evergreen hedges, there is no small skill and address to be used, in forming and trimming them for beauty and stability; leave the lower parts next the ground broader (two feet were sufficient for the thickness of the tallest hedge,) than the tops, gradually, so as not much to exceed a foot breadth at the utmost verge, (as architects diminish walls of stone and brick from the foundation,) for they else will be apt to bend and swag, (especially when laden with winter snows or ice,) grow too thick, heat, wither, and foul within, dry and sticky especially; when it were more than time they were cut close to the earth, for a fresh and verdant spring; and this method is to be practised in all hedges whatsoever.

But would you yet improve the standard, which I celebrate, to greater and more speedy exaltation, bud your Laurel on the Black Cherry stock to what height you please: This I had from an ocular

LAURO-CERASUS LUSITANICA MINOR. *The Smaller Portugal Laurel*; called in its native country, AZOUREIRO.

The leaves of this shrub are shorter than those of the common Laurel, approaching nearer to an oval form; they are of the same consistence, and of a lucid green, which mixing with the red branches, make a beautiful appearance. The flowers are produced in long loose spikes from the sides of the branches; they are white, and shaped like those of the common Laurel, appearing in June, and are succeeded by oval berries smaller than those of the common Laurel; they are first green, afterward red, and when ripe are black inclosing a stone like the Cherry.

This kind may be propagated in the same way as the common Laurel, either by cuttings, layers, or seeds. If the cuttings are planted at the same season, and in the same way as has been directed for the common Laurel, they will take root very freely; or if the young branches are laid in the autumn, they will take root in one year, and may then be removed into the nursery, where they may grow a year or two to get strength, and then be transplanted where they are to remain.

This tree is much hardier than the common Laurel; for in the severe frost of the year 1710, when great numbers of Laurels were entirely killed, and most of them lost their leaves, this remained unhurt, and continued throughout the season in perfect verdure.

testimony, who was more than somewhat doubtful of such alliances; though something like it in Palladius speaks it not so impossible :

CHAP. V.


Inseritur Lauro Cerasus, partuque coacto
 Tingit adoptivus virginis ora pudor.

A Cherry graft on Laurel stock, does stain
 The virgin fruit in a deep double grain.

They are raised of the seeds, or berries, with extraordinary facility, or propagated by layers, taleæ, and cuttings, set about the latter end of August, or earlier at St. James's tide, wherever there is shade and moisture. Besides that of the wood, the leaves of this Laurel, boiled in milk, impart a very grateful taste of the Almond; and of the berries, or cherries rather, (which poultry generally feed on) is made a wine, to some not unpleasant. I find little concerning the uses of this tree; of the wood are said to be made the best plough-handles. Note, that this rare tree was first brought from Civita Vecchia into England by the Countess of Arundel, wife to that illustrious patron of arts and antiquities, Thomas Earl of Arundel and Surry, great great grandfather to his Grace the present Duke of Norfolk, whom I left sick at Padua, where he died, highly displeas'd at his grandson Philip's putting on the Friar's frock, though afterwards the Purple, when Cardinal of Norfolk. After all, I cannot easily assent to the tradition, though I had it from a noble hand: I rather think it might first be brought out of some more northerly clime, the nature of the tree so delighting and flourishing in the shady and colder exposures, with an abhorrence of heat.

B A Y T R E E

LAURUS VULGARIS*. The BAY TREE. The learned Isaac Vossius, and Etymologists, are wonderfully curious in their conjectures

* Of the LAURUS there are no less than eleven Species enumerated by Linnæus, but it will be unnecessary in this place to take notice of more than one, viz.

LAURUS (*NOBILIS*) foliis venosis lanceolatis perennantibus, floribus quadrifidis dioicis. Lin. Sp. Pl. 529. Laurus Vulgaris. B. P. 400. THE BAY TREE.

It is of the class and order *Emacandria Monogynia*.

This shrub is propagated by seeds, cuttings, layers, and suckers, in a manner well known to every gardener. As this beautiful plant will grow under the dripping of trees, it is.

Volume II.

N

BOOK II. concerning its derivation; *a Laude*, says Isidore. And from the ingenious poet, we learn how it became sacred to Apollo, the Patron of the Wits, and ever since the Meed of Conquerors and heroic Persons. But leaving fiction, we pass to the culture of this noble and fragrant tree, propagated both by seeds, cuttings, suckers, and layers. They (namely the berries) should be gathered dropping ripe: Pliny has a particular process for the ordering of them, not to be rejected, which is to gather them in January, and spreading them till their sweat be over, he then puts them in dung, and sows them: As for the steeping in wine, water does altogether as well: Others wash the seeds from their mucilage, by breaking and bruising the glutinous berries, then sow them in rich ground in March, by scores in a heap; and indeed so they will come up in clusters, but nothing so well, nor fit for transplantation, as where they are interred with a competent scattering, so as you would furrow pease.

qualified for adorning the borders of woods and pleasure grounds. The leaves begin to open about the middle of March, and are quite out by the beginning of May. The flowers are of a light yellow colour, but make no show. It is a native of Italy. The *Bay-tree*, and not the *Laurel*, is undoubtedly the *Laurus* of the antients. The Laurel was not known in Europe till the latter end of the sixteenth century, about which time it was brought from Trebizond to Constantinople, and from thence it spread over most parts of Europe. Besides, *our* Laurel has not the properties ascribed by the antients to *their* Laurus. Virgil says it has a fine smell, which *our* Laurel has not:

Et vos, O Lauri, carpam, et te, proxima Myrte,
Sic posita; quoniam suaves miscetis odores.

ECL. II.

And in the sixth Æneid, “Oderatum Lauri nemus.”

The Pythian Priestess chewed the leaves of this tree before she placed herself upon the sacred Tripod. These being used after an abstinence of three days, naturally produced that wild enthusiasm with which her Oracles were always attended. From its being thus used it obtained the name of the “Prophetic Tree.” Whence Claudian,

—————venturi præscia Laurus.

Amongst the antients, Crowns of Laurel were worn by successful Generals at their triumphal entries: Apollo, when he made this tree his own, says,

Tu ducibus Latii aderis, cum leta triumphum
Vox canet; et longe visent Capitolia pompæ.

OPJD.

The Bay-tree is said to have a natural aversion to fire, which it shows by crackling in

Both this way, and by setting them apart, which I most commend, I have raised multitudes, and that in the berries, kept in sand till the spring, without any farther preparation; only for the first two years they should be defended from the piercing winds, which frequently destroy them; and yet the scorching of their tender leaves ought not to make you despair, for many of them will recover beyond expectation; nay, though quite cut down, they repullulate and produce young suckers. Such as are raised of berries may at three years growth be transplanted; which let alone too long, are difficult to take.

CHAP. V.

This aromatic tree greatly loves the mother's shade, (under which nothing else will prosper,) yet thrives best in our hottest gravel, having once pased those first difficulties: Age, and culture about the roots, wonderfully augment its growth; so as I have seen trees of them near thirty feet high, and almost two feet diameter. They make walking-staves, straight, strong, and light for old Gentlemen; and are fit also both for arbour and palisade work, so the gardener understands when to prune and keep them from growing too woody. And here I cannot but take notice of those beautiful case-standards, which of late you have had out of Flanders, &c. with stems so even and upright, heads so round, full, and flourishing, as seem to exceed all the topiary ornaments of the garden, that one tree of them has been sold for more than twenty pounds; though now, the mystery revealed, the price be much abated; and, doubtless, a good might be raised here, (without sending beyond sea for them,) were

the flames: "*Laurus manifesto abdicat ignes crepitu et quadam detestatione;*" and this was esteemed a good omen:

*Laurus ubi bona signa dedit, gaudete Coloni,
Distendet spicis horrea plena Ceres.*

TIB.

Chaucer, in his tale of the Flower and the Leaf, gives us a fine description of some of the most remarkable properties of this tree:

The Laurel is the sign of labour crown'd,
Which bears the bitter blast, nor shaken falls to ground:
From winter winds it suffers no decay,
For ever fresh and fair, and ev'ry month is May:
Ev'n when the vital sap retreats below,
Ev'n when the hoary head is hid in snow;
The life is in the leaf, and still between
The fitts of falling snow, appears the streaky green.

DRYDEN.

BOOK 11. our gardeners as industrious to cultivate and shape them. Some there are, who imagine them of another species than our ordinary Bay, but erroneously. I wonder we plant not whole groves of them, and abroad; they being hardy enough, grow upright, and would make a noble Daphnecon. The berries are emollient, sovereign in affections of the nerves, cholics, &c. they make good gargarisms, baths, salves, and perfumes: Of Bay-leaves, dried in a fire pan and reduced to a fine powder, as much as will cover half a crown, being drank in wine, seldom fails of curing an ague. And some have used the leaves instead of cloves, imparting its relish in sauce, especially of fish: and the very dry sticks of the tree, strewed over with a little powder or dust of sulphur, and vehemently rubbed against one another, will immediately take fire, as will likewise the wood of an old Ivy; nay, without any intentive addition, by friction only.

Amongst other things, it has of old been observed that the Bay is ominous of some funest accident; if that be so accounted which Suetonius (in Galba) affirms to have happened before the death of the monster Nero, when these trees generally withered to the very roots in a very mild winter: and much later; for in the year 1629, when at Padua, preceding a great pestilence, almost all the Bay-trees about that famous University, grew sick and perished: *Certo quasi presagio*, says my author, *Apollinem Musasque, subsequenti anno urbe illa bonarum literarum domicilio excelesuras.*—But that this was extraordinary, we are told the Emperor Claudius, upon occasion of a raging pestilence, was by his Physicians, advised to remove his court to Laurentium, the aromatic emissions of that tree being in such reputation for clearing the air, and resisting contagion; upon which account I question not but Pliny, the nephew, was so frequently at his beloved Laurentium, so near the city. Besides, those trees were extolled for their virtue against lightning, which Tiberius so exceedingly dreaded, that when it came with thunder, he would creep under his bed to avoid it, shading his head with the boughs. The branch let fall from the bill of the white hen into the lap of Livia Drusilla, being planted, prospered so floridly, as made it reputed so sacred, as to use it for impaling the heads of the triumphing Emperors, and to adorn the Limina of the Temples and Royal Palace of the great Pontiff; and thence called *Janitricis Cæsarium*.

Cur tamen apposita velatur janua lauro;
 Cingit et Augustas arbor opaca fores?
 Num quia perpetuos meruit domus ista triumphos?
 An quia Leucadio semper amata Deo?

CHAP. V.

OVID.

As still at present in Rome, and other cities, they use to trim up their churches and monasteries on solemn festivals, when there is station and indulgences granted in honour of the saint or patron; as also on occasion of signal victories, and other joyful tidings; and those garlands, made up with hobby-horse tinsel, make a glittering show, and rattling noise when the air moves them.

With the leaves of Laurel were made up the despatches and letters, which were sent to the Senate from the victorious General¹: The spears, lances^m, and fasces, nay tents and ships, &c. were all dressed up with Laurels; and in a triumph every common soldier carried a sprig in his hand, as we may see in the best basso-relievo of the antients, as of virtue to purge them from blood and slaughter. And now, after all this, might one conjecture by a mere inspection of these several sculps, statues, and medals yet extant, representing the heads of Emperors, Poets, &c. the wreaths and coronets to be composed of a more flexible and compliant species than the common Bay, and more applicable to the brows, except where the ends and stalks of the tender branches were tied together with a lemnisc or ribbon. And there be yet who contend for the Alexandrian Laurel, and the Tinus, as more ductile, but without any good evidence Pliny, I find, says nothing of this question, naming only the Cyprian and Delphic; besides, the figure, colour of the rind, and leaf crackling in the fire, which it impugns, (as it is said it does lightning,) gives plainly the honour of it to the common Bay.

¹ Publica victrices testantur gaudia chartæ.

MART.

^m Martia laurigerâ cuspidè pila virent.

Ib.

Of FENCES, QUICKSETS, &c.

OUR main plantation is now finished, and our forest adorned with a just variety: But what is yet all this labour, but loss of time and irreparable expense, unless our young and (as yet) tender plants be sufficiently guarded with munitions from all external injuries? For, as old Tufser,

*If cattle or coney may enter to crop,
Young Oak is in danger of losing his top.*

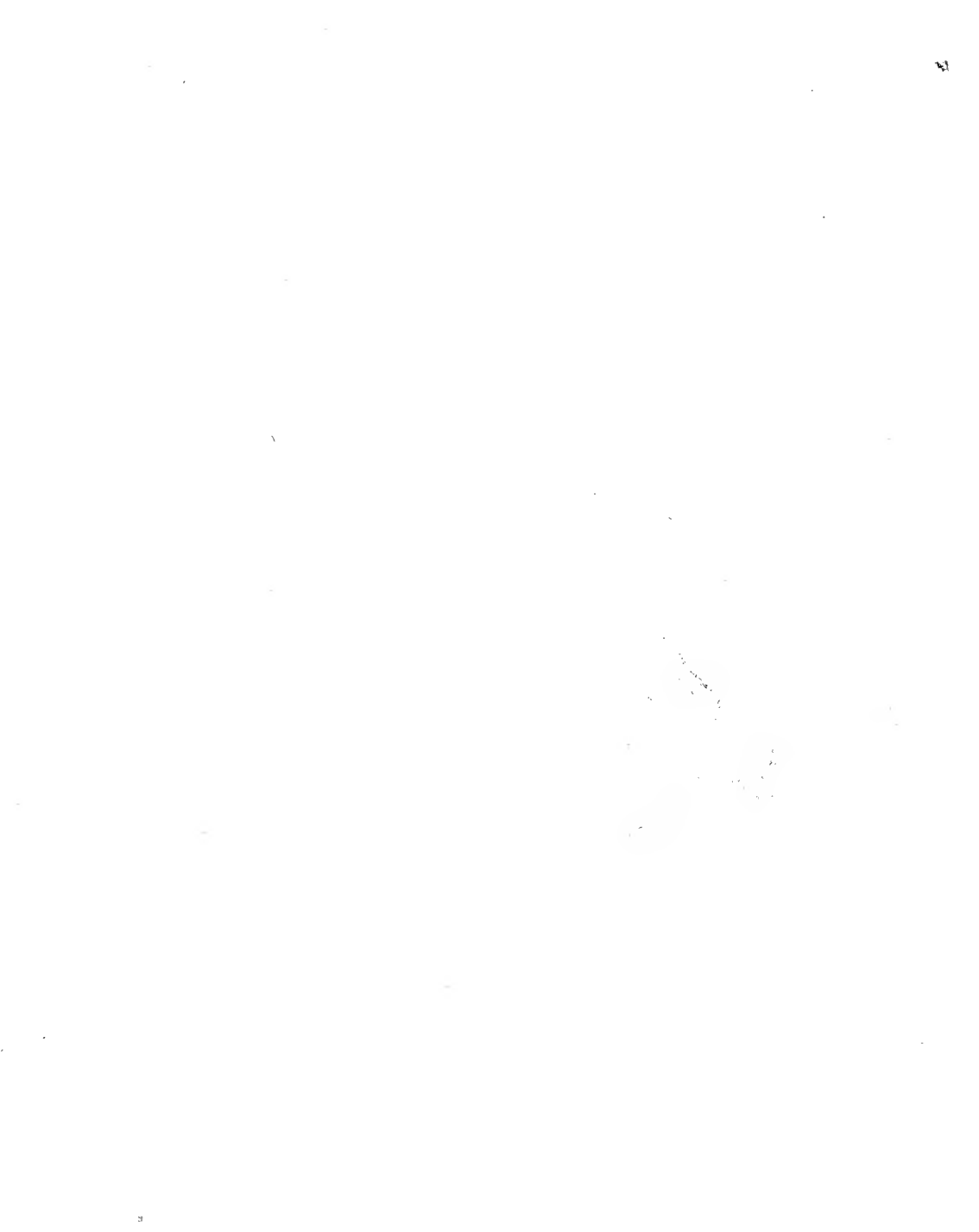
But with something a more polished style, though to the same purpose, the best of Poets;

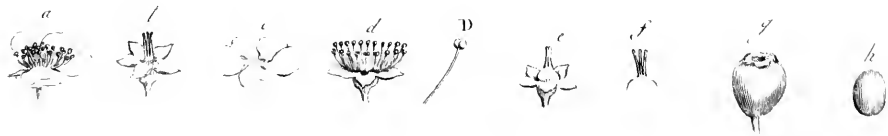
*Texcndæ sepes etiam, et pecus omne tenendum est:
Præcipuè dum frons tenera, imprudensque laborum:
Cui, super indignas hymes, solemque potentem,
Sylvestres uri assidue, capreæque sequaces
Illudunt; Pascuntur Oves, avidæque juvenæ.
Frigora nec tantum cana concreta pruina,
Aut gravis incumbens scopulis arentibus æstas;
Quantum illi nocuere greges, durique venenum
Dentis, et admorfo signata in stirpe cicatrix.*

GEORG II.

Guard, too, from cattle thy new-planted ground,
And infant-vines that ill can bear a wound:
For not alone by winter's chilling frost,
Or summer's scorching beam the young are lost;
But the wild buffaloes and greedy cows,
And goats and sportive kids the branches browse;
Not piercing colds, nor Sirius' beams that beat
On the parcht hills, and split their tops with heat,
Soe deeply injure, as the nibbling flocks,
That wound with venom'd teeth the tender, fearful stocks.

The reason that so many complain of the improsperous condition of their wood-lands and plantations of this kind, proceeds from this neglect; though, sheep excepted, there is no employment whatsoever incident to the farmer, which requires less expense to gratify his expectations; one diligent and skilful man will govern five hundred acres: But if through any accident a beast shall break into his master's field, or the wicked hunter make a gap for his dogs and horses, what a clamour is there made





The Hawthorn.

Botanical Description of a Hawthorn, &c. &c. &c. in the New Journal

of the Botanical Society

for the disturbance of a year's crop at most in a little corn! whilst abandoning his young woods all this time, and perhaps many years, to the venomous bitings and treading of cattle, and other like injuries, for want of due care, the detriment is many times irreparable; young trees once cropped hardly ever recovering. It is the bane of all our most hopeful timber.

CHAP. VI.

But shall I provoke you by an instance? A kinsman of mine has a wood of more than sixty years standing; it was, before he purchased it, exposed and abandoned to the cattle for divers years; some of the outward skirts were nothing, save shrubs and miserable starvelings; yet still the place was disposed to grow woody; but by this neglect continually suppressed. The industrious Gentleman fenced in some acres of this, and cut all close to the ground; and it is come in eight or nine years to be better worth than the wood of sixty; and will, in time, prove most incomparable timber; whilst the other part, so many years advanced, shall never recover; and all this from no other cause than preserving it fenced. Judge then by this, how our woods come to be so decried; Are five hundred sheep worthy the care of a shepherd? And are not five thousand Oaks worth the fencing, and the inspection of an Hayward?

Et dubitant homines serere, atque impendere curam? GEORG. II.

And shall men doubt to plant, and careful be?

Let us therefore shut up what we have thus laboriously planted, with some good Quickset hedge.

The HAWTHORN.

The HAWTHORNⁿ is raised of seeds; but then it must not be with despair because sometimes you do not see them peep the first year; for the

ⁿ CRATEGUS (*OXYACANTHA*) foliis obtusis subtrifidis serratis. Lin. Sp. Pl. 682. COMMON WHITE-THORNE. It is of the class and order *Icosandra Digynia*.

The HAWTHORN, of all other Thorns, is the best calculated for forming a good fence; and in all new inclosures is solely applied to that purpose. The plants should, at least, be three years old, with good roots, and put down in single rows, allowing four

BOOK II. Haw, and many other seeds, being invested with a very hard integument, will now and then suffer imprisonment two whole years under the earth; and our impatience at this does often frustrate the resurrection of divers seeds of this nature, so that we frequently dig up, and disturb the beds where they have been sown, in despair, before they have gone their full time, which is also the reason of a very popular mistake in other seeds, especially that of the Holly, concerning which there goes a tradition, that they will not sprout till they be pased through the maw of a Thrush; whence the saying, *Turdus exitium suum cacat*; (alluding to the Viscus made thereof;) but this is an error, as I am able to testify on experience. They come up very well of the berries, treated as I have showed in Book I. Chap. xxi. and with patience: for as I affirmed, they will sleep sometimes two entire years in their graves; as will also the seeds of Yew, Sloe, Phillyrea Angustifolia, and sundry others, whose shells are very hard about the small kernels; but which is wonderfully facilitated by being, as we directed, prepared in beds, and magazines of earth or sand, for a competent time, and then committed to the ground before the full in March; by which season they will be chitting, and speedily take root. Others bury them deep in the ground all winter, and sow them in February: And thus I have been told of a Gentleman who has considerably improved his revenue, by sowing Haws only, and raising nurseries of Quicksets, which he sells by the hundred far and near: This is a commendable industry.

But Columella has another expedient for the raising of our Spinetum, by rubbing the now mature Hips and Haws, Ashen-keys, &c. into the crevices of bafs-ropes, or wisps of straw, and then buryng them in a trench. Whether way you attempt it, they must (so soon as they peep,

inches between each plant. Such a hedge, if properly attended to, will in six years be proof against sheep and cattle, but if neglected for the first two years, especially if the land be poor, much art will be required to form it afterwards into a good fence.

Quickset hedges are of great antiquity. It appears from Homer, that, when Ulyses returned to his father Laërtes, the good old man had sent his servants into the woods to gather young Thorns, and was occupied himself in preparing ground to receive them. Odysey, Lib. xxiv. Varro calls this sort of fence, *Tutela naturalis et viva*. And Columella prefers it before the structile one, or dead hedge, as being more lasting and less expensive. *Vetustissimi auctores vivam septem structili præferunt, quia non solum minorem impensam decideret, verum, citius diuturnior immensis temporibus permaneret.* De R. R. Lib. xi.

and as long as they require it) be sedulously cleansed of the weeds; which, if in beds for transplantation, had need be, at the least, three or four years; by which time even your seedlings will be of stature fit to remove: For I do by no means approve of the vulgar premature planting of sets, as is generally used throughout England; which is to take such only as are the very smallest, and so to crowd them into three or four files, which are both egregious mistakes. CHAP. VI.

Whereas it is found by constant experience, that plants as big as one's thumb, set in the posture, and at the distance which we spake of in the Hornbeam, that is, almost perpendicular (not altogether, because the rain should not get in betwixt the rind and wood), and single, or at most not exceeding a double row, do prosper infinitely, and much out-strip the densest and closest ranges of our trifling sets which make but weak shoots, and whose roots do but hinder each other, and for being couched in that posture, on the sides of banks and fences, (especially where the earth is not very tenacious) are bared of the mould which should entertain them, by that time the rains and storms of one winter have passed over them. In Holland and Flanders (where they have the goodliest hedges of this kind about the counterscarps of their invincible fortifications, to the great security of their musketeers upon occasion) they plant them according to my description, and raise fences so speedily, and so impenetrable, that our best are not to enter into the comparison. Yet that I may not be wanting to direct such as either affect the other way, or whose grounds may require some bank of earth, as ordinarily the verges of copses, and other inclosures do, you shall by line cast up your fofs of about three feet broad, and about the same depth, provided your mould hold it; beginning first to turn the turf, upon which be careful to lay some of the best earth to bed your Quick in, and there lay or set the plants, two in a foot space is sufficient; being diligent to procure such as are fresh gathered, straight, smooth, and well-rooted; adding now and then, at equal spaces of twenty or thirty feet, a young Oakling or Elm-sucker, Ash, or the like, which will come in time, especially in plain countries, to be ornamental standards, and good timber. If you will needs multiply your rows, a foot, or somewhat less, above that, upon more congested mould, plant another rank of sets, so as to point just in the middle of the vacuities of the first, which I conceive enough: This is but the single fofs; but if you would fortify it to the purpose, do

BOOK II.

as much on the other side, of the same depth, height, and planting; and then, last of all, cap the top in pyramis with the worst, or bottom of the ditch. Some, if the mould be good, plant a row or two on the edge, or very crest of the mound, which ought to be a little flattened. Here also many set their dry hedge; for hedges must be hedged till they are able to defend and shade their under plantation, and I cannot reprove it: But great care is to be had in this work, that the main bank be well footed, and not made with too sudden a declivity, which is subject to fall in after frosts and wet weather, and this is good husbandry for moist grounds; but where the land lies high, and is hot and gravelly, I prefer the lower fencing; which, though, even with the area itself, may be protected with stakes and a dry hedge on the fofs-side, the distance competent, and to very good purposes of educating more frequent timber amongst the rows.

Your hedge being yet young, should be constantly weeded two or three years, especially before Midsummer, of Brambles, the great Dock, Thistle, &c. though some admit not of this work till after Michaelmas, for reasons that I approve not. It has been the practice of Herefordshire, in the plantation of Quickset-hedges, to plant a Crab-stock at every twenty feet distance; and this they observe so religiously, as if they had been under some rigorous statute requiring it: And by this means they were provided in a short time with all advantages for the grafting of fruit amongst them, which does highly recompense their industry. Some cut their sets at three years growth, even to the very ground, and find that in a year or two they will have shot as much as in seven, had they been let alone.

When your hedge is now of near six years stature, plash it about February or October; but this is the work of a very dextrous and skilful husbandman; and for which our honest countryman, Mr. Markham, gives excellent directions; only I approve not so well of his deep cutting the stems, if it be possible to bend them, having suffered in something of that kind. It is almost incredible to what perfection some have laid these hedges, by the rural way of plashing, better than by clipping; yet may both be used for ornament, as where they are planted about our garden-fences, and fields near the mansion. In Scotland, by tying the young shoots with bands of hay, they make the stems grow so very close

together, as that it encloseth rabbits in warrens instead of pales : and for this robust use we shall prefer the **Black Thorn** ; the extravagant suckers, which are apt to rise at a distance from the hedge-line, being sedulously extirpated, that the rest may grow the stronger and thicker. CHAP. VI.

And now since I did mention it, and that most I find do greatly affect the vulgar way of **Quicking**, (that this our discourse be in nothing deficient) we will in brief give it you again after **George Markham's** description, because it is the best and most accurate, although much resembling our former direction, of which it seems but a repetition, till he comes to the plashing. In ground which is more dry than wet, (for watery places it abhors,) plant your **Quick** thus : Let the first rows of sets be placed in a trench of about half a foot deep, even with the top of your ditch, in somewhat a sloping or inclining posture ; then having raised your bank near a foot upon them, plant another row, so as their tops may just peep out over the middle of the spaces of your first row : These covered again to the height or thicknefs of the other, place a third rank opposite to the first, and then finish your bank to its intended height. The distances of the plants should not be above one foot ; and the season to do the work in, may be from the entry of February till the end of March, or else in September to the beginning of December. When this is finished, you must guard both the top of your bank, and outmost verge of your ditch, with a sufficient dry hedge, interwoven from stake to stake into the earth, which commonly they do on the bank, to secure your **Quick** from the spoil of cattle. And then being careful to repair such as decay, or do not spring, by supplying the dead and trimming the rest, you shall, after three years growth, sprinkle some trees amongst them, such as **Oak, Beech, Ash, Maple, Fruit**, and the like ; which being drawn young out of your nurseries, may be very easily inserted.

I am not in the mean time ignorant of what is said against the scattering these masts and keys among our fences ; which grown, over-top the subnascent hedge, and prejudice it with their shade and drip. But this might be prevented by planting **Hollies**, proof against these impediments, in the line or trench where you would raise standards, as far as they usually spread in many years, and which, if placed at good distances, how close soever to the stem, would, besides their stout defence, prove a wondrous decoration to large and ample inclosures. But to resume

BOOK II.

our former work: That which we affirmed to require the greatest dexterity, is the artificial plashing of our hedge, when it is arrived to a six or seven years head; though some stay till the tenth, or longer. In February therefore, or October, with a very sharp hand-bill, cut away all superfluous sprays and stragglers, which may hinder your progress, and are uselefs. Then searching out the principal stems, with a keen and light hatchet cut them slantwise, close to the ground, hardly three quarters through, or rather so far only as till you can make them comply handsomely, which is your best direction, lest you rift the stem, and so lay it from your sloping as you go, folding in the lesser branches which spring from them; and ever within five or six feet distance, where you find an upright set, (cutting off only the top to the height of your intended hedge,) let it stand as a stake, to fortify your work, and to receive the twinings of those branches about it. Lastly, at the top (which should be about five feet above ground,) take the longest, most slender, and flexible twigs which you reserved, and (being cut as the former, where need requires,) bind in the extremities of all the rest; and thus your work is finished. This being done very close and thick, makes an impregnable hedge in a few years; for it may be repeated as you see occasion; and what you so cut away will help to make your dry hedges for your young plantations, or be profitable for the oven, and make good Bavin. There are some yet who would have no stakes cut from the trees, save here and there one, so as to leave half the head naked, and the other standing; but the over-hanging boughs will kill what is under them, and ruin the tree; so pernicious is this half-topping: Let this be a total amputation for a new and lusty spring. There is nothing more prejudicial to subnascent young trees, than, when newly trimmed and pruned, to have their (as yet raw) wounds poisoned with continual dripping, as is well observed by Mr. Nourse; but this is meant of repairing decayed hedges. For stakes in the above work, Oak is to be preferred, though some will use Elder, but it is not good, or the Black Thorn and Crab-tree; in moorish ground, Withy, Ash, Maple, and Hazel, but not lasting, driven well in at every yard of interval both before and after they are bound, till they have taken the hard earth, and are very fast: and even your plashed hedges need some small Thorns to be laid over to protect the spring from cattle and sheep, till they are somewhat fortified, and the doubler the winding is lodged the better, which should be beaten, and forced down together with the stakes, as equally as may be. Note, that

in sloping your windings, if it be too low done, as very usually, it frequently mortifies the tops; therefore it ought to be so bent as it may not impede the mounting of the sap. If the slash be of a great and extraordinary age, wind it at the nether boughs altogether, and cutting the sets, as directed, permit it rather to hang downwards a little, than rise too forwards; and then twist the branches into the work, leaving a set free, and unconstrained at every yard space, besides such as will serve for stakes, abated to about five feet in length, (which is a competent stature for an hedge,) and so let it stand. One shall often find in this work, especially in old neglected hedges, some great trees or stubs that commonly make gaps for cattle; such should be cut so near the earth as till you can lay them thwart, that the top of one may rest on the root or stub of the other, as far as they extend, stopping the cavities with its boughs and branches; and thus hedges, which seem to consist but only of scrubby trees and stumps, may be reduced to a tolerable fence: but in case it be superannuated and very old, it is advisable to stub all up, being quite renewed and well guarded. We have been the longer on these descriptions, because it is of main importance, and that so few husbandmen are so perfectly skilled in it: But he that would be more fully satisfied, I would have him consult Mr. Cook, chap. xxxii. or rather, *Instar omnium*, what I cannot without injury to the public, and ingratitude to the persons who do me the honour of imparting to me their experiences, but freely communicate.

It is then from the Reverend Mr. Walker, of Great Billing, near Northampton, that (with several other particulars relating to our rural subject) I receive from that worthy Gentleman Thomas Franklin, of Ecton, Esq. the following method of planting and fencing with Quicksets which we give you in his own words:

“ About ten or twelve years since I made some essays to set some
 “ little clumps of hedges and trees of about two poles in breadth, and
 “ three in length; the outfences ditched on the outside, but the Quick-
 “ sets in the inside of the bank, that the dead hedges might stand on the
 “ outside thereof; so that a small hedge of eighteen or twenty inches
 “ high, made of small wood, the stakes not much bigger than a man’s
 “ thumb, the banks being high, sufficiently defended them for four years
 “ time, and were hedged with less than one load of shreadings of Willow-

BOOK II.

“ sets, which, as my workmen told me, would have required six load
 “ of copse-wood : But the next year after their being planted, finding
 “ waste ground on the top of the bank of the outer fences, between the
 “ dead hedge and the quick, I put a footset in the same space between
 “ the quick and the dead hedge, which prospered better than those
 “ planted in the side of the bank, after the vulgar way, and hold it still.
 “ This put me upon thinking, that a cheaper and better sort of Quick-
 “ fence might possibly be found out ; and accordingly I made some trials
 “ with good success, (at least better than the old way,) though not to my
 “ full satisfaction, till I had perused Mr. Evelyn’s *Silva*. The method
 “ I used was this : First, I set out the ground for ditches and quick, in
 “ breadth ten feet ; then subdivided that, by marking out two feet and
 “ a half on each side (more or less, at pleasure,) for the ditches, leaving
 “ five in the middle between them : Then digging up two feet in the midst
 “ of that five feet, plant the sets in ; though it require more labour and
 “ charge, I found it soon repaid the cost. This done, I began to dig
 “ the fosses, and to set up one row of turfs on the outside of the said five
 “ feet ; namely, one row on each side thereof, the green side outmost
 “ a little reclining, so as the grafs might grow : After this, returning to
 “ the place begun at, I ordered one of the men to dig a spit of the under
 “ turf-mould, and lay it between the turfs, placed edgewise, as before
 “ described, upon the two feet which was purposely dug in the middle,
 “ and prepared for the sets, which the planter sets with two Quicks upon
 “ the surface of the earth, almost upright, whilst another workman lays
 “ the mould forward about twelve inches, and then sets two more, and
 “ so continues. Some there are who plant three rows of sets about
 “ eight inches interval ; but I do not approve it, for they choak one
 “ another. This finished, I order another row of turfs to be placed on
 “ each side upon the top of the former, and fill the vacuity between the
 “ sets and the turfs, as high as their tops, always leaving the middle,
 “ where the sets are planted, hollow, and somewhat lower than the sides
 “ of the banks by eight or ten inches, that the rain may descend to their
 “ roots, which is of great advantage to their growth, and far better than
 “ by the old way ; where the banks run too much sloping, the roots
 “ of the sets are seldom wetted in an ordinary season, the summer
 “ following ; but which, if it prove dry, many of the sets perish,
 “ especially the late planted : Whereas those which I planted in the
 “ latter end of April, though the summer happened to be somewhat dry,

“ generally escaped, very few of them miscarrying. Now the planting
 “ thus advanced, the next care is fencing, which is performed by setting
 “ an hedge of about twenty inches high upon the top of the bank, on
 “ each side thereof, leaning a little outward from the sets, which will
 “ protect them as well, if not better, than an hedge of three feet, or four
 “ inches more, standing upon the surface of the ground, which being
 “ raised with the turfs and sods about twenty inches, and the hedge
 “ about twenty inches more, will make three feet four inches, so as no
 “ cattle can approach the dead hedge to prejudice it, unless they set their
 “ feet in the ditch itself; which will be at least a foot deep, and from the
 “ bottom of the fofs to the top of the hedge, about four feet and a half,
 “ which they can hardly reach over to crop the Quick, as they might in
 “ the old way; and besides, such an hedge will endure a year longer.—
 “ I have at this present time an hedge which has stood these five years;
 “ and though nine or ten feet be sufficient for both ditches and bank, yet
 “ where the ground is but indifferent, it is better husbandry to take
 “ twelve feet, which will allow of a bank at least six feet broad, and
 “ gives more scope to place the dead hedges farther from the sets; and
 “ the ditches being shallow, will, in two years time, graze, though I con-
 “ fine myself for the most part to nine or ten, because I would take off
 “ the only objection of wasting ground by this way, should others follow
 “ it. In reply to this, I affirm, That if you take twelve feet in breadth,
 “ for ditch and bank, you waste more ground than by the common way:
 “ For in that a Quick is rarely set, but there is nine feet between the
 “ dead hedges, which is entirely lost all the time of fencing: When as
 “ with double ditches, there remains at least eighteen inches on each
 “ side where the turfs were set on edge, that bear more grafs than when
 “ it lay on the flat. But admitting it did totally lay waste three feet
 “ of ground, the damage were very inconsiderable, since forty perches,
 “ in length two hundred and twenty yards, which make perches
 “ 7, 25, 9, or 7½ poles, at thirteen shillings and fourpence the acre,
 “ amounts not to 7½ d. *per ann.* Now that this is not only the best but
 “ cheapest way of Quick-setting, will appear by comparing the charge
 “ of both. In the usual way, the charge of a three feet ditch is fourpence
 “ per pole, the owner providing sets; if the workman finds them, he
 “ will have for making the said ditch, and setting them, eightpence the
 “ pole, and for hedging twopence; that is, for both sides fourpence the
 “ pole, which renders the charge of hedging, ditching, and sets, twelve-

BOOK II. “ pence the pole ; that is, for forty rods in length, forty shillings : Then
 “ one load of wood out of the copse costs us, with the carriage, (though
 “ but two or three miles distance,) ten shillings, which will seldom hedge
 “ above eight poles (single hedge). But allowing it to do ten, to fence
 “ forty poles there must be at least eight load of wood, which costs four
 “ pounds, making the whole expence of ditching, setting, and fencing
 “ of forty poles to be six pounds, reckoning with the least; for I know not
 “ any that will undertake to do it under three shillings and sixpence per
 “ pole, and then the forty poles cost seven pounds. Whereas with
 “ double ditches, both of them, setting and sets, will be done for eight-
 “ pence per pole, and the husbandman get as good wages as with
 “ a single ditch, (for though the labour about them is more, yet the
 “ making the table is saved,) which costs one pound six shillings and
 “ eightpence. And the hedges being but low, they will make better
 “ wages at hedging for a penny the pole, than at twopence for common
 “ hedges ; which comes to six shillings and eightpence for hedging forty
 “ poles on both sides : Thus one load of wood will fence thirty poles
 “ at least, and forty hedged with two-thirds of wood less than in the
 “ other way, and cost but one pound six shillings and eightpence ; which
 “ makes the whole charge of sets, ditching, fencing, and wood, but three
 “ pounds.”

£.	s.	d.
1	6	8
0	6	8
1	6	8
3	0	0

Hitherto this obliging and industrious Gentleman.

To other uses :—The root of an old Thorn is excellent both for boxes and combs, and is curiously and naturally wrought : I have read that they made ribs to some small boats or vessels with the White Thorn ; and it is certain, that if they were planted single, and in standards, where they might be safe, they would rise into large bodied trees in time, and be of excellent use for the turner, not inferior to Box. It was accounted among the fortunate trees, and therefore used in *Fasces*

Nuptiarum, since the jolly shepherds carried the White Thorn at the rape of the Sabines. CHAP. VI.

The distilled water, and stone, or kernels of the Haw reduced to powder, is generally agreed to be sovereign against the stone. The Black Crab, rightly seasoned and treated, is famous for walking-staves, and if overgrown, is used in mill-work; yea, and for rafters of great ships. Here we owe due Eulogy to the industry of the late Lord Shaftesbury, who has taught us to make such inclosures of Crab-stocks only, planted close to one another, as there is nothing more impregnable or becoming, or you may sow cyder-kernels in a rill, and fence it for a while with a double dry hedge, not only for a sudden and beautiful, but a very profitable inclosure; because, amongst other benefits, they will yield you Cyder-fruit in abundance. But in Devonshire they build two walls with their stones, setting them edgeways, two, and then one between; and so as it rises, fill the interval, or cofer, with earth, (the breadth and height as you please,) continuing the stone-work, and filling; and, as you work, beating in the stones flat to the sides, they are made to stick everlastingly. This is absolutely the neatest, most saving, and profitable fencing imaginable, where slaty stones are in any abundance; and it becomes not only the most secure to the lands, but the best for cattle, to lie warm under the walls; whilst other hedges, be they ever so thick, admit of some cold winds in winter-time when the leaves are off. Upon these banks they plant not only Quick-sets, but even Timber-trees, which exceedingly thrive, being out of all danger.

The PYRACANTHA, and PALIURUS.

The PYRACANTHA^o, PALIURUS^o, and like preciouser sorts of Thorn and robust Evergreens adorned with Caralin Berries, might easily

^o MESPILUS (*PYRACANTHA*) spinosa, foliis lanceolato-ovatis crenatis, calycibus fractis obtusis. Lin. Sp. Pl. 685. *PRICKLY MEDLAR*, called *PYRACANTHA*. It is of the clafs and order *Icosandria Pentagynia*. This plant being of a flexible nature, it is usually nailed to the wall, in which situation it shows its berries to great advantage.

^o RHAMNUS (*PALIURUS*) aculeis geminatis: inferiore reflexo, floribus trigynis.— Lin. Sp. Pl. 281. *CHRIST'S THORN*. It is of the clafs and order *Pentandria Monogynia*.

The PALIURUS is supposed to be the plant that composed the Crown that was placed

BOOK I. be propagated by seeds, layers, or cuttings, into plenty sufficient to store even these vulgar uses, were men industrious; and then how beautiful and sweet would the environs of our fields be! for there are none of the spinous shrubs more hardy, none that make a more glorious show, nor fitter for our defence, competently armed, especially the Rhamnus, which I therefore join to the Oxycantha, for its terrible and almost irresistible spines, able almost to pierce a coat of mail; and for this made use of by the malicious Jews, to crown the sacred temples of our Blessed Saviour, and is yet preserved among the most venerable relics in St. Chapel at Paris, as is pretended by the devotees, &c. and hence has the tree (for it sometimes exceeds a shrub) the name of *Christ's Thorn*.—

upon the head of Christ at his Crucifixion; but Dr. Hafselquist, who had great opportunities of examining the plants of the Holy Land, is of opinion that it was a species of Zizyphus which grows in great plenty in the neighbourhood of Jerusalem. It is a very thorny plant, and is called by Linnæus, *Rhamnus aculeis geminatis rectis, foliis ovatis*. Sp. Pl. 282. The learned Dr. Pearce, late Lord Bishop of Rochester, sees the whole of this transaction in a very different light. And as his own words will best explain his opinion, I shall here transcribe them from his most excellent work, intitled, “A Commentary upon the Four Evangelists.” “The *ακανθων* may as well be the plural genitive “case of the word *ακανθω* as of *ακανθων*: If of the latter, it is rightly translated of *Thorns*, “but the former word signifies what we call *Bears-foot*, and the French *Branche Ursine*.— “This is not of the Thorny kind of plants, but is soft and smooth. Virgil calls it *Mollis* “*Acanthus* (Ecl. iii. 45. and Georg. iv. 137): So does Pliny, Sec. Epist. v. 6. and Pliny the “elder, in his Nat. Hist. xxii. 22. (p. 277. Edit. Hard. fol.) says that it is *levis*, smooth, and “that it is one of those plants which are cultivated in gardens. I have somewhere read “(but cannot at present recollect where,) that this soft and smooth herb was very common “in and about Jerusalem. I find nothing in the New Testament said concerning this “crown which Pilate’s soldiers put upon the head of Jesus, to incline one to think that “it was made of Thorns, and intended (as is usually supposed) to put him to pain. The “reed put into his hand, and the scarlet robe on his back, were only meant as marks “of mockery and contempt. One may also reasonably judge by the soldiers being said “to plait this crown, that it was not composed of such twigs and leaves as were of a “thorny nature. I do not find that it is mentioned by any one of the primitive Christian “Writers, as an instance of the cruelty used towards our Saviour before he was led to his “crucifixion, till the time of Tertullian, who lived after Jesus’s death at the distance of “above one hundred and sixty years. He indeed seems to have understood *ακανθων* in the “sense of *thorns*, and says, De coron. milit. Sect. xiv. (Edit. Pomel. Franck. 1597.) *quale, “oro te, Jesus Christus sentum pro utraque sexu subit? Ex spinis, spinum, et tribulis*. The total silence “of Polycarp, Barnabas, Clem. Romanus, and all the other Christian Writers, whose “works are now extant, and who wrote before Tertullian, in this particular, will give “some weight to incline one to think that this crown was not plaited with *thorns*.”—
Vol. I. p. 106. Ed. 1777.

Thus might Barberries now and then be also inserted among our hedges, which, with the Hips, Haws, and Cornel-Berries, do well in light lands, and should rather be planted to the south than north of west, as usually we observe them. CHAP. VI.

Some, as we noted, mingle their very hedges with Oaklings, Ash, and Fruit-trees, sown or planted, and it is a laudable improvement; though others do rather recommend to us sets of all one sort, and will not so much as admit of the Black Thorn to be mingled with the White, because of their unequal progress; and indeed, Timber-trees set in the hedge (though contemporaries with it,) do frequently wear it out: and therefore I should rather encourage such plantations to be at some yards distance, near the verges, than perpendicularly in them. Lastly, if in planting any of the most robust forest-trees (especially Oak, Elm, Chesnut,) at competent spaces, and in rows, you open a ring of ground at about four feet distance from the stem, and prick in Quick-set plants, you may, after a while keep them clipped, at what height you please:— They will appear exceedingly beautiful to the eye, prove a good fence, and yield useful bush, bavin, and (if you maintain them unshorn,) Hips and Haws in abundance; this should therefore especially be practised, where one would invite the birds.

In Cornwall they secure their lands and woods with high mounds, and on them they plant acorns, whose roots bind in the looser mould, and so form a double and most durable fence, incircling the fields with a coronet of trees. They do likewise, and that with great commendation, make hedges of our *Genista Spinosa*, prickly Furze, of which they have a taller sort, such as the French employ for the same purpose in Bretagne, where they are incomparable husbands.

F U R Z E.

FURZE^a is to be sown (which is best,) or planted of the roots in a furrow: If sown, weed till it be strong; both tonsile, and to be

^a ULEX (*EUROPÆUS*) foliis villosis acutis, spinis sparsis. Lin. Sp. Pl. 1045. COMMON FURZE.

It is of the class and order *Diadelphia Decandria*.

Mr. Evelyn very warmly recommends this shrub not only for hedges, but for fodder

diligently clipped, which will render it a very thick, excellent, and beautiful hedge; otherwise, permitted to grow at large, it will yield very good faggot: It is likewise admirable covert for wild fowl, and will be made to grow even in moist as well as dry places. The young and tender tops of Furze, being a little bruised, and given to a lean sickly horse, will strangely recover and plump him. Thus, in some places, when they lay down their barren grounds, they sow the last crop with this seed, and so let them remain till they break them up again, and, during that interim, reap considerable advantage: Would you believe (writes a worthy correspondent of mine,) that in Herefordshire, famous for plenty of wood, their thickets of Furzes, viz. the Vulgar, should yield them more profit than a like quantity of the best wheat-land of England? for such is theirs. If this be questioned, the scene is within a mile of Hereford, and proved by anniversary experience, in the lands, as I take it, of a Gentleman who is now one of the burgeses for that city.— And in Devonshire (the seat of the best husbands in the world) they sow on their worst land, well ploughed, the seeds of the rankest Furzes, which, in four or five years, becomes a rich wood; No provender, as we say, makes horses so hardy as the young tops of these Furzes; no other wood so thick, nor more excellent fuel; and for some purposes also, yielding them a kind of timber to their more humble buildings, and a great refuge for fowl and other game. I am assured in Bretagne it is sometimes sown no less than twelve yards thick, for a speedy, profitable, and impenetrable mound: If we imitated this husbandry in the dry and hot barren places of Surry, and other parts of this nation, we might exceedingly spare our woods. I have bought the best sort of French

to cattle in winter. In his days it seems to have been a favourite plant for those uses.— Mons. Duhamel, in his Elements of Agriculture, speaks much in its favour as winter provender for cattle. “In Normandy and Bretagne, at the beginning of winter, when the grafs fails, they cut the young shoots of this plant to supply the place of fodder; the first cutting is in December; but in good soils it shoots again, and may be continued cutting without permitting it to blossom, because the prickles are then tender, and a few strokes of the mallet are sufficient to prepare it as food for horses or other cattle, which derive good nourishment from it. In countries where they have mills to grind apples, or seeds from which oils are expressed, these serve to grind the furze with great expedition.” Vol. ii. p. 124. From a Memoir inserted in the fourth volume of the “Present State of Husbandry in Scotland,” it appears that in the county of Aberdeen, they make use of bruised whins for winter fodder, and find them to answer well both for horses and even.

seed at the shops in London. It seems that in the more eastern parts of Germany, and especially in Poland, this vulgar trifle, and even our common Broom is so rare, that they have desired the seeds of them out of England, and preserve them with extraordinary care in their best gardens. This I learn out of our Johnson's Herbal; by which we may consider, that what is reputed a curse, and a cumber in one place, is often esteemed an ornament and blessing in another: but we shall not need go so far for this, since both Beech and Birch are almost as great strangers in many parts of this nation, particularly Northampton and Oxfordshire. Mr. Cook says much in praise of Juniper for hedges, especially for the more elegant inclosures.

CHAP. VI.

B R O O M.

GENISTA SCOPARIA¹. BROOM. This is another improvement for barren grounds, and saver of more substantial fuel: It may be sown English, or (what is more sweet and beautiful,) Spanish, with equal success. In the western parts of France, and with us in Cornwall, it grows to an incredible height, (however our poet gives it the epithet of *Humilis*,) and so it seems they had it of old, as appears by Gratius's Genista Altinates, with which, as he affirms, they used to make staves for their spears and hunting darts. The seeds of Broom vomit and purge, whilst the buds and flowers, being pickled, are very grateful.

E L D E R.

SAMBUCUS². The ELDER. This makes a considerable fence, if set of reasonable lusty truncheons, much like the Willow, and (as I have seen them maintained) laid with great curiosity; these far excel

¹ SPARTIUM (*SCOPARIUM*) foliis ternatis solitariisque, ramis inermibus angulatis.—Lin. Sp. Pl. 997. COMMON ENGLISH BROOM. It is of the class and order *Dialyptili Decandria*.

² SAMBUCUS (*NIGRA*) cymis quinquepartitis, caule arboreo. Lin. Sp. Pl. 325.—COMMON ELDER. It is of the class and order *Pentandria Trigynia*.

BOOK II.

those extravagant plantations of them about London, where the lops are permitted to grow without due and skilful laying. There is a sort of Elder which has hardly any pith; this makes exceedingly stout fences, and the timber very useful for cogs of mills, butchers' skewers, and such tough employments. Old trees do in time become firm, and close up the hollowness to an almost invisible pith. But if the medicinal properties of the leaves, bark, berries, &c. were thoroughly known, I cannot tell what our countryman could ail, for which he might not fetch a remedy from every hedge, either for sickness or wound: The inner bark of Elder, applied to any burning, takes out the fire immediately: that, or in season the buds, boiled in water-gruel for a breakfast, has effected wonders in a fever; and the decoction is admirable to assuage inflammations and tetterous humours, and especially the scorbut: But an extract, or theriaca, (so famous in the poem of Nicander,) may be composed of the berries, which is not only efficacious to eradicate this epidemical inconvenience, and greatly to assist longevity, but is a kind of catholicon against all infirmities whatever: and of the same berries is made an incomparable spirit, which drunk by itself, or mingled with wine, is not only an excellent drink, but admirable in the dropsy. In a word, the water of the leaves and berries is approved in the dropsy, every part of the tree being useful, as may be seen at large in *Blocwitzius's Anatomy* thereof^t. The ointment made with the young buds and leaves in May with butter, is most sovereign for aches, shrunk sinews, hæmorrhoids, &c. and the flowers macerated in vinegar, not only are of a grateful relish, but good to attenuate and cut raw and gross humours. Lastly, the fungus (which we call *Jews-Ears*;) decocted in milk, or macerated in vinegar, is of known effect in the angina and sores of the throat. And less than this could I not say (with the leave of the charitable physician) to gratify our poor woodman; and yet when I have said all this, I do by no means commend the scent of it, which is very noxious to the air; and therefore though I do not undertake that all things which sweeten the air are salubrious, nor all ill savours pernicious, yet, as not for its beauty, so neither for its smell, would I plant Eder near my habitation; since we learn from *Biesius*^{*}, that a certain house in Spain, seated among many Elder-trees, diseased and killed almost all the inhabitants, which when

* De Aeris
Potestate.

^t *Anatomia Sambuci. Lipsiæ. 1631.*

at last they were grubbed up, became a very wholesome and healthy place. The Elder does likewise produce a certain green fly, almost invisible, which is exceedingly troublesome, and gathers a fiery redness where it attacks. CHAP. VI.

S P I N D L E - T R E E.

EVONYMUS^a. SPINDLE-TREE. This is a shrub which commonly grows in our hedges, and bears a very hard wood, of which they sometimes make bows for viols, and the Inlayer uses it for its colour, and Instrument-makers for tothing of organs, and virginal keys^z, tooth-pickers, &c. What we else do with it I know not, save that (according to its name, abroad) they make spindles with it. I also learn, that three or four of the berries purge both by vomit and siege, and the powder, made of the berry, being baked, kills nits, and cures scurfy heads. Matthiolus says the poor people about Trent press oil out of the berries, wherewith to feed their lamps: But why they were wont to scourge paricides with rods made of this shrub, before they put them into the sack, see Modestinus, L. penult. SS. ad Legem Pomp. de Parricid. cited by Mr. Ray.

D O G W O O D.

Here might come in, or be named at least, **WILD CORNEL^y, or DOGWOOD**, good to make mill-cogs, pestles, bobbins for bone-lace, spokes for wheels, &c. also the best skewers for butchers, because it does not taint the flesh, and is of so very hard a substance as to make wedges to cleave and rive other wood with instead of iron.

^a **EVONYMUS (EUROPÆUS)** floribus plerisque quadrifidis. Lin. Sp. Pl. 286 *COMMON SPINDLE-TREE.* It is of the class and order *Pentandria Monogynia*.

There is also an Evergreen Spindle-tree, which is a native of America. Linnaeus titles it *Evonymus floribus omnibus quinquefidis.* Sp. Pl. 286.

^z In a note upon p. 55. Vol. II. Mr. Evelyn mentions the *Virginals* as a musical instrument, played on by young Ladies in his time. It was much like the Harpsichord, and played upon by the fingers.

^y **CORNUS (SANGUINEA)** Arborea, cymis nudis. Lin. Sp. Pl. 171. *BLOODY-TWIG, or COMMON DOGWOOD.* It is of the class and order *Tetrandria Monogynia*

VIBURNUM.

The VIBURNUM^z, or WAY-FARING TREE, growing plentifully in every corner, makes pins for the yokes of oxen; and superstitious people think that it protects their cattle from being bewitched, and place the shrub about their stalls: It certainly makes the most pliant and best bands to faggot with. The leaves and berries are astringent, and make an excellent gargle for loose teeth, sore throat, and stop fluxes. The leaves decocted to a lye, not only colour the hair black, but fasten the roots; and the bark of the root, macerated under ground, well beaten, and often boiled, serves for bird-lime.

YUCCA.

The AMERICAN YUCCA^a is a hardier plant than we take it to be; for it will suffer our sharpest winter, as I have seen by experience, without that trouble and care of setting it in cases in our Conservatories of hyemation; such as have beheld it in flower (which is not indeed till it be of some age) must needs admire the beauty of it; and it being easily multiplied, why should it not make one of the best and most ornamental fences in the world for our gardens, with its natural palisadoes, as well as the more tender, and impatient of moisture, the Aloe, does for their vineyards in Languedoc? But we believe nothing improvable, save what our grandfathers taught us. Finally, let trial likewise be made of that Thorn, mentioned by Captain Liggon in his History of Barbadoes, whether it would not be made to grow amongst us, and prove as convenient

^z Of the VIBURNUM there are nine species; but what is here meant is the VIBURNUM (*LANTANA*) foliis cordatis serratis venosis subtus tomentosis. Lin. Sp. Pl. 384. WAY-FARING-TREE. It is of the class and order *Pentandria Trigynia*. The LAURUSTINUS is the only Evergreen of this Genus.

^a Of the YUCCA there are four Species, and I imagine that the following is the kind recommended by Mr. Evelyn:

YUCCA (*GLORIOSA*) foliis integerrimis. Lin. Sp. Pl. 156. ADAM'S NEEDLE. It is of the class and order *Hexandria Monogynia*. When carefully attended to, the Yucca may be made to grow in the open ground, but will not perfect its seed with us. It is a native of Canada.

for fences as there, the seeds or sets being transported to us with due care.—Having thus accomplished what, by your commands, I had to offer concerning the propagation of the more solid, material, and useful trees, as well the dry as aquatical, and, to the best of my talent, fenced our plantation in, I should here conclude, and set a bound likewise to my discourse, by making an apology for the many errors and impertinencies of it, did not the zeal and ambition of this illustrious Society, to promote and improve all attempts which may concern public utility or ornament, persuade me, that what I am adding for the farther encouragement to the planting of some other useful (though less vulgar) trees, will at least obtain your pardon, if it miss of your approbation ^b.

CHAP. VI.

F R U I T - T R E E S.

To discourse in this style of all such Fruit-trees as would prove of greatest emolument to the whole nation, were to design a just volume ; and there are directions already so many, and so accurately delivered and published, (but which cannot be affirmed of any of the former classes of Forest-trees, and other remarks, at the least to my poor knowledge and research) that it would be needless to repeat them.

I do only wish (upon the prospect and meditation of the universal benefit) that every person whatever, worth ten pounds *per annum*, within her Majesty's dominions, were, by some indispensable statute, obliged to plant his hedge-rows with the best kinds of fruit trees, especially in such places of the nation, as being the more inland counties, and remote from the seas and navigable rivers, might the better be excused from the planting of timber, to the proportion of those who are more happily and commodiously situated for the transportation of it.

Undoubtedly, if this course were taken effectually, a very considerable part both of the meat and drink, which is spent to our prejudice, might be saved by the country people, even out of the hedges and mounds, which would afford them not only the pleasure and profit of their delicious fruit, but such abundance of cyder and perry, as should suffice.

^b This Discourse on Forest-trees was undertaken at the request of the Royal Society in the year 1664, and greatly contributed to the reputation of that learned Body.

BOOK II. them to drink of one of the most wholesome and excellent beverages in the world.

Old Gerard did long since allege us an example worthy to be pursued: "I have seen, saith he," (speaking of Apple-trees, lib. iii. cap. ci.) in "the pastures and hedge-rows about the grounds of a worshipful Gentleman, dwelling two miles from Hereford, called Mr. Roger Bodnome, "so many trees of all sorts, that the servants drink for the most part no "other drink but that which is made of apples: The quantity is such, "that by the report of the Gentleman himself, the Parson hath for tithes "many hogsheads of cyder; the hogs are fed with the fallings of them, "which are so many, that they make choice of those apples they do eat, "and will not taste of any but of the best. An example doubtless to be "followed of Gentlemen that have land and living: But *Envy* saith, the "poor will break down our hedges, and we shall have the least part of "the fruit. But forward; in the name of God, graff, set, plant, and "nourish up trees in every corner of your ground; the labour is small, "the cost is nothing, the commodity is great; yourselves shall have "plenty, the poor shall have somewhat in time of want to relieve their "necessity, and God shall reward your good minds and diligence." Thus far honest Gerard. And in truth, with how small a charge and infinite pleasure this were to be effected, every one that is patron of a little nursery can easily calculate: For, by this expedient, many thousands of acres, sowed now yearly with barley, might be cultivated for wheat, or converted into pasture, to the increase of corn and cattle. Besides, the timber which the Pear-tree, Black Cherry, and many thorny Plums (which are best for grain, colour, and glofs) afford, is comparable, for divers curious uses, with any we have enumerated. The Black Cherry Wood grows sometimes to that bulk as is fit to make stools with, cabinets, tables, especially the redder sort, which will polish well, also pipes and musical instruments; the very bark is employed for bee-hives. I would farther recommend the more frequent planting and propagation of Fir, Pine-trees, and some other beneficial materials, both for ornament and profit; especially since we find by experience they thrive so well where they are cultivated for curiosity only.

I have now finished my planting. A word or two concerning the preservation of the trees, and the cure of their infirmities, expect in the next chapter.

C H A P. VII.

Of the INFIRMITIES of TREES, &c.

SO many are the infirmities and sicknesses of trees^c, and indeed CHAP. VII.
 infirmities of the whole family of vegetables, that it were almost impossible to enumerate and make a just catalogue of them, and as difficult to find such infallible cures and remedies as could be desired, the effects

^cVegetables cannot be supposed to be subject to infirmities, unless we allow them to be organized bodies, and endued with life. That they have life, may be proved from the following considerations: 1. Their Motion; 2. Anatomy; 3. Generation; 4. Age; 5. Diseases; 6. Death.

1. MOTION. It is evident that a dead body has no motion of its own; if therefore any body has spontaneous motion, it must also have life: For proper and internal motion in every body depends on the spontaneous propulsion of fluids, and where such a propulsion of fluids is, there is life. That there is motion in plants, is apparent to every one; e. g. herbs in green-houses, or stoves, incline or turn towards the light. When shut up, if they find a hole in the wall, shutters, or frames, there they endeavour to penetrate. Several plants, especially those with compound yellow flowers, during the whole day turn their flowers toward the sun; to wit, to the east in the morning, to the south at noon, and to the west toward evening; and this is observable in the Sun-flower and other Plants. I believe every body knows, that the greatest number of plants in a serene sky, expand their flowers, and, as it were, with cheerful looks behold the light of the sun; but before rain they shut them up; e. g. the Tulip. The flowers of the *Draba Alpina*, Alpine Whitlow Grass, the *Parthenium foliis ovatis crenatis*, Bastard Feverfew with egg-shaped crenated leaves, and the *Trientalis*, or Winter-green, hang down in the night, as if the plants were asleep, lest rain or the moist air should injure the fertilizing dust. The Trefails, and one species of Wood-sorrel, shut up or double their leaves before storms and tempests, but in a serene sky expand or unfold them, so that from them the husbandman can pretty clearly foretel an approaching storm. And it is well known that the *Bauhinia*, or Mountain Ebony, Sensitive Plants, and *Cassia*, observe the same rule. The flowers of Goat's Beard open in the morning at the approach of the sun, and shut about noon; hence it is called John-go-to-bed-at-noon. *Parkinsonia*, Tamarind-tree, *Eschynomene*, or Bastard Sensitive Plant, and several others of the *Dialophia* class, in serene weather expand their leaves in the day-time, and contract them in the night. The Tamarind-tree is said, by Alpinus and Acosta, to enfold within its leaves the flowers or fruit every night, to guard them from cold or rain. This seemed like a paradox to Syenus and Ray: but the flower-stalk with the flower or fruit lies upon the winged leaves from the bosom of which it springs; hence it is, that while the leaves fold themselves up every night, they shut up or enclose the fructification within them. Some of the *Mimosa*, or Sensitive Plants, and the *Oxalis*, or Wood-sorrel with pinnated leaves, upon being touched roll up their leaves, and turn downwards

arising from so many, and such different causes. Whenever, therefore, our trees and plants fail and come short of the fruit and productions we expect of them, (if the fault be not in our want of care,) it is certainly to be attributed to those infirmities to which all elementary things are obnoxious, either from the nature of the things themselves, and in themselves, or from some outward injury, not only through their being unskillfully cultivated by men, and exposed to hurtful beasts, but subject to be

or shrink, and after a little space extend them again, as if they had both life and sensation. As it cannot be denied, but that man, kept long from motion, grows pale and weak, so, on the other hand, it is a certain truth, that motion or exercise renders him florid, stout, and healthy: for exercise enlarges the limbs, as Avicenna rightly observes. Hence the rustic excels the courtier in strength of body and largeness of limbs, being used to much walking, and other exercise; and it is well known that the right hand of mechanics, and other people inured to labour, is for the most part bigger than the left. These obvious truths need no laboured demonstration. With plants it is the same. Those in stoves and green-houses, though they have sufficient heat and nourishment, are slender, weak, and lose the colour of their leaves, and seem to languish for want of motion: and trees, surrounded with high walls or buildings, and confined within narrow bounds, are slender, and grow tall, but not strong. Pines in very thick woods, where the high winds have not free access to shake them, grow tall and slender; while others planted in open fields, and frequently shaken by stormy winds, have not only thick and strong stems, but also strike deep root, and put out beautiful and spreading branches.

2. ANATOMY. Malpighi and Grew, unknown to each other, undertook the anatomy of plants nearly about the same time. Many things, however, have been found out since their days—and many things remain yet to be discovered.

The general and obvious parts of a plant are five. The root; the stem; the branches; the leaves; the flower. The component parts of these divisions are simple in comparison to the animal body. The offices of a vegetable being only increase and fructification, there was no necessity for a complicated structure.—A good microscope discovers the constituent parts of a plant to be, 1. A very thin outer rind. 2. An inner rind much thicker than the former. 3. A blea, of a spongy texture. 4. A vascular series. 5. A fleshy substance, which answers to the wood of a tree, or shrub. 6. Pyramidal vessels contained within the flesh. And 7. A pith.—Whatever part of the plant we examine, we observe these, and no more. The root, its ascending stalk, and descending fibre, are one, and not three substances. This reduces the entire vegetable to one body; and what appears in the flower to be many parts, are only the extremities of the seven above-mentioned. The cup terminates the outer bark. The inner rind ends in the outer petals. The blea forms the inner petals. The vascular series ends in the nectaria. The flesh makes the filaments. The pyramidal vessels form the receptacle. The pith furnishes the seeds and their capsules. Words not being able to convey an adequate idea of these parts, I must beg leave to refer the reader to the engravings of Dr. Hill, as published in his Vegetable

preyed upon and ruined by the most minute and despicable insects, besides other casualties and accidents innumerable, according to the rustic rhyme : CHAP. VII.

The Calf, the Wind-shock, and the Knot,
The Canker, Scab, Scurf, Sap and Rot.

Whatsoever is exitial to men is so to trees ; for the aversion of which they

System. His researches into the vegetable creation being very minute, I have followed him in the enumeration of the constituent parts of a plant. He justly recommends the Black Helebre as the properest subject for dissection. It is a perennial plant of a firm texture, and not too complex, consisting only of a root, radical leaves, and a flower-stem.

A careful maceration of the parts, a good microscope, and a most delicate touch, are essentially necessary towards investigating the structure of vegetable bodies. Trees, shrubs, and herbs are organized in the same manner ; but the colour and thickness of their component parts are different, according to their respective natures.

The outer bark is the first thing that presents itself to our view. It has the appearance of a fine film full of irregular meshes, though in reality it consists of two membranes, with a series of vessels between them. These take their course upwards, and as they advance towards the cup of the flower, inosculate with the small vessels of the inner bark, into which they pour part of the juices they have received from the earth and the atmosphere. The fine meshes serve the purposes of inhalent or exhalent pores, according to the circumstances of the weather. The inner bark is much thicker than the outer. It is made up of several flakes laid evenly upon one another, each of which consists of two membranes inclosing a series of vessels. These communicate freely through the whole substance of the rind, and as they inosculate with the vessels of the outer bark, so they also communicate with those of the blea. The blea lies immediately under the inner bark. It is one complete and single substance, uniform in its structure. It is of a considerable thickness, and is made up of beds of hexagonal cells. In the angles formed by these cells, we observe the vessels of the blea. They pour their contents into the cells, which appear to be reservoirs for the water imbibed by the plant. Underneath the blea, lies the fourth substance called the Vascular Series. Its structure is extremely simple, being a single course of greenish vessels lodged between two membranes. It terminates in the nectaria. At a certain season of the year, the juices of the vascular series are very mucilaginous. They are particularly so in the Holly, and seem to be more elaborated than those of the blea. Its vessels have a free communication with the wood and blea. The favourers of a circulation assert that, through these vessels, the returning sap descends ; but by the most accurate experiments of Dr. Hales, it appears that the vegetable juices do rise and fall in the same series of vessels, and consequently have no circulation.

The wood, or fleshy part of a plant, comes next to be examined. In this the life of the vegetable seems to be placed. It is universal in the plant, and is made up of strong fibres. From it all the other parts are produced. It shoots a pith inward, and a rind, blea, and vas-

had, of old, recourse to the Robigalia and other Gentile ceremonies: but no longer abused, by charmers and superstitious fopperies, we have, in this chapter endeavoured to set down and prescribe the best and most approved remedies hitherto found out, as well natural as artificial.

And *first*, Weeds are to be diligently pulled up by hand after rain,

ular series outward. The filaments in the flower, which are essential parts in the production of new plants, are continuations of it. And as the seed-vessels are portions of the pith, so are the petals and nectaria continuations of the rind, blea, and vascular series; all which the plant shoots outward. Through every part of the wood, or flesh, there are vessels that carry a juice highly elaborated, the greatest part of which has undergone the concoction of the rinds, blea, and vascular series. The woody fibres constitute an order of vessels, which are named Tracheæ. These are filled with elastic air, and may be discovered by the eye, in the wood of all trees. The Tracheæ make up an arterial system, and supply the place of the heart in animals. Being filled with air, they become subject to the alternacies of heat and cold. Their use shall be explained hereafter. The pyramidal vessels are spread through all the substance of the flesh, and, as they advance upwards, their ramifications inosculate, so as to prevent any possible obstruction of the sap. Their juices, as I have observed, are highly elaborated, having passed through all the orders of sap-vessels. It will here be necessary to remark, that the sides of these vessels are constantly in contact with the Tracheæ; so that, from the nature of their situation, they must, at all times, be subject to the vicissitudes of the weather. The pyramidal vessels communicate with the pith, which remains to be described. The pith is to be found in all trees, shrubs, and plants. It occupies the centre, but is not always regularly continued. When examined by a microscope, it has the appearance of a number of vesicles, and is of an uniform structure. It does not appear to be absolutely necessary to vegetation, as we often observe Elms, and other trees, to live and thrive without it. In trees, it is found in the branches, being obliterated in the trunk. The vessels of the flesh communicate with it. From them it receives a fluid; and probably it is the receptacle of some part of the sap. In extreme dry weather such a store may be necessary. Transverse sections of the ribs of leaves discover it. When minutely traced, it is found to run up to the ovarium, where it forms the seeds and their capsules. From this survey of the anatomy of a plant, it is evident that there is a correspondence between all its parts. By means of a variety of strainers, different juices are prepared from the same mass. Matter, considered as matter, has no share in the qualities of bodies. It is from the arrangement of it that we have so many different substances in nature. We may eat the earth, and we may drink the water that moistens it, and yet, from the modification of its parts, it is capable of producing both bread and poison. We reason improperly, when we say that every plant takes from the earth such particles as are natural to it. A Lemon ingrafted upon an Orange stock, is capable of changing the sap of the Orange into its own nature, by a different arrangement of the nutritive juices. A mass of innocent earth can give life and vigour to the bitter Aloe, and to the sweet Cane; to the cool House-Leek, and to the fiery

whilst your seedlings are very young, and till they come to be able to kill them with shade and over-dripping; and then are you, for the obstinate, to use the hoe, fork, and spade, to extirpate Dog-grafs, Bear-bind, &c. CHAP. VII.

And here, mentioning shade and dripping, though I cannot properly speak of them as infirmities of trees, they are certainly the causes of their

Mustard; to the nourishing Grains, and to the deadly Night-shade. The fibres of a root are supposed to be simple capillary tubes; but, upon a minute inspection, we discover them to consist of the seven component parts of the plant. At their extremities we observe a spongy kind of excrescence pierced with innumerable small holes. Through these the nutritive juices of the earth are absorbed. When a plant has been pulled up, it will be retarded in its growth, until nature has renewed that spongy nipple. The bark and leaves of a plant imbibe, at proper seasons, the moisture of the atmosphere. At other times they perspire the superfluous nourishment. This opens to our view an extensive prospect of the vegetable œconomy. We have already seen that all the parts of a plant are the same. They only differ in shape. The roots are formed sharp and pointed, to make their passage easier through the earth. The leaves are made broad to catch the moisture of the air with more readiness. When the root of a tree happens to be elevated, instead of being retained within the earth, it assumes the appearance of a perfect plant, with leaves and branches. Experiments show us that a young tree may have its branches placed in the earth, and its roots elevated in the air; and in that inverted state it will continue to live and grow. The air contains, especially during the summer months, all the principles of vegetation: Oil for the perfect food, water to dilute it, and salts to assimilate it. These are greedily absorbed by the vessels of the leaves and bark, and conveyed to the innermost parts of the plant for its growth and fructification. When the air happens to be cold and moist, this absorption takes place. When it is hot and dry, the same vessels throw off the superfluous moisture by perspiration. In animals, the kidneys and pores of the skin carry off the superfluity. The vegetable not having kidneys, perspires more than the animal. Dr. Hales has demonstrated that this perspiration is considerable. I shall here transcribe his statical experiments upon the Sun-flower, for the benefit of those who may not have an opportunity of examining the original.

“ July 3, 1724, in order to find out the quantity imbibed and perspired by the Sun-flower, I took a garden-pot, (Plate 1. Fig. 5.) with a large Sun-flower, a, 3 feet $\frac{1}{2}$ high, which was purposely planted in it when young: It was of the large annual kind. I covered the pot with a plate of thin milled lead, and cemented all the joints fast, so as no vapour could pass, but only air, through a small glass tube, b, nine inches long, which was fixed purposely near the stem of the plant, to make a free communication with the outward air, and that under the leaden plate. I cemented also another short glass tube, c, into the plate, two inches long, and one inch in diameter. Through this tube I watered the plant, and then stopped up also the holes, d, e, at the bottom of the pot with corks. I weighed this plant and pot morning and evening, for fifteen several days, from July 3, to August 8, after which I cut off the plant close to

unthriving till removed; such as that of the Oak and Mast-holme, Walnut, Pine, Fir, &c. the thicknefs of the leaves intercepting the sun and rain; whilst that of other trees is good, as the Elm, and several others.

Secondly, Suckers should be duly eradicated, and with a sharp spade

“ the leaden plate, and then covered the stump well with cement; and upon weighing
 “ found there perspired through the unglazed porous pot two ounces every twelve hours
 “ day: which being allowed in the daily weighing of the plant and pot, I found the
 “ greatest perspiration of twelve hours in a very warm dry day to be one pound fourteen
 “ ounces; the middle rate of perspiration, one pound four ounces. The perspiration of a
 “ dry warm night, without any sensible dew, was about three ounces; but when any sen-
 “ sible, though small dew, then the perspiration was nothing; and when a large dew, or
 “ some little rain in the night, the plant and pot was increased in weight two or three
 “ ounces. [I used avoirdupois weights.] I cut off all the leaves of this plant, and laid
 “ them in five several parcels, according to their several sizes, and then measured the
 “ surface of a leaf of each parcel, by laying over it a large lattice made with threads, in
 “ which the little squares were a quarter of an inch each; by numbering of which I had
 “ the surface of the leaves in square inches, which, multiplied by the number of the leaves
 “ in the corresponding parcels, gave me the area of all the leaves; by which means I
 “ found the surface of the whole plant, above ground, to be equal to 5616 square inches,
 “ or 39 square feet. I dug up another Sun-flower, nearly of the same size, which had
 “ eight main roots, reaching fifteen inches deep and sideways from the stem: It had
 “ besides a very thick bush of lateral roots from the eight main roots, which extended
 “ every way in a hemisphere, about nine inches from the stem and main roots. In order
 “ to get an estimate of the length of all the roots, I took one of the main roots with its
 “ laterals, and measured and weighed them; and then weighed the other seven roots,
 “ with their laterals; by which means, I found the sum of the length of all the roots to be
 “ no less than 1448 feet. And supposing the periphery of these roots, at a medium to
 “ be 0.131 of an inch, then their surface will be 2276 square inches, or 15.8 square feet;
 “ that is equal to 0.4 of surface of the plant above ground. If, as above, twenty ounces
 “ of water, at a medium, perspired in twelve hours day, (i. e.) thirty-four cubick inches
 “ of water, (a cubick inch of water weighing 25½ grains) then the thirty-four cubick inches,
 “ divided by the surface of all the roots, is = 2286 square inches (i. e.) $\frac{34}{2286}$ is = $\frac{1}{67}$; this
 “ gives the depth of water imbibed by the whole surface of the roots, viz. $\frac{1}{67}$ part of an
 “ inch.—And the surface of the plant above ground being 5616 square inches, by which
 “ dividing the thirty-four cubick inches, viz. $\frac{34}{5616}$ = $\frac{1}{165}$, this gives the depth perspired by
 “ the whole surface of the plant above ground, viz. $\frac{1}{165}$ part of an inch. Hence the
 “ velocity with which water enters the surface of the roots to supply the expense of per-
 “ spiration, is to the velocity with which their sap perspires, as 165 : 67, or as $\frac{1}{67}$: $\frac{1}{165}$, or
 “ nearly as 5 : 2. The area of the transverse cut of the middle of the stem is a square
 “ inch; therefore the areas, on the surface of the leaves, the roots, and stem, are

dexterously separated from the mother-roots, and transplanted in convenient places for propagation, as the season requires.

Here note, That stocks raised from suckers, and employed in grafting fruit, are more disposed to produce suckers, than such as come from stones and pippins.

“5616, 2276.1. The velocities in the surface of the leaves, roots, and transverse cut of the stem, are gained by a reciprocal proportion of the surfaces.

$$\text{“ Area of } \left\{ \begin{array}{l} \text{leaves} = 5616 \\ \text{roots} = 2276 \\ \text{stem} = 1 \end{array} \right\} \text{ velocity } \left\{ \begin{array}{l} = \frac{1}{5616} \\ = \frac{1}{2276} \\ = 1 \end{array} \right\} \text{ or as } \left\{ \begin{array}{l} \frac{1}{5616} \text{ inch.} \\ \frac{1}{2276} \text{ inch} \\ 34 \text{ inch.} \end{array} \right.$$

“Now, their perspiring 34 cubick inches in twelve hours day, there must so much pass through the stem in that time; and the velocity would be at the rate of 34 inches in twelve hours, if the stem were quite hollow. In order therefore to find out the quantity of solid matter in the stem, July 27, at 7. a. m. I cut up even with the ground a Sun-flower; it weighed 3 pounds; in thirty days it was very dry, and had wasted in all 2 pounds 4 ounces; that is, $\frac{2}{3}$ of its whole weight; so here is a fourth part left for solid parts in the stem, (by throwing a piece of green Sun-flower stem into water, I found it very near of the same specific gravity with water) which filling up so much of the stem, the velocity of the sap must be increased proportionably, viz. $\frac{3}{4}$ part more, (by reason of the reciprocal proportion,) that 34 cubick inches may pass the stem in twelve hours; whence its velocity in the stem will be $45\frac{1}{4}$ inches in 12 hours, supposing there be no circulation nor return of the sap downwards. If there be added to 34, (which is the least velocity) $\frac{1}{4}$ of it = $11\frac{1}{4}$ this gives the greatest velocity, viz. $45\frac{1}{4}$. The spaces being as 3 : 4, the velocities will be 4 : 3 :: $45\frac{1}{4}$: 34. But if we suppose the pores in the surface of the leaves to bear the same proportion as the area of the sap-vessels in the stem do to the area of the stem; then the velocity both in the leaves, root, and stem, will be increased in the same proportion. A pretty exact account having been taken of the weight, size, and surface of this plant, and of the quantities it has imbibed and perspired, it may not be improper here to enter into a comparison of what is taken in and perspired by a human body, and this plant. The weight of a well-sized man is equal to 160 pounds: the weight of the Sun-flower is 3 pounds; so their weights are to each other as 160 : 3, or as 53 : 1. The surface of such human body is equal to 15 square feet, or 2160 square inches. The surface of a Sun-flower is 5616 square inches; so its surface is, to the surface of a human body, as 26 : 10. The quantity perspired by a man in twenty-four hours is about 31 ounces, as Dr. Keill found. *Phil. Medic. Stat. Britan.* p. 14. The quantity perspired by the plant, in the same time, is 22 ounces, allowing two ounces for the perspiration of the beginning and ending of the night in July, viz. after evening, and before morning weighing, just before and after night. So the perspiration of a man to the Sun-flower is as 141 : 100. Abating the six

Thirdly, Fern is best destroyed by striking off the tops, as Tarquin did the heads of the Poppies: This done with a good wand or cudgel, at the decrease in the spring and now and then in summer, kills it, as also it does Nettles in a year or two, (but most infallibly by being eaten down, at its spring, by Scotch sheep) beyond the vulgar way of mowing or burning, which rather increases than diminishes it.

“ ounces of the thirty-one ounces, to be carried off by respiration from the lungs in the
 “ twenty-four hours (which I have found by certain experiment to be so much, if not
 “ more); the twenty-five ounces multiplied by 438, the number of grains in an ounce
 “ avoirdupois, the product is 10,950 grains; which divided by 254, the number of grains
 “ in a cubick inch of water, gives 43 cubick inches perspired by a man: which divided
 “ by the surface of his body, viz. 2160 square inches, the quotient is nearly $\frac{1}{50}$ part of a
 “ cubick inch perspired off a square inch in twenty-four hours. Therefore in equal
 “ surfaces, and equal times, the man perspires $\frac{1}{50}$, the plant $\frac{1}{157}$, or as 50 : 15. Which
 “ excess in the man is occasioned by the very different degrees of heat in each; for the
 “ heat of the plant cannot be greater than the heat of the circumambient air, which heat
 “ in summer is from 25 to 35 degrees above the freezing point; but the heat of the
 “ warmest external parts of a man’s body is 5† such degrees, and the heat of the blood
 “ 94 degrees; which is nearly equal to such a degree as a man can well
 “ bear to hold his hand in, stirring it about; which heat is sufficient to make a plentiful
 “ evaporation.

“ *Qu.* Since then the perspirations of equal areas in a man and a Sun-flower are to
 “ each other as 165 : 50; or as $3\frac{3}{5}$: 1; and since the degrees of heat are as 2 : 1, must
 “ not the sum or quantity of the areas of the pores lying in equal surfaces, in the
 “ man and Sun-flower, be as $1\frac{1}{2}$: 1? for it seems that the quantities of the evaporated
 “ fluid will be as the degrees of heat, and the sum of the areas of the pores taken
 “ together.

“ Dr. Keill, by estimating the quantities of the several evacuations of his body, found
 “ that he eat and drank, every twenty-four hours, 4 pounds 10 ounces. The Sun-flower
 “ imbibed and perspired in the same time 22 ounces; so the man’s food, to that of the
 “ plant, is as 74 ounces to 22 ounces, or as 7 : 2. But, compared bulk for bulk, the plant
 “ imbibes 17 times more fresh food than the man: for deducting 5 ounces, which
 “ Dr. Keill allows for the *faeces alvi*, there will remain 4 pounds 5 ounces of fresh liquor,
 “ which enters a man’s veins; and an equal quantity passes off every twenty-four hours.
 “ Then it will be found that 17 times more new fluid enters the sap-vessels of the plant,
 “ and passes off in twenty-four hours, than there enters the veins of a man, and passes off
 “ in the same time. And since, compared bulk for bulk, the plant perspires 17 times
 “ more than the man, it was therefore very necessary, by giving it an extensive surface,
 “ to make a large provision for a plentiful perspiration in the plant, which has no other
 “ way of discharging superfluities; whereas there is provision made in man, to carry off
 “ above half of what he takes in, by other evacuations. For since neither the surface of
 “ his body was extensive enough to cause sufficient exhalation, nor the additional reek,

Fourthly, Over much wet is to be drained by trenches, where it infests the roots of such kinds as require drier ground: but if a drip do fret into the body of a tree by the head, which will certainly decay it, cutting first the place smooth, stop and cover it with loam and hay, or a Cerecloth, till a new bark succeed. But not only the wet, which is to be diverted by trenching the ground, is exitial to many trees, but their repletion of too

“ arising from the heat of his blood, could carry off above half the fluid which was necessary to be discharged every twenty-four hours, there was a necessity of providing the kidneys to percolate the other half through. And whereas it is found that 17 times more enters, bulk for bulk, into the sap-vessels of the plant, than into the veins of a man, and goes off in twenty-four hours; one reason of this greater plenty of fresh fluid in the vegetable than the animal body, may be, because the fluid which is filtrated through the roots immediately from the earth, is not near so full freighted with nutritive particles as the chyle which enters the lacteals of animals; which defect it was necessary to supply by the entrance of a much greater quantity of fluid. And the motion of the sap is thereby much accelerated, which in the heartless vegetable would otherwise be very slow; it having probably only a progressive and not a circulating motion, as in animals. Since then a plentiful perspiration is found so necessary for the health of a plant or tree, it is probable that many of their distempers are owing to a stoppage of this perspiration by inclement air. The perspiration in men is often stopped to a fatal degree; not only by the inclemency of the air, but by intemperance, and violent heats and colds. But in the more temperate vegetable, perspiration can be stopped only by inclement air; unless by an unkindly soil, or want of genial moisture, it is deprived of proper or sufficient nourishment. As Dr. Keill observed in himself a considerable latitude of degrees of healthy perspiration, from a pound and a half to 3 pounds; I have also observed a healthy latitude of perspiration in this Sun-flower, from 16 to 29 ounces, in twelve hours day. The more it was watered, the more plentifully it perspired, (*ceteris paribus*) and with scanty watering the perspiration much abated.”

From these accurate experiments, it is evident that vegetables inspire and expire. Pure air is necessary for animals. Vegetables require the same. When obliged to breathe their own vapours, they become unhealthy. For that reason corn is seldom good in small inclosures; neither are trees healthy when much crowded. The superior goodness of the grain produced by the drill and alternate husbandry*, evinces the necessity of a free circulation of air. There is a certain height to which the soil ought to raise the ears of corn. When, from too much closeness, they are elevated beyond that pitch, the real nourishment that should go to the grain, is spent upon the straw. The stems also, that should have been hardened by the air, become weak, and unable to stand against moderate storms of wind and rain. The culture of Beans shows the truth of this observation. When sown too thick, they push themselves upward with seeming vigour; and the crop has the appearance of being a good one. But when examined, we find the pods small, and few in number. On the contrary, when sown in drills, with proper intervals, the straw is shorter, and the pods much larger, and more numerous. But to return to our philosophical argument. The analogy that subsists between plants and animals, has induced some very emi-

* Vide Geographical Essays, p. 87.

abundant nourishment; and therefore sometimes there may be as much occasion to use the lancet, as venæsection to animals; especially if the hypothesis hold, of superfluous moisture's descent into the roots, to be re-coacted; but where, in case it be more copious than can be there elaborated, it turns to corruption, and sends up a tainted juice, which perverts the whole habit of the tree: In this exigence therefore, it were,

nent naturalists to suppose a regular circulation of the vegetable juices. M. Perrault, M. Major, M. Mariotte, Malpighi, and our countryman Grew, contended, much about the same time, for the circulation of the sap. According to their microscopical observations, the wood of trees, and the flesh of plants, consist of fine capillary tubes, which run parallel from the root, through the trunk and branches. These they looked upon as arteries. Other minute vessels were observed running between the wood and inner bark, which they distinguished by the name of Veins. They also described, very correctly, the Tracheæ, or air-vessels, which take their course through the fibres of the wood. These anatomical preliminaries being settled, they proceeded to reason in this manner. The root having absorbed a quantity of juice from the earth, it is made to ascend through the vessels of the wood, by the alternate expansion and contraction of the Tracheæ, assisted by the natural absorption of the sap-vessels themselves. They supposed the sap to be rarefied to the degree of a fine vapour, in which state it mounted upwards to the extreme parts of the plant, where meeting with the external air, it became condensed into a liquor, and in that form returned to the root by the venal system, between the wood and bark. Dr. Hales, in the most satisfactory manner, set aside this doctrine, and substituted another in its place, more consonant to reason and experiment. It is something remarkable that Dr. Hervey should have been the first who established the *circulation* of the blood in opposition to most of the anatomists in Europe; and that Dr. Hales should have clearly disproved the *circulation* of the sap, contrary to the opinion of almost every naturalist of his time. In order that we may have a distinct view of the motion of the sap, it will be necessary to reflect, that the root, stem, branches, and leaves are constructed in the same manner. Sallows, Willows, Vines, and most Shrubs, will grow in an inverted state, with their tops downward in the earth. Dr. Bradley describes the manner of inverting a young Cherry-tree, the roots of which will put forth leaves, and the branches become roots. Hence it is obvious that the nutritive matter may be conveyed as well by the leaves as the roots, their vascular structure being the very same. We have now settled the anatomical structure of a plant. Upon it depends much of what we know of the vegetable œconomy. The motion of the sap comes next to be examined.

During the heat of a summer's day, all plants perspire freely from the pores of their leaves and bark. At that time the juices are highly rarefied. The diameters of the Tracheæ, or air-vessels, are enlarged, so as to prefs upon and straiten the vessels that carry the sap. In consequence of which their juices, not being able to escape by the roots, are pressed upward, where there is the least resistance, and perspire off the excrementitious parts by the leaves and top-branches, in the form of vapour. When the solar heat declines, the Tracheæ are contracted; the sap-vessels are enlarged, and the sap sinks down in the manner of the spirits of a thermometer. In consequence of this change, the capillary vessels of the leaves

perhaps, more advisable to draw it out by a deep incision, and to depend upon a new supply, than, upon confidence of correcting this evil quality by other medications, to let it perish. Other causes of their sickness, not always taken notice of, proceed from too liberal refreshments and over-watering in dry and scorching seasons, especially in nurseries: The water should therefore be fitly qualified, neither brackish, bitter, stagnant, nor

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and top-branches become empty. Being surrounded with the humid vapours of the evening, they fill themselves from the known laws of attraction, and send down the new-acquired juices to be mixed with those that are more elaborated. As soon as the sun has altered the temperature of the air, the Trachea become again distended, and the sap-vessels are straitened. The same cause always produces the same effect: and this alternate ascent and descent, through the same system of vessels, continues as long as the plant survives.—The irregular motion of the stem and branches, is another cause that contributes to the ascent of the sap. Every time that these parts are acted upon by the air, they are made to assume a variety of angles, whereby the sap-vessels are suddenly straitened. The contained juices consequently receive reiterated impulses, similar to what happens to the blood of animals from the contraction of the heart. This observation may assist us in investigating the vegetable œconomy, so far as it regards the management of fruit-trees, and probably may be extended throughout the whole system of gardening, planting, and farming. It may be objected, that trees fixed to the wall do, notwithstanding, carry their sap to the extreme branches; but it should be considered that the warmth of their situation, assisted by the horizontal direction of their branches, is fully sufficient to propel the sap, without the undulatory motion that I have mentioned.

I beg leave to remark, that these observations are only intended to convey a general idea of the motion of the sap. It varies according to the temperature of the weather.—The air is seldom one moment alike. The sap must therefore sometimes move quick, sometimes slow. It may rise and fall many times in a day. Sudden heats push it upward, sudden colds make it fall. Thus the juices are blended, and the secretions forwarded.—The manner that the nutritive juices of the earth and atmosphere are conveyed into the sap-vessels, remains to be described. And this makes a necessary part of our present argument, as it may assist us in finding out, and explaining, the diseases of plants from the variations of the weather. The outer-bark which covers every external part of a vegetable, as well below as above the surface, is full of perspiratory or absorbent holes.—The vessels of this bark being endowed with the power inherent in capillary tubes, draw up the moisture that is applied to their surface. From them it is committed to the vessels of the inner bark. After receiving some degree of melioration, the sap is delivered to the blea. From the blea, it passes, by anastomosing canals, to the vascular series. From thence to the wood, or flesh, where it receives its last concoction. The nutritive particles, being separated by the mechanism of these numerous canals, are applied towards the fructification and increase of the plant; while the watery and excrementitious parts are carried expeditiously to the leaves, where they are perspired off in the form of vapour.—

putrid, sour, acrimonious, vitriolic, arenous and gravelly, churlish, harsh, and lean, (I mention them promiscuously); and whatever vicious quality they are perceptibly tinged and impregnated with, they are by no means proper drink for plants. Wherefore a very critical examen of this so necessary an element (the very principle, as some think, and only nutriment of vegetables) is highly to be regarded, together with more

It is evident, however, that, as water contains but few particles that are fit for nourishment, it was necessary that plants should have the power of imbibing a large portion of that fluid. For which reason the sun-flower, considered bulk for bulk, takes in seventeen times more nourishment than a man, and consequently perspires more. During the continuance of dry north-east winds, the leaves of corn are observed to grow yellow, and the early-set fruit frequently falls off. This is owing to the want of moisture in the atmosphere to fill the vessels of the leaves and top-branches, whereby the fruit is deprived of nourishment. Under such circumstances, it is probable that wall-fruit may be preserved by prudently watering the leaves and top-branches during the decline of the day. It is, however, a singular happiness that the air is at no time perfectly free from moisture.—Bring a bottle of cold water into the warmest room, and its surface will immediately be covered with a thick dew. An air absolutely dry, would, in a few days, annihilate the vegetable creation. The air is justly said to contain the life of vegetables, as well as animals. It is a compressible and elastic fluid, surrounding the face of the globe, and reaching to a considerable height above it. Vegetables do not grow in vacuo, and animals die when deprived of air. It has two states, being either elastic or fixed. Dr. Hales observes, that, in its elastic and active state, it conduces to the invigorating the juices of vegetables; and, in its fixed and inert state, gives union, weight, and firmness to all natural bodies. By his experiments we are informed, that fixed air constitutes near one third part of the solid contents of the heart of Oak. It is found to bear the same proportion in Pease, Beans, and other vegetable substances. Heat and fermentation render it elastic. It is again capable of being absorbed and fixed. Was the whole air of the universe brought at once into an elastic and repulsive state, every thing would suffer a sudden dissolution. Was it entirely fixed, then all things would be reduced to an inert lump. Almighty Providence has provided against these extremes, and in the most wonderful manner preserves the balance. Air is to be found in every portion of earth; and as it always contains a solution of the volatile parts of animal and vegetable substances, we should be careful to keep our stiff soils as open as possible to its influence. It passes, both in its active and fixed state, into the absorbent vessels of the root, and, mixing with the juices of the plant, circulates through every part. Dr. Hales, in his statical experiments upon the Vine, discovered it ascending with the sap in the bleeding season.

Having demonstrated that the motion of the sap depends upon the influence of the air, and the power of absorption common to all capillary tubes, it naturally follows, that it cannot remain one moment at rest. The gradations from heat to cold, and *vice versa*, are infinite, and sometimes desultory. So must be the motion of the sap. From the

than ordinary skill how to apply it: In order to which, the constitution and texture of plants and trees are philosophically to be considered; some affecting macerations with dung and other mixtures, (which I should not much commend,) others quite the contrary, the quick and running spring, dangerous enough, and worse than snow-water, which is not in some cases to be rejected: Generally, therefore, that were to be chosen,

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combinations of the nutritive particles, a number of different fluids are prepared in the same plant. Matter is the same in all; but the modification of it makes things sweet or sour, acrid or mild. The universal juice of a plant is a limpid subacid liquor, which flows plentifully from a wound made in a tree when the sap is rising. The Birch and the Vine yield it in great abundance. This liquor, as it moves through the innumerable small vessels, becomes more and more concocted, and is the general mass from which all the juices are derived. It may be called the blood of the plant. By a certain modification, it produces high-flavoured oils, gums, sugar, wax, turpentine, and even the constituent parts of the plant itself. How this transmutation is performed, remains, and perhaps ever will remain, unknown.

I hope it will not be objected to me, that in this examination I have been too minute.— In the history of nature we cannot be too particular. Every part of it demands our most serious attention, and every part of it repays us for the labour we bestow. The wings of the butterfly are painted by the same Almighty hand that made the sun. The meanest vegetable, and the most finished animal, are equally the care of Providence. We constantly view the wisdom of God in his works; and yet, as the wise man observes, “hardly do we guess aright at the things that are upon the earth, and with labour do we find the things that are before us.”

3. GENERATION. It is well known that the ancients supposed two sorts of generation, to wit, equivocal and univocal. This latter, they said, took place when any thing was produced from its proper egg or matrix; the equivocal, when any living thing was generated fortuitously or by chance, from the confused mixture of particles. Thus, *e. g.* they believed that fleas were generated from urine and saw-dust; that myriads of little insects, like atoms, came up out of slimy water, and maggots out of cheese in the summer; that several sorts of herbs quickly sprang up out of mould taken from a considerable depth below ground; and lastly, that worms were produced from putrid carcases. Others thought that the Creator, at the beginning, mixed seeds and eggs with the earth every where; so that when such earth was dug up, and the sun, by his heat, had hatched the seeds, they imagined that herbs, plants, and animals sprung up, which were concealed therein from the creation. But all the ingenious men of this age, who have imbibed the sound principles of natural philosophy and natural history, have long ago rejected this ridiculous opinion. God at the first gave to every living thing its own proper seed, and to each a tendency or propensity to propagate its species; and established this first and great law to remain unalterable, “Increase and multiply.” If from putrefaction, and the heat of the sun, living creatures and plants could be produced, it would have been need-

BOOK II. which passing silently through ponds and other receptacles, is exposed to the sun and air. This approaches nearest to that of rain dropping from the uberous cloud, and is certainly the most natural and nursing. As to the quantity, some plants require plentiful watering, others rather often, than all at once; all of them sucking it in by the roots for the most part, which are their mouths, and carrying it thence through all the canals,

less, and consequently highly unworthy of the Supreme Being, to have created so many and so amazingly curious vessels for the preparation of the seed; for in that case putrefaction would be equivalent to creation. And if very minute insects and other animals could be produced from putrefaction, and hatched by the heat of the sun, why might not horses, elephants, and other large animals, be produced in the same way? For in large bodies the mechanism is easier, as the matter is more manageable; but in such minute insects, and, as we may say, such nothings, what wisdom, what power, what inexplicable perfection is displayed, since nature is never more complete, than in her most minute works! He must be void of understanding who does not perceive the absurdity of equivocal generation, when he sees a body made with such wonderful art, and adorned with so many thousand pipes and canals, that no mechanic, even the most perfect of mortals, can find out all the contrivance, much less imitate this wonderful fabric; yet can, as it were by a wilful mistake, say, that he believes all those things were made by a fortuitous and confused concurrence of atoms. For it would follow from hence, that a new species both of animals and plants would always occur, neither of which we observe, or have any account of.— In this case too, there could be no arguing from the genera to the species. In a word, there would be no such thing as certainty, but all confusion. Redi, having a mind to examine equivocal generation, put recent flesh into a glass vessel, covered with a very thin linen cloth, and exposed it to the sun; after a little time, he found that flies laid their eggs upon the linen cloth; but no maggots were produced in the flesh. We must not conclude that insects are produced by equivocal generation, because we see many thousands of them about pools and ditches, where the putrefying filth of those places furnishes plentiful nourishment for them, which is the reason that their eggs are there deposited. The *Staphelia Hirsuta* produces a flower that stinks like carrion, for which reason the flesh-flies, deceived by the smell, fill the whole flower full of their eggs, taking it for putrid flesh. We have no reason to believe, what some have asserted, that wheat degenerates into barley, and barley into oats, and oats into brome-grass; for every species produceth its own like; nor was it ever known that the fierce eagle produced the timorous dove. Having confuted equivocal generation, it will follow that every living thing is produced by univocal generation, or from an egg. New vegetables, we have already proved, are endued with life, therefore they all proceed from eggs. And indeed the great Harvey long ago maintained this doctrine, that every living thing derives its origin from an egg. But some of the moderns have strenuously endeavoured to overthrow this opinion, their cause being chiefly supported by such arguments as the following: If, say they, we take a part from the root, and set it in the ground, it strikes root, and a new plant springs up; again, if a Polypus be cut into several parts, from each of these parts an entire and


organs and members of the whole vegetable body, digested and qualified so as to maintain and supply their beings and growth, for the producing of whatever they afford for the use of man, and other living creatures.

CHAP. VII.

Fifthly, The bark-bound are to be released by drawing your knife rind-deep from the root, as far as you can conveniently, drawing your

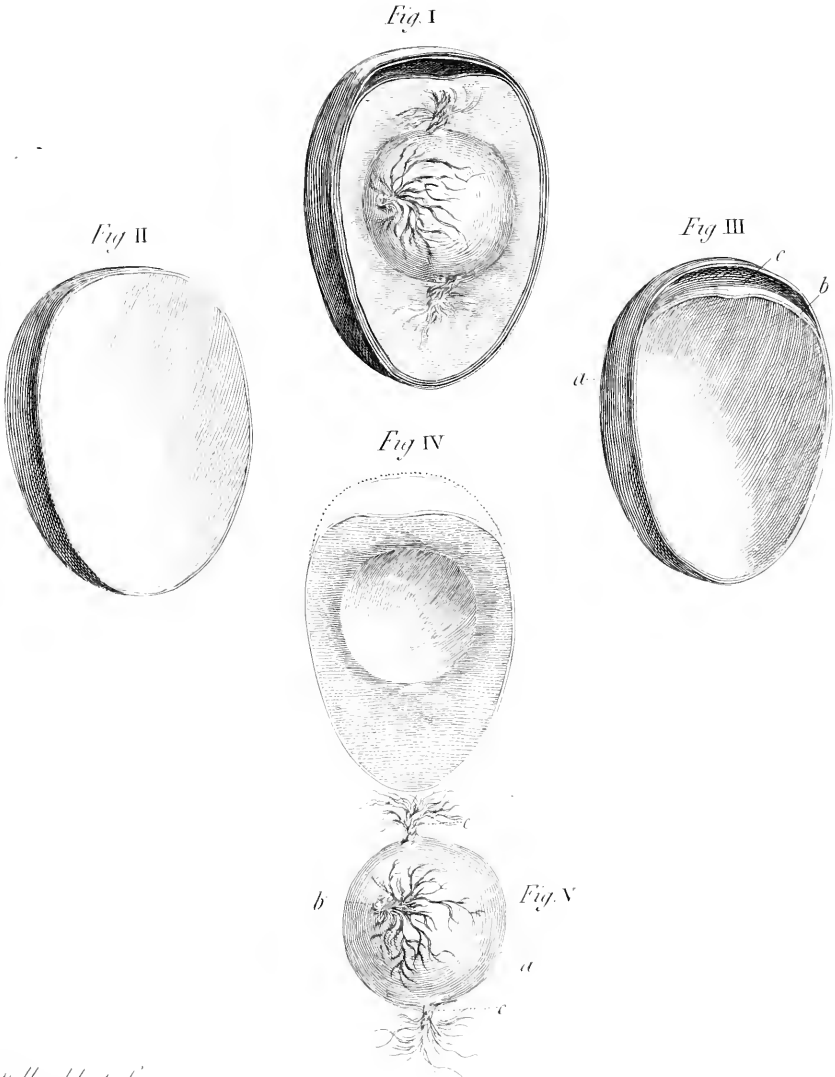
complete Polypus is formed, according to the late discoveries of Trumbull and others.— But do we not as frequently see that a plant produces from the same root several shoots or stems? For a stem is nothing but a root above ground; for which reason, if we turn a tree, e. g. the Lime-trees, upside down, the stem will become the root, and the root be changed into branches. Besides, what we have said is farther confirmed by the branches, all of which spring from the stem or root; but the stem or root from whence this branch or shoot was taken, arose from a seed or egg. The same thing may be said of the Polypus among animals; and therefore a Polypus lives a vegetable life, or a vegetable lives the life of a polypus: and this manner of propagation, though very rare in the animal creation, is extremely common in the vegetable kingdom. No one ought to wonder that new leaves are produced every year from the root or branches; for in the same manner do we daily see the feathers of birds produced. A feather which is a most curious piece of workmanship, consists of a concave base, filled with a vessel like a lymphatic, so that the nutriment can pass upward but not downward; next there is the midrib, and the lateral branches both partial and proper, so that a feather may be compared to a fern twice compounded.— Now daily experience informs us that feathers, though adorned with such curious mechanism, fall off every year, and that others, springing from the body of the bird, succeed in their room. Moreover, it is evident that feathers grow only out of the body of the bird, that this body is their root, and that this root owes its origin at first to a seed or egg. The same also holds in plants; therefore Polypi, and plants of every kind, have undoubtedly seeds or eggs, by which they are multiplied, without being cut or propagated by shoots, layers, branches, or suckers. Add to this, that the famous Bern. Jussieu discovered eggs or seeds in the Polypi, as may be seen in the Transactions of the Stockholm Society for the year 1746.


Here we are to observe that all viviparous animals have their eggs, out of which comes their offspring, though these eggs are contained in their proper matrix, and excluded in due time, in the same manner as an egg in the nest cherished by the incubation of the bird, whose uterus is the nest. Nor can we deny, but the smallest vegetables have seeds, although often not discoverable by the naked eye. Valisnerius has discovered the seeds in Ducks-meat, and Michelius has done the same in the Macor and Byssus; Bobart in the Ferns; Linnaeus in the Mosses; and Reaumur in the Fungi. The ancients thought that Mistletoe was produced without seed, having seen it often grow from the underside of branches; for how the seeds of the Mistletoe could be conveyed from one tree to another, and there adhere to the underside of the branches, was very difficult for them to conceive. But time has discovered, that the Thrush, swallowing the berries on account of the pulp, afterwards voids the seeds entire, which stick with the excrements to the

BOOK 11.  knife from the top downwards, half way, and at a small distance from the bottom, upwards, the other half; this, in more places, as the bulk of the stem requires; and if crooked, cut deep and frequent in the ham; if the gaping be much, fill the rift with a little cow-dung. Do this on each side, and at spring, February or March: Also, cutting off some branches is profitable, especially such as are blasted, or lightning-struck:

branches. These viscous seeds are washed by the rains, so that some of them are often protruded to the lower side of the branches, where they grow.

Some people are persuaded, that the sessile and flat funguses on trees, are morbid excrescences; but it is plain they are true species of those agarics which are furnished with caps and stems, and grow on the ground, whose seeds falling on a moist tree, produce, as it were, half caps without stems. That seeds are the eggs of plants, appears from hence, that as every egg produces an offspring similar to the parent, so do the seeds of vegetables, and consequently they also are eggs. The containing parts of a hen's egg are, the shell, the external film or membrane, the internal membrane lying immediately under the former, the chalazæ, or membrane inclosing the yolk, twisted at the extremities. The parts contained are, the air within the membranes at the obtuse end of the egg, the white, the yolk, and the cicatricula, in the centre of which is the speck of life. When an egg is set under the hen, after two days incubation, the speck of life becomes red, sends out its blood-vessels through the yolk, and at last we find the whole chick is formed out of the speck of life. The yolk becomes the secundines; the white contributes to the nourishment of the chick; and the two membranes become the amnion and chorion. A seed has also a shell, external membrane or film, a membrane including the yolk, the yolk itself; and the point of life. In seeds, however, the white is wanting, there being no use for it, as the moisture of the earth supplies its place, and nourishes the embryo of the plant. Neither have the eggs of fishes any white, because they are always in the water. When the flower is going off, the seed begins to swell, and on its outside there is seen a vesicle, which is the amnion of Malpighi, furnished with an umbilical cord, or navel-string, which is produced through the chorion to the opposite side of the egg. While with the egg the amnion increaseth, on its top is observed another small body, which likewise increaseth continually, till it has filled the whole chorion and egg; and the amnion and chorion are turned into the external shell or coat of the seed. See Logan's Exper. 9, by which it appears that the same changes are brought about in the seed as in the egg; and therefore, that the seeds are the eggs of plants cannot be doubted. That plants spring from the yolk of the egg is farther confirmed by the lobes, which, when we speak of cows and other similar quadrupeds, are nothing else than several secundines, always adhering to the fetus, drawing their supply of fluids from the matrix, which fluids they prepare for the nourishment of the tender fetus. That most plants have seminal leaves or lobes is very well known. Now these seminal leaves once constituted the whole seed, except the hilum, or little heart, in which is the point of life; and these lobes prepare the nourishment for the very tender plant, until it be able to strike root in the earth; in the same



If, as sometimes, it proceed from the baking of the earth about the stem, CHAP. VII.
lighten and stir it. 

Sixthly, The Teredo, Cofsi, and other worms, lying between the body and the bark (which they separate) poison that passage to the great prejudice of some trees; but the holes once found, they are to be taken out

manner as the yolk in an egg, becoming the placenta, prepares the nourishment, and sends it by the navel-string to the chick. LINN.

The annexed plate represents the egg of a hen on the fourth day of incubation. Fig. 1. The containing and contained parts, as they appear upon the removal of the forepart of the shell. Fig. 11. The shell. Fig. 111. The two membranes which line the inside of the shell, and inclose the whole contents. *a*. The shell. *b*. The inner membrane. *c*. The cavity formed by the membranes, in which a portion of air is inclosed. Fig. iv. The white, which serves for the nourishment of the chick during incubation. Fig. v. The yolk, with the speck of life and its blood-vessels. *a*. The yolk. *b*. The cicatricula, containing the speck of life. *c. c.* The chalazæ, or twisted extremities of the membrane that surrounds the yolk.—If we compare these chalazæ to the extremities of an axis passing through the yolk, that sphere will be found to be composed of two unequal portions, its axis not passing exactly through its centre. And as the cicatricula, with the speck of life, is always placed on the side of the smaller portion, it follows that in all positions of the egg, during the first five days of incubation, it must be uppermost, and consequently nearest the hen; for the yolk is a body specifically heavier than the white with which it is surrounded.

It is wonderful to observe the attention of Providence to the infancy of animal life; but our wonder is turned into adoration, when we observe the same goodness continued through all the stages of animal existence. It is in the form of instinct that the finger of God operates during the advanced periods of animal life; a principle, that never ceases to act for the preservation, as well as continuation, of animated nature.

From the foregoing observations it is evident that the seeds of all vegetables may be considered as eggs, from which the respective species are produced. Now, daily experience teaches us, that no egg can produce an animal, till it be impregnated or fecundated by the male: A hen indeed will lay eggs, but they will prove abortive, unless they are impregnated or fertilized by the male. That generation precedes the birth, appears throughout universal nature. In quadrupeds it does without doubt: but in fishes, it is supposed by some that generation follows or comes after the birth or exclusion of the eggs, and that the male sperm is emitted upon the eggs after they are excluded from the matrix of the female. This is demonstrable in Salmon during the spawning season.

Physiologists have entertained a variety of opinions concerning generation. After rejecting the effervescences, precipitations, and other ridiculous notions of the ancients, they now seem to acquiesce in two opinions. The first is that of the great Harvey, who supposed that in the speck of life, or cicatricula, the entire rudiments of the future fetus were present, perfect in all its members, and that it was only requisite that the male

BOOK II. with a light incision, and the wound covered with loam. Or, let the dry part of the wood, bark and all, be cut, applying only a wash of urine and vinegar twice or thrice a week during a month: The best means to find out their quarters, is to follow the Wood-pecker and other birds; these pitching upon the stem, as you may observe them, and knocking with their bills, give notice that the tree is infected, at least between the bark.

sperm should add or excite the first spirit, motion, and life. His followers contend, that so curious and wonderful a machine as an animal body, could never be formed and perfected by another machine: and that therefore in the ovaria of the first female there must needs have been her offspring, or ova, and in them others; and so on in an infinite series through all the subsequent descending generations. In a word, that in the ovaria, or loins, of Eve, the whole race of mankind were contained, whether past, present, or future. Now, allowing the infinite divisibility of matter, yet it exceeds all belief, that so many myriads should be contained in one egg. The second hypothesis is that of Leuwenhoek. He supposed that the semen masculinum contained millions of animalcules, and that each of the ova, in the female ovaria, had a small perforation, no bigger than to admit a single animalcule. Through this small aperture an animalcule is supposed to enter; soon after which the ovum becomes detached, and, in a wonderful manner, descends down the Fallopian tube into the uterus, together with the animalcule, which in time becomes a perfect fetus. But this theory is more plausible than just: for by the conjunction of two animals of different kinds, a species is produced, which we call hybrid, mongrel, or mule, being of a mixed nature between the male and female parent. And it must be allowed that an animal so shaped could not be produced, were the rudiments of the fetus to derive their origin wholly from the male, agreeably to this Hypothesis. All we certainly know of the mysterious work of generation, is that all animals require the concurrence of a male and female to produce their kind; and that these, distinctly and invariably, are found to beget creatures of their own species. We know but little of those peculiar characters in the parts that go to make up animated nature, which mark one animal to creep in the dust, and another to glitter upon the throne! Something more certain may be discovered regarding the origin of vegetable life, to which we shall now return.

That we may make a full inquiry into this subject of the generation of plants, it will be proper to investigate the situation of their genital organs. Now we have proved that the seeds are the eggs of plants; and it appears that wheresoever the fecundated eggs are, there we are to seek for the organs of generation; and we shall find the genital organs of plants where the seeds are produced. But the seeds are produced where the flower and fruit are; therefore the flower and fruit are the genital organs of plants. Some have asserted that certain vegetables wanted flowers, and others both flowers and fruit. Tournefort maintained that the Alge and Mosses had seeds, but no flower; and that the Fungi, and some others, had neither flowers nor fruit. Hence some of the moderns have argued against the fructification. But for one to deny flowers and fruit to the most minute vegetables, which he finds in all the larger species that fall under his inspection, is not the part of a fair and rational inquirer. For it is the same as if we should conclude con-

But there are divers kinds of these *ξυλόφαγοι*, of which the *Teredo*, already mentioned, will sometimes make such a noise in a tree, as to awaken a sleeping man. The more ruggous are the *Cofsi*, of old had in *Deliciis* amongst the Epicures, who used to fatten them in flour; and this (as Tertullian and S. Hierom tell us) was the chief food of the Hierophantæ *Cereri*, as they are this day a great regalo in Japan: In the mean time,

cerning some minute species of insects, that they had neither feet, nor eyes, nor mouth, nor genitals, because we cannot discover them with the naked eye. Bobart sowed the seeds of Ferns, which grew very well. Plumier discovered the flowers in some of the Fern kind, and the same may be easily investigated in the *Trichomanes* of Linnaeus. Linnaeus discovered the seeds of Mosses; and in the *Polytrichum* we have pretty clear signs of both sexes. In the *Lycopodium Selaginoides*, or Prickly Club-moss, Linnaeus observed, that one part of the fructification contained the fertilizing dust, and the other the seeds; which were evident signs that the plant had both flower and fruit. B. Jussieu traced the flowers of the *Pitularia* or Pepper-grafs. Reaumur discovered the fructification in the *Fuci*. Linnaeus numbered the *stamina* and *pistilla* in the *Jungermannia Epiphyllis*, or Broad-leaved *Jungermannia*. Valisnerius has delineated in the *Lennea*, or Ducks-meat, the *calyx*, the *stamina*, the *pistillum*, the *capsula*, and the seeds. Michelius has frequently numbered the *stamina* of the *Fungi*, and has sown their seeds, which grew very well. Nov. Gen. Tab. 68, 73, and 74. Hence therefore we may conclude, that these lowest tribes of vegetables are all furnished with flowers and fruit, although, by reason of their exceeding minuteness, they have not hitherto been distinctly known to Botanists. In short, there never was a clear and evident example produced of any plant which wanted flowers and fruit; and therefore we may justly say, that in their fructification consists the essence of plants.

Universal experience attests, that the flower always precedes or goes before the fruit, in the same manner as generation precedes the birth in animals; so that not one example of the contrary can be produced in any individual. The *Colchicum Autumnale*, or Meadow-saffron, flowers in the autumn, but the fruit, with the stem and leaves, appears the following summer in the months of May and June. The *Hasel* puts forth its flowers early in the spring, but ripens its fruit or nuts in August. In a word, the flowers always come before the fruit in every plant, without exception.

Since in animals all generation precedes the birth, and in vegetables every flower precedes the fruit, we must necessarily ascribe fecundation to the flower, and the birth or exclusion of the seed to the ripe fruit.

Hence we may define a flower to be the genital organs of a plant serving for fecundation, and the fruit to be the genital organs serving for the birth or maturation of the seed. There has been much dispute among Botanists concerning the definition of a flower; many have asserted that the essence of a flower consisted in the corolla or petals: this opinion Knautius embraced, and also denied that there ever were any flowers destitute of petals. Our senses tell us, that there are many plants, some of which want the calyx, as the Tulip, Fritillary, &c. others the corolla; as the Grasses, Cats-tail, Bur-reed, and.

experience has taught us, that millepedes, (plentifully found under old timber logs) being dried and reduced to powder, and taken in drink, are an admirable specific against the jaundice. They also purify the blood, and clarify the sight.

There is a pestilent green worm which hides itself in the earth, and

Pine; others the filaments of the stamina, as the Birthwort; others the style, as the Graft of Parnafus, &c.; but all flowers whatever, except the Moyses, are furnished with the antheræ, or stigmata, or both together; and as this holds universally in every species of plant, (the Moyses only excepted,) these parts must necessarily constitute the essence of a flower. If we find a flower with antheræ, but no stigmata, we may also assuredly find another flower either on the same, or on a different plant of the same species, which has stigmata with the antheræ, or without them. Pontedera, on the authority of the Hortus Malabaricus, contends, that there are some plants which have no antheræ; *e. g.* the *Cycas Circinalis*, or Sagoe Palm-tree, the *Celtis*, or Nettle-tree, with some others: But in this he is mistaken; for even the number of the antheræ in those plants he mentions is at present very well known to Botanists. The same objection has been made in regard to the *Isaetes*, or Quillwort; but Linnæus discovered the antheræ of this plant: It. Scan.—Hence we perceive the error of the followers of Rivinus, who took the nectaria in the Hellebore, Nigella, and Pafion-flower, for flowers; which nectaria have properly no pistilla nor antheræ. For the act of fecundation two things are requisite, namely, the genital organs of both sexes; because, as was said above, one of the sexes alone cannot propagate the species. Now the act of fecundation is performed in the flower; therefore it follows, that the genital organs of both sexes must be present in the flower. We are here however to observe, that the genital organs of both sexes are not always present in one and the same flower. It is sufficient that those of the male be in one flower, and those of the female in another. Since every plant bears seeds by which its offspring can be propagated, and no egg can be hatched before fecundation, it will follow, that fecundation is as necessary as the seeds themselves. Hence it appears, that the organs of both sexes, which serve for fecundation, are altogether necessary, if the flower is perfect, and that they are the essential parts. But we find no parts of a flower that are essential but the antheræ and stigmata, therefore these parts are the genital organs of both sexes, serving for fecundation.

The male organs of generation in animals are very different. Some have a penis, as the quadrupeds, birds and serpents, some of the fishes, insects, and worms; others have no penis, as many of the true fishes, and those called shell-fish. Some have seminal vesicles, as the greatest part of quadrupeds; others have none, as the dog kind. Some have testicles distinct from the seminal vesicles, as the quadrupeds; and others have both testicles and seminal vesicles united in one, as the fishes. Now we maintain that the antheræ, the male organs of generation in flowers, are nothing else but the bodies which prepare and contain the male sperm: therefore these antheræ are the testicles together with the seminal vesicles, and their dust the genuine male sperm of plants, answering to

gets into pots and cases, eating our seedlings and gnawing the very roots, which should be searched out. And now we mention roots; overgrown toads will sometimes nestle at the roots of trees, when they make a cavern, which they infect with a poisonous effluvia or vapour, of which the leaves, famished and flagging, give notice, and the enemy dug out with the spade. But this chiefly concerns the gardeners mural fruit-

CHAP. VII.

those particles which are called animaleules in the male sperm of animals. The truth of this we shall prove by the following arguments. 1. *Preceding the fruit*.—The antheræ and their dust always come before the fruit. When the fruit sheds its seeds, it is come to maturation. This is the case with the antheræ; for when they shed their dust, they are come to maturation, and have done their office; yet their dust is always shed when the flower is in full vigour, and then the antheræ drop, and are useless. 2. *Situation*.—The antheræ are always so situated in the flower, that their dust, which is the male sperm, may reach the pistillum or female organ; for the stamina either surround the pistillum, as in most flowers; or, if the pistillum incline to the upper side of the flower, the stamina do the same, as in the Didynamia; or, if the pistillum nods, the stamina ascend, as in the Calsias, and the common Winter-green. Several plants in the Monoecia Clafs, have male flowers over the female, as Indian Corn, Palma Christi. 3. *Time*.—The antheræ and stigmata are in full vigour at the self-same time, and this not only when both are in one and the same flower, but also when they are in distinct or separate flowers; so that the long catkins of the Hasel, Birch, and Alder, never discharge the dust of their antheræ before the stigmata below them are come out. The male Hemp never sheds its dust before the pistilla of the female plants appear. 4. *Cells*.—Tournelort was of opinion, that the antheræ did the office of kidneys, purging the several parts of the plant from all such particles as were not fit for its nourishment, by receiving them into their cells, and that their valves were burst open by those accumulated excrements. Pontedera's opinion was, that the antheræ are nothing else but a cluster of cells, which receive a peculiar juice or fluid, and then transmit it through the filaments to the receptacle, from whence it is carried to the embryos of the seed; but the falsehood of this opinion will appear from the consideration of all the plants of the Dioecia Clafs, the figure of the pollen, artificial fecundation, capriciation, and the culture of Palm-trees. If we cut asunder the antheræ before they shed their dust, we find their structure altogether as wonderful and curious as the seed-vessels themselves. For within they consist either of one cell, as the Mercury; or two, as Hellebore; or three, as the Orchis; or four, as the Fritillary; and they open or split either longitudinally, as the Leucoium, or greater Snow-drop; or at the base, separating into pieces or valves, as the Barren-wort; or from the top, as the common Snow drop; or at the two points or horns, as the Whortle, Heath, Winter-green, and Marsh-rosemary. 5. *Castration*.—If we cut off the antheræ of any plant which bears but one flower, taking care at the same time that no other plant of the same species is near it, the fruit proves abortive, or at least produces seeds which will not vegetate. This is a certain truth, which any one will find upon trial. 6. *Figure*.—The figure of the fertilizing dust will clearly convince any one, that this fine powder is not accumulated by chance, or from the

trees; though I question not but that even our forest-trees suffer by such pernicious vapours, rats, and other stinking vermine, making their nests within them. But for all these let our industrious planter (especially the learned favourers of the most refined parts of horticulture) consult the Discourses and Experiments of Sig. Fran. Redi, Malpighius, Leuwenhoek, Swammerdam, &c. with our own learned Doctors, Lyster, Sloane,

dryness of the antheræ. Malpighi, Grew, Mercard, and Geoffroy, who had all viewed the figure of these particles with good Microscopes, found all the particles exactly equal to one another, but in different genera, as great a difference in shape and figure, as the seeds themselves. As for example, in the Sun-flower the particles are globular and echinated, or full of prickles; in the Bloody Cranes-bill, they are like a perforated globule of fire: in the Mallows, they appear like wheels with teeth; in the Ricinus, or Palma Christi, they are shaped like a grain of wheat; in the Pansies, they are angulated; in the Turkey Wheat, flat and smooth; in the Borage, like a thin leaf rolled up; in the Narcissus, kidney-shaped; in the Comfrey, like double globules. The powder of the antheræ, in point of fecundation, answers to Leuwenhoek's animalcules in the male sperm; and the stigma, which receives this dust, is always moist, that the dust may instantly adhere or stick to it. The observation of the famous botanist B. Jafsicu, concerning the Maple, deserves our notice. "Those Gentlemen," says he, "who have examined the fertilizing dust of the Maple by microscopes, have drawn the particles in form of a cross. But I found their form to be globular, and as soon as the particles touched any moisture, they burst into four parts or valves, in the shape of a cross." From which observation we may infer, that those particles are hollow globules containing some subtle matter within, and that as soon as the hollow globules touch the moisture, they burst and discharge their exceeding fine contents. This last observation throws some light on the generation of animals, from its analogy to the seminal animalcules. Upon the whole, it abundantly appears, that the antheræ are the male organs of generation, and their dust the genuine male sperm. Since in every flower the antheræ and stigmata are the genital organs serving for fecundation, and the antheræ the male organs, it is obvious to every one, that the stigmata, the other essential part of the flower, is the female organ of generation, which we shall more fully prove by the following arguments.

The parts of the pistillum are three, the germen, the style, and the stigma. The germen, or seed-bud, while the plant is in flower, is always imperfect and immature, being only the rudiment of the future fetus; the style is no essential part, for it is wanting in many species of plants; but the germen can never bring the fruit to maturity, except it be within the flower along with the stigma. Hence it follows, that the stigma is that part of the flower, which receives the impregnating dust. This will farther appear,—1. *From the Situation.*—For we are to consider that the stigma is always so situated, that the antheræ, or their impregnating dust, can reach it, as we have shown above. Hence the syngencious plants are rarely barren. Moreover, the stigma has always a figure proper and peculiar to itself, so that in most (though not all) plants it is double when the fruit consists of two cells, as in the masked and umbelliferous plants; triple, when the seed-vesel

Hook, (and other sagacious Naturalists) to show, that none of these diseases and infirmities in plants proceed from any pure accidental, but real cause; as flatus, venomous liquor, and infections. Some, even of the minutest animals, are provided with instruments to pierce the very solid substances of trees and plants, and infuse their pestiferous taint; where likewise they leave their eggs, boring those nestling places with certain

has three cells, as in the Lilies; quadruple, when the seed-vesel has four cells, as in the Grafts of Parnassus; there are five stigmata when the seed-vesel has five cells, or five seeds, as in the Geranium, Winter-green, Wood-sorrel; there are six stigmata when the seed-vesel has six cells, as in the Asarabacca; there are ten stigmata when the seed-vesel has ten cells, as in the Pork-physick; there are many stigmata when the seed-vesel has many cells, as may be seen in the Mallows, or in the Poppy, which is furnished with as many receptacles for the seed as there are stigmata. 2. *Time*.—The stigmata are always in full vigour at the same time with the antheræ. For in the Indian Wheat, as Logan observes, on the same day that the antheræ burst their inclosure, and hang down in the open air, are seen the bundles and extremities of the styles coming out of the sheath of the spike to open view. 3. *Falling off*.—The stigmata, in most plants, when they have discharged their office, drop off in the same manner as the antheræ do; which is a most evident sign that the stigmata contribute nothing to the ripening of the fruit, but serve only for the purpose of generation. 4. *Being cut off*.—If the stigmata be cut off before they have received the impregnating dust of the antheræ, the plant is castrated as to the female organs, and the fruit perishes: A sufficient demonstration that the stigma is that part of the female organ of generation destined for conception. The stigma of a flower has, besides, two other singular properties; namely, that it is always divested of the cuticle or film, nor has it any bark as the other parts, and then it is always bedewed with a moisture. Hence it appears, that the arguments of Pontedera have no force to invalidate this doctrine. For when he would oppose the doctrine of the generation of plants, the whole force of his argument is drawn from the umbelliferous plants, whose styles are not come up when their stamina appear. But the stigma is that part which serves for the purpose of generation, and not the style, which may be wanting in many, as it is not an essential part of the flower. It is sufficient, therefore, that the stigmata in the umbelliferous plants be in full vigour at the self-same time with the antheræ, though the style be lengthened after conception, which is the case also in the Maple.

The generation then of plants is brought about by the antheræ shedding their dust on the stigmata. It is not sufficiently clear in what way the generation of animals is accomplished; but thus far we are certain, that the male sperm must come in contact with the female organ, if there be any impregnation. In the vegetable kingdom the genital dust is carried by the air to the moist stigmata, where the particles burst and discharge their exceedingly fine or subtle contents, which impregnate the ovary. That this is the case, will be shown by the following arguments. 1. *Sight*.—When a plant is in flower, and the dust of the antheræ is flying about, part of this dust lights upon, and is seen to cling to the stigma. The flower of the Pansies shows this in a most agreeable manner; for, when the

terebrae, where we find those innumerable perforations which we call worm-eaten; the wider latebrae are made by erucæ, caterpillars, ants, and bigger insects, raising morbid tumors and excrescences, and preying upon the fruit, as well as on the leaves, buds, and flowers, so soon as their eggs are hatched, when they creep out of their little caverns, in armies like

flower is scarcely opened, you shall see the stigma, like a concave globe, gaping wide open on one side, and of a pure white colour; but, as soon as the five stamina have discharged their dust, you may observe the whole stigma filled with this genital dust, and covered all over with a yellow or brownish colour, yet the tube of the pistillum remains clear and transparent. Before this impregnation, if you gently squeeze the stigma, there oozes from it a certain sweetish liquor, which retains and attracts the genital dust. In the hedge-hyfsop also the stigma gapes or opens to receive the male dust, upon which it shuts, and the ovary being thus impregnated ripens its seed. The Iris shows us a particular structure; for the stigmata spreading wide, wholly cover the antheræ; yet they are so situated in regard to the petals, that, by means of a gentle wind under the stigmata, the male dust can mount by the channels of the petals. The *Campanula* differs from other flowers in this, that the male dust adheres to the side of the rough style, and from thence is communicated to the stigma by certain canals. In the syngenesious plants, the stigmata rise through a cylinder of the antheræ, and as each stigma comes up, it always brings along with it the fertilizing dust; hence fecundation rarely fails in such plants. 2. *Propagation*.—For the most part the stamina and pistillum are of the same height, that the male dust may more easily come at the stigma; but in some plants it is not so, and then a singular process of fecundation may be observed. In the *Geranium Inquinans*, or African Tree Cranesbill, with a thick mallow leaf and scarlet flower, where the pistillum is shorter than the stamina, the flowers before they blow are pendulous, but upon their opening they stand upright, that the powder may fall upon the stigma; after which they again nod till the fruit is ripe, and then they stand upright a second time, that their seeds may be more easily scattered about. The same may be seen in the *Claytonia Sibirica*. Some of the Pinks have pistilla longer than the stamina: the flowers do not nod, but the pistilla are reflected or bent back like rams' horns towards the antheræ. The flower of the *Nigella Arvensis*, or Horned Field Fennel Flower, when it first opens, has the five pistilla erect and longer than the stamina; but when the flower is well expanded, the styles are bent back that they may touch the antheræ which surround them; when they have received the male dust they are again elevated, and ever after remain erect. In the Tamarind-tree, Passion-flower, and Calsias, the styles are reflected nearly in the same manner towards the antheræ. 3. *Place*.—The stamina, for the most part, surround the pistillum, so that some of the dust is always blown by the wind on the stigma. Plants of the *Didynamia* class, which have their flowers erect, and standing at an acute angle with the stem, bend their stamina and pistilla to the upper lip of the flower, where the stigma, placed among the antheræ, is generally defended from rain. Plants of the *Dradelpbia* class, which have their flowers nodding at an acute angle from the perpendicular line, have the stamina and pistilla declining within the keel of the corolla, which is compressed or flat, that the fecun-

the Egyptian locusts, invading all that is green, the tender rudiments first, and then attacking the tougher and solider parts of vegetables. To those learned persons above, we may not forget the late worthy and pious Mr. Ray, where in the Second Part of his Treatise of the Wisdom of God in the Creation, we have a brief, but ingenious account of what

datation may be thereby facilitated, while the vexillum keeps off the rain. Plants of the *Menocia* class have the male flowers mostly placed above the female, that the dust may more readily fall on the pistilla, as may be seen in the *Cavex*, Indian Wheat, Job's-tears, Bur-reed, Cat's-tail, lesser Burdock, *Cafava*, *Ambrosia*, Water-milfoil, Arrow-head, and *Palma Christi*. Yet there are a few exceptions, among which we shall reckon the Pine and the Fir, where the antheræ are so very numerous, that if any animal, or the wind, shake the tree, we may see the dust flying upwards like smoke; and so plentiful is the dust, that if, in the time of flowering of the Pine, Fir, or Juniper, it chanced to rain, the banks of the adjacent standing waters are painted with yellow rings of the dust from those trees. The *Teucrium Flavum*, or Shrubby Germander, has a yellow corolla, the two upper segments of which ascending, prefs like fingers the antheræ, which are placed on nodding filaments to the stigma, that the genital powder may touch it, and they continue to cover it for some days after the fecundation, and then resume their former place. The *Feratrura Album*, or White Hellebore, has its male flowers placed below, but the others and upper flowers are all hermaphrodites; for which reason the male flowers, as not being so necessary, are placed lower. 4. *Time*.—Here we are to observe, that the stamina and pistillum come at the same time, and that not only in one and the same flower, but also where some are male and others female, on the same plant, a very few only excepted. The wonderful contrivance of the Great Author of Nature in the *Jatropha* or *Cafava*, and the Plantain-tree, is truly worthy of our observation. The *Jatropha Urens*, or Prickly Cafava, has a Corymbus, whose first or uppermost forks bear female flowers, which come out a day or two before the males; the other forks, or branches, of the Corymbus produce male flowers, but the female flowers, which come out first, cannot be impregnated by their dust, because they were withered before the males expanded; and therefore those female flowers prove abortive, unless they are impregnated from some other Corymbus which has male flowers at the same time. The *Musa Paradisiaca*, or Plantain-tree, produces a spadix, which contains often two hundred germina, the few female flowers of which continue in blow for some days; when the female flowers have done blowing, the males succeed, and continue in flower till the fruit is ripe, in which no seed is to be found. Wherefore the authors of the Hortus Malabaricus have asserted that seeds were evidently wanting in the Plantain-tree, which seemed a Paradox to Linnæus; but when he saw the first female flowers destitute of males, and that the males which followed came too late to impregnate the females, he clearly perceived that no seeds would ever be produced in this species, unless several plants placed together were to flower nearly at the same time, and then one could impregnate the other. There is one thing farther remarkable in the *Musa*, and that is, it produces two sorts of flowers, very different in the same plant, some of which want the stigmata, and others the antheræ; the first may be called male hermaphrodites, and the

BOOK II.

concerns this subject, together with what is added about spontaneous productions of these despicable little animals, to which I refer the curious.

Trees, especially fruit-bearers, are infested with the measles, by being burned and scorched with the sun in great droughts; to this com-

latter female hermaphrodites. Here then we have an unexampled species of Polygamy, where those different flowers may impregnate each other, and one female joined with barren males is impregnated by the males belonging to another female, which is itself barren. Another thing which merits our observation in regard to time is, that when the male and female flowers are in distinct cups on the same plant, or on different plants of the same species, and where the male flowers are not erected perpendicularly over the females, there it is necessary that the flowering be over before the leaves come out, lest the fecundation should be hindered by the intervention of the leaves; *e. g.* in the Mulberry, Mistleto, Alder, Birch, Hornbeam, Beech, Oak, Hasel, Walnut, and also in the Willow, Sea-buckthorn, *Myrica* or Dutch Myrtle, Poplar, Ash, and Dogs-Mercury.

5. *Rains*.—In almost all sorts of flowers we see how they expand or open by the heat of the sun; but in the evening, and in a moist state of the air, they close or contract their flowers, lest the moisture getting to the dust of the antheræ should coagulate the same, and render it incapable of being blown on the stigmata; but (which is indeed wonderful) when once the fecundation is over, the flowers neither contract in the evening, nor yet against rain. Flowers with covered antheræ never shut up in the night-time; *e. g.* those of the *Dynamia* and *Diadelphia* classes. The antheræ of the Rye hang out beyond the flower, and if rain falls while it is in flower, the dust is clotted; hence the husbandmen do truly predict a bad crop of Rye; for the grains are not so numerous, because many of the florets prove abortive. But the antheræ of the Barley lie so close within the husk, that the rain cannot get in. If rain falls upon the bloom of the Apple, Pear, or Cherry, the gardener immediately dreads the blossoms falling off, or proving abortive; and experience confirms the truth of this, for the powder of the antheræ is spoiled; yet this accident oftener happens in the Cherry than the Apple or Pear; for all the antheræ of the cherry flowers discharge their dust at once: but the case is not so in the others. Smoke also is injurious, by drying up the moisture of the stigmata.

6. *Culture of Palm-trees*.—That the cultivators of the common Palm-tree, or Date-tree, cut off the male spadixes, and place them over the females, is recorded by Theophrastus, Pliny, Prosper Alpinus, Tournefort, Kämpfer, and others; and if they neglect to do this, the Dates are harsh, bad-tasted, and many trees wholly destitute of fruit. The Date-tree is every year thus impregnated in Arabia, Persia, and Egypt, by the inhabitants. “The male spathe being ripe (says Kämpfer) are taken from the top of the tree, the spadixes taken out, and divided into lesser branches, that the rudiments of the fruit may be sprinkled with the minute atoms of their dust; a small branch of the male spadix is fixed into the middle of the female spadix, and thus discharges its dust on the seed-buds. It is remarkable that the spadixes dried, are still proper to impregnate the females, and may be kept a whole

monly succeeds lousinefs, which is cured by boring a hole into the principal root, and pouring in a quantity of brandy, stopping the orifice with a pin of the same wood. CHAP. VII.

Crooked trees are reformed by taking off or topping the preponderers whilst charged with leaves, or woody and hanging counterpoises.

year without losing their virtue. It sometimes happens that the females are impregnated by the dust blown to them by the wind; but since this is precarious, it is better done by the hand. If there be no impregnation, the female trees inevitably drop all the rudiments of the fruit, which is a great calamity to the owners, and to the country people in general, who are supported by their crop of Dates, as we are by our crops of corn. I remember it happened in my time, that the Grand Seignior meditated an invasion of the city and territory of Basora, which the Prince of the country prevented, by giving out that he would destroy all the male Palm-trees on the first approach of the enemy, and by that means cut off from them all supplies of subsistence during the siege." Thus far Kæmpfer. Hear also what Tournefort says on this subject. "Hagdi Mustapha, Ambafador from Tripoli, told me, that a branch of the flower of the male Palm was inserted into the spatha of the female just at the time the spatha used to open; for when the flower is fully expanded, it sheds its dust; without the assistance of which the Dates would be harsh and ill-tasted, disagreeable, and without stones or kernels, and only fit to be given to camels and other beasts of burden." In the males and females of the *Pistachia* Nut-tree they observe the same method as in those of the Date-tree. "In Sicily (says Geoffroy, in his *Materia Medica*) the countrymen pluck clusters of flowers from the male *Pistachia*, with the fecundating dust of which they impregnate the female flowers: Others gather the male flowers, expose them to dry in proper bags, and scatter the prolific dust on the female flowers, that the fruit may not prove abortive, and the crop fail." 7. *Nodding Flowers*.— Since the male dust is generally of a greater specific gravity than the air, in most plants that have the pistillum longer than the stamina, the All-wise Creator has made the flowers nodding, that the powder may more easily reach the stigma, as may be seen in the common Snow-drop, greater Snow-drop, Sow-bread, *Naveifus*, Fritillary, *Campanula*, Dogstooth, Violet, &c. Now it cannot be said that this happens merely from the weight of the flower, for sometimes the fruit in the same plants, which is ten times heavier than the flower, grows erect, as in the Crown Imperial, Fritillary, and others. 8. *Sunk Flowers*.— The stems of many plants grow under water; but a little before they blow, the flowers emerge or rise above the surface of the water, as we see in the water-lily, Frogs-bit, Broad-leaved Pond-weed, Perennial Arsmart, &c. There are others in which all the parts grow under water, as the Water-milfoil, Water-soldier, several of the Pond-weeds, all which, about the time of flowering, raise their flowering stems above the water, which stems sink again as soon as the time of flowering is over. The *Valisneria* of Micheli, a kind of Pond-weed, which grows in Italy, bears a very long scapus, or flowering stem, but twisted in form of a screw; hence it appears very short. This plant grows in rivulets and ditches under water, and bears on the extremity of its stem one flower only. About

Excorticated and bark-bared trees may be preserved by nourishing up a shoot from the foot, or below the stripped place, and inserting it into a slit above the wounded part: to be done in the spring, and secured from air, as you treat a graff: This I have out of the very industrious Mr. Cook, p. 48. But Dr. Merret brought us in this relation to the Royal Society, that making a square section of the rinds of Ash and

the time of blowing, the scapus is lengthened till the calyx has reached the surface of the water; which done, the flower is expanded, and, after a few days, the flowering and impregnation being over, it sinks again, the stem turning in a spiral form as before. This is the female plant. The *Vallinoioides* of Micheli grows in the same places under water, having a flower stem scarce an inch high, which consequently does not reach the surface of the water; this bears many flowers, which when the time of flowering approaches, drop from the scapus, and rise like little bladders: as soon as they have reached the surface of the water, though before shut, they then open, and swimming about, shed their dust on the female flowers, which are also swimming in the same places. This is the male plant of the former. H. Cliff. 454. Micheli, without attending to the sex, has carefully observed and faithfully described this circumstance. 9. *Syngenesious Flowers*.—The compound flowers are formed in different ways. In the *Polygamia Aequalis* all the florets are furnished with stamina and pistilla. In the *Polygamia Superflua* all the florets have stamina and pistilla in the disk or middle of the flower; but in the radius there are only female flowers, which are impregnated by the male dust of those in the disk. In the *Polygamia Superflua* the disk is filled with hermaphrodite florets, as in the former; but the female flowers, which constitute the radius, cannot ripen their seed, being all without stigmata. Lastly, the florets of the *Polygamia Necessaria*, which fill the disk, have the stamina and pistilla, but for want of the stigmata these florets bear no seeds, and the plants would all have been barren, had not the All-wise Creator furnished the radius, which consists only of female florets, with complete pistilla that have the stigmata, and consequently ripen the seed. 10. *Consideration of all Sorts of Flowers*.—The tenth and last argument is drawn from the genuine consideration of all sorts of flowers. And here, for the sake of brevity, we shall examine only a few out of the many that might be produced in proof of the Linnæan doctrine of the generation of plants. The *Celisia*, Cocks-comb, is furnished with a pistillum surrounded by five stamina, whose filaments are joined below by a thin plaited film. In moist weather this film is relaxed, and the antheræ stand at a great distance from one another, but in dry weather the film is contracted, by which means the filaments come close together, so that the antheræ almost touch the stigma, and hence the impregnation is assisted. The Saxifrage has ten stamina, in the centre of which are two pistilla. After being in flower for some days, two of the stamina, which stand opposite to one another, meet, that their dust may fall perpendicularly down on the stigmata, while their antheræ force open, as it were, each other's farinaiferous cells, by rubbing against one another; next day these two stamina recede from one another, and two others supply their place, and thus they continue to do till all the males have discharged their dust in the same manner. The grafs

Sycamore, (March 1664,) whereof three sides were cut, and one not; the success was, that the whole bark did unite, being bound with pack-thread, leaving only a scar: but being separated entirely from the tree, namely several parts of the bark, and at various depths, leaving on some part of the bark, others cut to the very wood itself, being tied on as the former, a new rind succeeded in their place; but what was covered over beyond

of Parnassus has five short stamina; one of which, as soon as the filament is sufficiently lengthened, touches the stigma with its antheræ, and having discharged its fertilizing dust, immediately rises, and whereas it was bent inward before, it now bends backward, and the filament grows afterwards almost as high as the corolla; then the second stamen comes forward in the same way and manner; then the third, fourth, and fifth, till they have all discharged their office. The *Lychnis Flos Cœuli*, or Meadow Pinks, and the *Gypsophila Fastigiata*, a kind of Soapwort, have procumbent stems; but when the time of flowering approaches, these are raised upright, that the dust of the antheræ, being exposed to the wind, may be more readily blown upon the stigmata. This is also the reason why the greatest part of flowers are elevated on flowering stems above the ground, that the wind may more easily shake them. For the Narcissus, Snow-drop, Violet, Cross-wort, and some others, have their stems erect, but after the time of flowering, their stems recline to the ground.

Almost all the spiked plants begin their flowering below, or in the lower part of the stem, that in case the dust of the first should not prove sufficient, that of the latter may make up the loss. Of this sort are also the corymbiferous and umbelliferous plants, not to say the compound flowers, where the florets constituting the radius open first; then follow the interior florets, and the disk is elevated or raised, that the exterior florets may also receive some of their dust, if they were not sufficiently impregnated before.— This is so certain and constant a rule, that when Linnæus found the *Hieracium Præmorsum*, the greater Broad-leaved Hawk-weed, or greater Upright Mouse-ear, observe a different order, *i. e.* the uppermost flowers come out first, he thought it a singular instance in Nature. The Pellitory clearly shows us the process of generation; if we observe it in a morning at a proper hour, we shall see how its antheræ burst with great elasticity, and emit their dust all round; and, of consequence, also upon the pistillum. The same experiment succeeds, if we touch the antheræ with the point of a needle, as Vaillant has observed.— The Melons, Pompions, Cucumbers, Gourds, &c. have two sorts of flowers; the one male, which are called barren; the other female, which bear the pistilla and fruit. The gardeners advise, that the barren flowers should be carefully plucked off, by reason they think these deprive the plant too much of its nourishment: But without doubt they are mistaken; for they had better take the entire male flowers and sprinkle the females with their dust at noon, or roll the male flowers on the female, by which means the male dust will readily reach the stigmata, and the females, thus impregnated, will ripen their fruit: for the reason why the fruit drops off, is for want of being impregnated, and not for want of nourishment, as is the vulgar opinion. Hence it is, that if gardeners do not give air to

BOOK II. the places of incision with diachylon plaster, and also bound as the rest, did, within the space of three weeks, unite to the tree, though with some shrivelling and scar: The same experiment tried about Michaelmas, and in the winter, came to nothing: Where some branches were decorticated quite round, without any union, a withering of the branch beyond the incision ensued; also a twig separated from a branch, with a sloping cut,

their stoves, so that generation may be assisted by the help of the wind, the fruit drops off, or miscarries. In 1723, a Pompion flowered in Stenbroholt Garden, the male flowers of which were carefully plucked off every day, as soon as they appeared, lest they should draw from the female flowers too much of their nourishment; the consequence was, that not one fruit appeared on the plant that season. If we pluck the flowers of the male Hemp, before those of the female plant are opened, we shall get none, or but very few ripe seeds. Yet it happens sometimes, that the female Hemp, bears one or two male flowers, by which some of the females may be impregnated; and this circumstance deceived Camerarius. The Hops are of two sorts; the one male, and the other female; and that which they commonly call the fruit, is only the calyx expanded and lengthened; hence the female plants, though not impregnated, can bear cones. This it was which deceived Tournefort, so that he would not acknowledge the sexes of plants, because a female plant of the Hop, in the garden at Paris, throve well, and bore fruit in plenty every year, when no male plants were within several miles of it. The same thing happens in the Mulberry and Blite, the berries of which are only succulent calyxes, but not seed-vesels or ovaria.— One Richard Baal, a gardener at Brentford, sold a great quantity of Cauliflower seed, which he raised in his own garden, to several gardeners in the suburbs of London, who carefully sowed the seeds in good ground, but they produced nothing but the common long-leaved Cabbage; for which reason they complained that they were imposed upon, and commenced a suit against the aforefaid Baal in Westminster Hall. The Judge's opinion was, that Baal should return the gardeners their money, and also make good their loss of time and crops. Ray's Hist. vol. I. p. 42. This however ought not to be considered as a fraud on the part of the poor gardener, but ought to be ascribed to the impregnation of his good plants by the common Cabbage. Wherefore, if we have an excellent sort of Cabbage, we ought not to let it flower in the neighbourhood of an inferior kind, lest the good sort be impregnated by the dust of the other, whereby the seeds will produce a degenerate race. If we intend to plant the Poplar or Willow, for walks, we should take only the male plants for that purpose; for if the females are planted, they will multiply so fast as to form a grove instead of a walk. The Juniper does not produce fruit every year in equal plenty; for if rain falls during its time of flowering, the fruit is deprived of the farina, and falls off. A female plant of the Juniper grew for many years in Clifford's garden, but never produced any fruit for want of a male plant. The *Rhodota*, or Rosewort, grew in the Upsal garden from the year 1606, at which time Professor Rudbeck brought it thither from the mountains of Lapland; but it never ripened its seeds, being without a male plant. It is needless to mention more examples, though I could easily

and fastened to it again in the same posture, bound and covered with the former plaster, withered in three days time. Among other easy remedies, a cerecloth of fresh butter and honey, applied whilst the wound is green, especially in summer, and bound about with a thumb-rope of moist hay, and rubbed with cow-dung, has healed many: But for rare and more tender trees, after pruning, take purely refined tallow,

CHAP. VII.

deduce some singular experiments from many more plants, to corroborate this doctrine of the generation of plants. I shall not speak of the Maize, the generation of which is denied by Siegesbeck and others, from the situation of the antheræ and pistilla; but refer for this to a treatise written by Mr. Logan, of Philadelphia, entitled, "Experiments concerning the Generation of Plants." Concerning the Hazel, see the Experiments of Mr. Bradley, late Professor of Botany in Cambridge. As to the Fig-tree, we shall explain its peculiar manner of generation, which is called Caprifigation, more at large.—Tournefort, while he was in the islands of the Archipelago, accurately observed this, and has described it in the following manner. "There are three varieties of the *Caprificus*, or Wild Fig, which is the male, called by the natives *Fornites*, *Cratirites*, and *Orni*. These produce their fruit at three different times of the year; the fruit of the *Fornites*, or first variety, begin to bud in August, and hold to the end of November, at which time many small insects make their escape from them, and lay their eggs on the *Cratirites*, or second variety, whose fruit is now coming out. The *Cratirites*, or second variety, bud in the end of September, and hold till May following. The insects sometimes come out of these before the *Orni*, or third variety are budded; in which case the husbandmen carefully seek for those trees of the *Cratirites* whose insects have not yet come out, and tie their branches on the *Orni*, that the insects may lay their eggs thereon. The *Orni*, or third variety, bud in May, and are ripe in July. In all the three varieties, certain insects are generated, which deposite their eggs, and these eggs become worms, and afterwards are turned into flies before the fruit falls off. The countrymen chiefly gather the *Orni* in June and July, a little before the dog-days, or when the insects begin to fly, and tie them with threads to the cultivated Fig-tree; then the insects by wounding the orifices of the cultivated Figs, make their way into the cavities of the fruit, which ripen after this in about fourteen days." This we shall now explain. The *Caprificus*, or Wild Fig, is the male plant, and the cultivated Fig the female. The flowers are disposed within the cavity of the receptacle, which is so close shut, that often it will scarce admit the end of a common needle through the pore in its extremity. Now the fig-flies, which are of the ichneumon kind, being transformed, and furnished with wings, about the time the farina of the male Fig is ripe, make their escape from those male Figs, and being wholly covered with their dust, after copulation, they seek for a place to lay their eggs, and flying to every one of the female Figs, they enter their cavities, which are filled with pistilla from all sides, by which means they must necessarily brush off that farina, or male dust, with which they were covered, and thus the seeds are impregnated. It is true, the female Fig can ripen its fruit, though the seeds are not impregnated, because this fruit is not a pericarpium, or see l-vefvel, but

BOOK II. mingled and well hardened with a little loamy earth and horse-dung newly made.

Dr. Plot speaks of an Elm growing near the bowling-green at Magdalen-College, quite round disbarked, almost for a yard near the ground, which yet flourishes exceedingly; upon which he dilates into an accurate

only a receptacle: So that also the Hop, Mulberry, Strawberry, and Blite, can produce fruit, though their seeds do not ripen, because their fruit is nothing but a receptacle or calyx. Some botanists, who were ignorant of this, seeing those trees produce fruit without previous impregnation, thought they had found an unanswerable argument against the generation of plants; but they did not consider, that the fruit of the Fig is not a seed-vesel, but a common receptacle. Yet it appears, that the fruit of the Fig, if the seeds are impregnated, grow to a much larger size than those which are not; which Tournefort also observed; for he tells us, that a Fig-tree, in Franche Compte, where there is no caprification, produced every year only twenty-five pound weight of Figs; but that another of the same size in one of the islands of the Archipelago, produced yearly two hundred and eighty pound weight of Figs, which is above ten times the quantity of the other. This age hath clearly refuted the opinion of Camerarius, who maintained that the seeds of Figs, never produced any plants. For Linnæus tells, that Fig-trees are raised every year in Holland from the seeds, provided the fruit is brought from Italy. But if the fruit grew in France, England, Germany, or Sweden, where there are no Wild Figs, the seeds produce nothing; on the other hand, if those seeds are sown, which grew in Italy or the Greek islands, where the male Fig abounds, the plants readily spring up, putting forth leaves, which at first are like those of the Mallow. The same experiment was tried with good success in the Upsal garden in the year 1744. I shall now mention the utility of insects in the fecundation of plants. In a great many flowers there is a honey-juice, separated by the flower, which Pontedera thinks is that balsam which the seeds imbibe, to make them keep and preserve their vegetative quality longer; and as long as the balsam is not dried up or spoiled, so long the seeds are fit to germinate. Several insects, as bees, flies, butterflies, live on this honey-juice only. Quintilian, the Roman Orator, has a very singular case in one of his Orations: "A poor man and a rich man," says he, "had two small adjoining gardens. The rich man had many fine flowers in his garden, and the poor man had bees in his. The rich man complained that his flowers were spoiled by the poor man's bees, which he warned him to remove. The poor man not complying, the other scattered poison on his flowers; on which the poor man's bees all died; and Dives is guilty of this great injury. The poor man pleads that the bees did no hurt at all to the rich man's flowers; that neither the Creator nor any human laws, had ever restrained bees within any certain limits; and therefore the rich man might hinder the bees from settling on his flowers if he could." But the other might have objected, that the bees were so far hurtful to his flowers, that they sucked the honey-juice, and carried off the fertilizing dust. After all, it is probable that the bees are more useful than hurtful to flowers, since by their unwearied labours they spread the fertilizing dust, so that

discourse how it should possibly be, all trees being held to receive their nutrition between the wood and the bark, and to perish upon their separation; this tree being likewise hollow as a drum, and its outmost surface, where decorticated, dry and dead. The solution of this phenomenon (to all appearance, from the verdant head,) could not have been more philosophically resolved, than by the hypothesis there produced

CHAP. VII.

it may reach the pistillum: for it is not clear what use the honey-juice is of in the œconomy of flowers. From what has been said it appears, that the generation of plants is performed by the genital dust of the antheræ falling on the moist stigma, or female organ; which dust by the help of the moisture, adheres and bursts, discharging its contents, the subtle particles of which are absorbed by the style, into the ovarium, germen, or seed-bud.—Upon the whole, I think that the flowering of plants may be truly called their generation; the antients having with great propriety named the flower, the joy of plants. *Flor gaudium arborum.*—PLIN.

The calyx then is the bed, in which the stamina and pistilla, celebrate the nuptials of plants; and here also those tender organs are cherished and defended from external injuries. The corolla, or petals, are the curtains, closely surrounding the male and female organs, in order to keep off storm, rain, or cold; but when the sun shines bright, they freely expand, both to give access to the sun's rays, and to the fecundating dust. The filaments are the spermatic vessels by which the juice, secreted from the plant, is carried to the antheræ. The antheræ are the testicles, and may not improperly be compared to the soft roe or milt of fishes. The dust of the antheræ answers to the sperm and seminal animalcules; for, though it is dry, that it may the more easily be conveyed by the wind, yet it gets moisture upon touching the stigma. The stigma is that external part of the female organ which receives the male dust, and on which the male dust acts. The style is the vagina, or tube, through which the effluvia of the male dust pass to the germen or seed-bud. The germen is the ovary, for it contains the unimpregnated or unfertilized seeds. The pericarpium, or seed-vessel, answers to the impregnated ovary; and, in fact, is the same with the germen, or seed-bud, only increased in bulk, and loaded with fertile seeds. The seeds are the eggs, of which we have already fully spoken. We ought to observe, that the calyx is a production of the external bark of the plant; the corolla, of the inner bark; the stamina, of the alburnum, or white sap; the pericarpium, or seed-vessel, of the woody substance; and the seeds, of the pith of the tree; for in this manner they are placed, and in this manner also they are unfolded. Therefore in a flower we find all the internal parts of a plant unfolded. This, though obscurely, was taken notice of by Cæsalpinus, and also by Mr. Logan of Philadelphia. Flowers then are nothing else but the genitals of plants, with this difference from those of animals, that their organs of generation are reckoned obscene, and modesty forbids us to examine them; for which reason nature has taken care frequently to hide them from our sight. But in the vegetable kingdom it is quite otherwise; for there those parts are not hid, but rather exposed to the view of all. Add to this, that they are the most beautiful of all the parts of plants, in which the

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by the Doctor, who assures me, he was yet deliberating whether the tree being hollow, it might not possibly proceed from some other latent cause, as afterwards he discovered; when having obtained permission to open the body of it, he found another Elm letting down its stem all the length of this empty case, and striking root when it came to the earth, from whence it derived nourishment, maintaining a flourishing top, and has,

study, love, and contemplation of men are conversant. As the genitals of all animals have a rank and strong smell in rutting time, so the flowers, or genitals, of plants also send forth a smell, which, though very different in different plants, is for the most part very agreeable. We see then how the Great Creator has enriched the most innocent nuptials of plants, with the most singular and superb ornaments. Let us behold the bed, or calyx; with what art is it constructed! the curtain, or superb covering, called the corolla, how neat and elegant its extremity or termination, how splendidly cut or carved, how fine and thin, and with what lively and beautiful colours is it adorned! We may truly say, in the emphatical language of the scriptures, *that Solomon in all his glory was not arrayed like one of these.* The *Anavathus Tricolor* wants this beautiful covering of the corolla; but here nature has taken care to cover the flowers with a shade or fine-coloured crown of the leaves, which is laid over the flowers, that the few males, being defended from showers, might more easily and safely discharge their farina on the females below. All animals appear most beautiful and healthy just before their copulation. The hart tosses up his prominent horns; the birds shine and glitter with gay colours; the fishes taste then most deliciously. But when the time of copulation is over, the hart loses his lofty or towering horns; the birds lose much of their beauty; and the fishes a great deal of their former flavour or fine taste. Now plants are subject to the same changes: for in the spring and flowering-time their verdure and beauty is most amazingly gay; but, when that is over, they lose much of their former splendor. Thus copulation weakens and debilitates. In the silk worm, moths and butterflies, one may see, when their copulation is over, how their wings droop, and their life expires; but if a butterfly be shut up in a room alone, and not suffered to copulate with others, it will often remain in health and vigour for half the year. In the annual and biennial plants one may observe, that before they have flowered, they resist the cold of winter, e.g. the Pinks, Lichnises, and others; but if they flower the first year, as soon as winter approaches they generally die; if, on the other hand, they do not flower, they will often continue in vigour three or four years. The Plantain-tree has continued in the gardens of Holland for a hundred years; but when it has once flowered, no art, skill, or experience, can prevent its lofty stem from perishing the year following. The *Corypha*, or Umbrella Palm-tree, remains barren for thirty-five years, growing in that time to the height of seventy feet; and in the space of four months after that time, it rises thirty feet higher, puts forth its flowers, and produces its fruit the same year; which done, it totally dies, both root and stem. Hort. Cliff. 482. The *Lavatera Arborescens*, or Sea Tree-Mallow, will rise to a considerable height, bearing the winter frosts very well; but when it has once blown, though it were to produce but one flower, not all the assistance of the

til now, paused for a little miracle, as it still may do for a thing extraordinary, and rare enough; for not only its passage, and how it should come there, unless haply some of the samera, or seed, of the old tree, when pregnant, should have luckily fallen down within the hollow pipe, or, as might be conjectured, from some sucker springing of a juicy root, but the strange incorporating of the superior part of the bole with the

gardener, or green-house, or any art, can prevent its perishing on the first approach of winter.

The stomach of plants is the earth, from which they receive their nourishment; and the finest and most subtle part of the soil is their chyle. The root, which carries the chyle from the stomach to the body of the plant, is analogous to the lacteals or chyiferous vessels of animals. The trunk, which supports and give strength to the whole plant, is analogous to the bones. The leaves by which plants transpire, are instead of lungs. The leaves may be also compared to the muscles of animals; for by their agitation with the wind the plant is put in motion. For these reasons, herbs furnished with leaves cannot thrive, except they have air; but succulent plants, which have no leaves; *e. g.* some of the *Euphorbias*, Torch-thistles, Melon-thistle, Prickly-pear, and the *Stapelia*, though shut up in green-houses, and quite deprived of the external air, do thrive very well. If you shut up a tree or a shrub, which is full of leaves, in a close room in the summer time, it will die; but if in the winter, when it has lost all its leaves, it will remain safe. Heat is to plants analogous to the heart in animals. Plants have no heart, nor indeed have they any occasion for such an organ, for they live in the same manner as Polypes do in the animal kingdom; their juices, mixed with air are propelled through the vessels, but not circulated back again by returning vessels. The blood-vessels of animals are divided into various branches, so also are the vessels of plants.

From what has been said it follows, that a flower which is furnished with antheræ, but wants the stigmata, is a male flower, that a flower which has stigmata, but no antheræ, is a female; and one that has both, is an hermaphrodite flower. Nor need we wonder, that in the vegetable kingdom many plants are hermaphrodite, though in the animal kingdom there are very few of this kind; for there one sex can easily go to the other; whereas plants are fixed to one spot, and cannot go from it. Justly therefore has the All-wise Creator furnished snails and other slow-paced animals with the genital organs of both sexes, lest the species should be extinct or lost; during their copulation then, the one acts on the other, and each acts the part of male and female, while both impregnate and are impregnated by each other.

We call a plant which has only male flowers, a male plant; that which has only female flowers, a female plant; and that which has only hermaphrodite flowers, an hermaphrodite plant. A fourth sort, having on one and the same stem both male and female flowers distinct, is called an androgynous plant. There is also a fifth sort, namely, when on one and the same plant there are not only hermaphrodite flowers, but also male or female flowers; and this is called a polygamous plant. When male flowers are added to the hermaphrodite, they serve to impregnate those which have not been impregnated by their

BOOK II. old hollow-tree which embraces it, not by any perceptible roots, but as if it were only one body with it, whilst the rest of the vaginated stem touches no other part of the whole cavity, till it comes to the ground, is surprising. This being besides very extraordinary, that a tree, which naturally grows taper as it approaches the top, should swell, and become bigger there than it is below. But this the Doctor will himself render

own males, *e. g.* in the Cross-wort, and White Hellebore; or if female flowers are added, they are impregnated by the farina of the hermaphrodite flowers, as in the *Pellitory* and *Orrache*. It is very remarkable, that the seeds of the hermaphrodite flowers in the *Orrache* are altogether unlike the seeds of the female flowers both in shape and size, yet they produce the same plant, as well as the seeds of compound flowers do, which grow in the disk and in the radius, or in the centre and margin of the flower. To this place we may refer a third sort of polygamous plants, in which there are two sorts of hermaphrodite flowers on one individual, one sort wanting the stigmata, and the other the anthera, as in the Plantain-tree.

When there are more petals in flowers than they ought to have, such are said to be luxuriant; and they are of three sorts, viz, Full, when all the stamina are wanting, and petals only grow in their room: Multiplied, when some of the stamina are wanting, and some remain: or Proliferous, when another flower with its proper flower-stalks grows out of the pistillum, or centre of the flower. All luxuriant flowers are justly reckoned monsters; since the essential parts are changed into a different nature and figure: which, notwithstanding, is much admired by florists, who take great delight in full and multiplied flowers, or double flowers, as they commonly call them. It is remarkable, that when monopetalous flowers are changed into luxuriant or full ones, only the corolla is increased, as in the Gelder Rose, African Marygold, Feverfew, &c. And this holds chiefly in compound flowers, and but seldom in any other. Hence we may see, that no full flowers are ever natural, but always propagated from single ones; for nature never produces any race of mere monsters. These full flowers are at first produced from a superabundance of nourishment. And since these full flowers are destitute of stamina, they are consequently deprived of the male organs of generation, which should impregnate the stigmata; but no seeds will germinate, (as we have observed before,) unless they have been fertilized by the male dust; therefore such flowers must necessarily be barren, or produce no seeds. Of this sort are the Pinks, the *Hepatica*, Stock July-flower, Indian Crefs, Pomegranate, Rose, *Ranunculus*, Marsh-marygold, *Lychmis*, Violet, Wall-flower, Piony, *Narcissus*, &c.—All these, with full flowers, never produce seeds, but are propagated by suckers, off-sets, or slips. I am well aware, that the Poppy, the Fennel-flower, and some few among the compound flowers, do sometimes produce good seeds, because some of their stamina remain to impregnate the pistillum. The same way of reasoning may be applied to all proliferous flowers, *e. g.* the *Ranunculus* and Rose; for they are barren, because they want the germen, and female parts of generation, when the proliferation is from the centre of the flower; but their offspring sometimes produce good seeds, providing they are not full flowers.

From this dissertation the reader may perceive how similar nature is to herself, and how



Fig. 6.

J. H. ...

a more minute account of in the next impresson of that excellent piece of his; nor had I anticipated it on this occasion, but to let the world know, in the mean time, how ingeniously ready he is to acknowledge the mistake, as he has been successful in discovering it.

Deer, conies, and hares, by barking the trees in hard winters, spoil

exact in following her own laws in all her works. Who would ever believe so many truths were discoverable concerning plants? though, without doubt, there are many more that remain still undiscovered. I shall conclude with the words of Pliny: "That there is in plants a natural instinct to generation; and that the males, by a certain blast and subtle powder, do consummate the nuptials on the females."—Nat. Hist.

And now we are upon the subject of Generation, let us take a view of the analogy between animal and vegetable parturition. The subject is curious, and I believe, has hitherto passed unnoticed; I mean the parturition of an ear of corn. Pl. 36, Fig. 1. represents an ear, or husk, of wheat, confined in what may be called the uterus, and within a few days of delivery. *a.* The os uteri. *b. b.* The gravid uterus, the mouth of which is, at this time, sealed up to keep out the dews and rain. Fig. 2. The uterus cut open, to show the ear in its natural situation. *a.* The os uteri. *b. b.* The uterus cut open. *c.* The ear. Fig. 3. An ear of wheat after having passed through the os uteri. This may be called a natural birth. *a.* The ear. *b.* The os uteri. As the fibres of the vegetable os uteri, are incapable of distention, the ring is divided, to allow a passage for the ear without laceration. *a. a.* The uterus delivered of its burden. Fig. 4. An ear of wheat some days after a natural delivery. *a.* The ear. *b.* The uterus contracted to its natural size.—Fig. 5. An ear of wheat, after having forced its way through the side of the uterus, the neck being rendered impervious in consequence of being bent down by the action of the wind. This may be called the Cæsarean operation; but which, from the peculiar structure of the vegetable uterus, is not attended with danger. *a.* The os uteri. *b.* The neck of the uterus, bent down by the action of the wind. *c. c.* The uterus. *d.* The ear, delivered in a more easy way than in Fig. 6. Fig. 6. An ear of wheat in the act of forcing its way through the side of the uterus. *a.* The os uteri. *b.* The neck of the uterus bent down by the action of the wind. *c.* The ear forcing its passage through the side of the uterus.—*d. d.* The uterus. On a careful examination, we find the uterus made up of a broad leaf, folded up into a tubular form, so that by a gentle lateral pressure of the ear, it is easily unfolded. Had it been a perfect tube, parturition could never have been performed without laceration, in cases where the neck of the uterus was bent down by natural violence. This is a wise provision of the Author of Nature, to obviate frequent and unavoidable accidents. And here it will be proper to remark, that the birth of the ear, or husk, is previous to conception, the antheræ and stigmata being at this time imperfectly formed; so that the vegetable has another birth to undergo, when the grain has arrived at maturity. It is in this manner that God has thought proper to discover to our senses

BOOK II. many tender plantations: Next to the utter destroying them, there is nothing better than to anoint that part which is within their reach, with *stercus humanum*, tempered with a little water or urine, and lightly brushed on; this renewed after every great rain: But a cleanlier than this, and yet which conies, and even cattle most abhor, is to water or sprinkle them with tanners' liquor, viz. that which they use for dresing their hides; or to wash with slacked lime and water, altogether as expedient; also to tie thumb-bands of hay and straw round them as far as they can reach.

Mofs (which is an adnascent plant) is to be rubbed and scraped off with some fit instrument of wood, which may not exorticate the tree, or with a piece of hair-cloth after a sobbing rain; or by setting it on fire with a wisp of straw, about the end of December, if the season be dry, as they practise it in Staffordshire; but the most infallible art of Emuscation is taking away the cause (which is superfluous moisture in clayey and spewing grounds,) by dresing with lime.

Ivy is destroyed by digging up its roots, and loosening its hold; and

much of his Providence; and to encourage our researches, he has endowed us with a most ardent desire to trace him along the path that he has made.

4- AGE. It is abundantly evident that every living thing has its beginning and ending, and undergoes innumerable changes. Thus we see that infancy is weak and feeble; but youth is comely, flourishing, and luxuriant. Manhood is plump, strong, and full of stature; but old age droops, becomes weak, languid, and dry, the sad presages of approaching dissolution. And are not plants subject to the same vicissitudes, and go through the same stages? In their infant, or very youthful state, they are small and weak, destitute of flowers and fruit; when more advanced, they wanton in beautiful and shining colours, being the most agreeable, and, as it were, in the joyous spring of life; in summer being then more plump, firm, and strong, but less splendid, they bear fruit: in autumn, or old age, they droop, grow dry, and wither, returning to dust from whence they came. The Ivy in its first or tender state has spear-shaped leaves, and bears neither flowers nor fruit. This is that variety which Bauhine calls *Hedera lumi repens*, "Ivy creeping on the ground." The same plant, when more advanced, bears five-lobed leaves, climbs on trees and walls, and is barren. This variety Bauhine calls *Hedera major sterilis*, the "Greater barren Ivy." In its next, or more mature state, it sends forth three-lobed leaves, and, leaving its props and supporters, it rises by its own strength, and puts on the appearance of a pretty tall tree, being loaded with flowers and fruit. This is the *Hedera Arborea* of C. B. "Tree

even the removal of Ivy itself, if very old, and when it has long invested its support, is attended with pernicious consequences, the tree frequently dying from the sudden exposure to unaccustomed cold. Of the roots of Ivy (which shrub may, with small industry, be made a beautiful standard,) are made curiously polished and flecked cups and boxes, and even tables of great value. Mistletoe and other excrescences are to be cut and broken off. But the fungi (which prognosticate an internal fault) are remedied by abrasion, interlucation, and exposure to sun.

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The bodies of trees are visited with canker, hollownefs, hornets, ear-wigs, snails, &c.

The wind-shock is a bruise and a shiver throughout the tree, though not constantly visible, yet leading the warp from smooth renting, caused by over-powerful winds, when young, and perhaps by subtile lightnings, to which the strongest Oaks, and other the most robust trees, are fain to submit, and will be twisted like a rope of Hemp; and therefore, of old, not used to kindle the sacrifice. Trees likewise often suffer the same injury by rigorous and piercing colds and frosts; such as in the year

Ivy." But when old, it puts forth egg-shaped leaves without lobes. This is the *Hetera Poetica* of C. B. "Poets' Ivy." Daily experience abundantly shows, that all plants undergo a variety of changes. From the seed spring up tender shoots, which at first resemble small shrubs; these, by degrees, acquire a firm trunk, and bear flowers and fruit; after this the branches flag, and are covered, as well as the trunk, with mofs, first one branch decaying, and then another, till the whole tree moulders away, and the place thereof knoweth it no more. LINN.

5. DISEASES When life, in any manner of way, is hurt or injured, that state we call Disease; to which vegetables, as well as animals are subject. By too great heat they are parched, become languid, and droop; by too much cold they are often killed, or made subject to cold tumours, analogous to kibes and chilblains in the human body. Sometimes they are liable to canker, sometimes to vermin; from whence they are said to be lousy. LINN.

DEATH. Death is the privation of life. Every living thing is subject to Death, as constant experience teaches. Since then, we know that vegetables as well as animals die by diseases and external injuries, we may ask, How can vegetables exchange life for death, if they were not previously endowed with life? For if we break a stone, which has no life, into a thousand parts, it by no means undergoes such a change as we observe in vegetables. LINN.

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1683, split many stately timber-trees from head to foot; which, as the weather grew milder, closed again, so as hardly to be discerned, but were found at the felling miserably shattered, and good for little. The best prevention is shelter, choice of place for the plantation, and frequent shreading, whilst they are yet in their youth. Wind-shaken is discovered by certain ribs, boils, and swellings on the bark, beginning at the foot of the stem, and ascending the body of the tree to the boughs. But against such frosts and fire from heaven there is no charm.

Cankers, of all other diseases the most pernicious, corroding, and eating to the heart, and difficult to cure, (whether caused by some stroke, or galling, or by hot and burning land,) are to be cut out to the quick, the scars emplastered with tar mingled with oil, and over that a thin spreading of loam, or else with clay and horse-dung; but best with hogs-dung alone, bound to it in a rag; or by laying Wood-ashes, Nettles, or Fern to the roots. You will know if the cure be effected, by the colour of the wounds growing fresh and green, and not reddish: But if the gangrene be within, it must be cured by nitrous, sulphureous, and drying applications, and by no means by any thing of an unctuous nature, which is exitial to trees, tar, as was said, only excepted, which I have experimentally known to preserve trees from the envenomed teeth of goats, and other injuries; the entire stem smeared over, without the least prejudice, and to my no small admiration. But for over-hot and torrid land, you must sadden the mould about the root with pond-mud and neats-dung; and by grafting fruit-trees on stocks raised in the same mould, as being more *homogeneous*.

Hollowness is contracted, when, by reason of the ignorant or careless lopping of a tree, the wet is suffered to fall perpendicularly upon a part, especially the head, or any other part or arms, by which means the rain is conducted to the very heart of the stem and body of the tree, which it soon rots. In this case if there be sufficient sound wood, cut it to the quick, and close to the body, and cap the hollow part with a tarpaulin, or fill it with good stiff loam, horse-dung, and fine hay mingled, or with well-tempered mortar, covering it with a piece of tarpaulin. This is one of the worst evils, and to which the Elm is most obnoxious. Old broken

boughs, if very great, are to be cut off at some distance from the body, but the smaller close ^d.

Hornets and wasps, by breeding in the hollownefs of trees, not only infect them, but will peel them round to the very timber, as if cattle had

^d In the year 1791, Mr. William Forsyth, Superintendant of his Majesty's gardens at Kensington, published the following composition for curing injuries and defects of fruit and forest trees, and for which he received a distinguished mark of his Majesty's approbation.

“ Take one bushel of fresh cow-dung, half a bushel of lime rubbish of old buildings, (that from the ceilings of rooms is preferable,) half a bushel of wood ashes, and a sixteenth part of a bushel of pit or river sand. The three last articles are to be sifted fine before they are mixed; then work them well together with a spade, and afterwards with a wooden beater, until the stuff is very smooth, like fine plaster, used for the ceilings of rooms.

“ The composition being thus made, care must be taken to prepare the tree properly for its application, by cutting away all the dead, decayed, and injured part, till you come to the fresh sound wood; leaving the surface of the wood very smooth, and rounding off the edges of the bark with a draw knife, or other instrument, perfectly smooth, which must be particularly attended to: then lay on the plaster, about one-eighth of an inch thick, all over the part where the wood or bark has been so cut away, finishing off the edges as thin as possible. Then take a quantity of dry powder of wood ashes, mixed with a sixth part of the same quantity of the ashes of burnt bones; put it into a tin box, with holes in the top, and shake the powder on the surface of the plaster, till the whole is covered over with it, letting it remain for half an hour, to absorb the moisture: then apply more powder, rubbing it gently with the hand, and repeating the application of the powder, till the whole plaster becomes a dry, smooth surface.

“ All trees cut down near the ground should have the surface made quite smooth, rounding it off in a small degree, as before-mentioned; and the dry powder directed to be used afterwards, should have an equal quantity of powder of alabaster mixed with it, in order the better to resist the dripping of trees, and heavy rains.

“ If any of the composition be left for a future occasion, it should be kept in a tub, or other vessel, and urine of any kind poured on it, so as to cover the surface, otherwise the atmosphere will greatly hurt the efficacy of the application.

“ Where lime rubbish of old buildings cannot be easily got, take powdered chalk, or common lime, after having been slaked a month at least.

“ As the growth of the tree will gradually affect the plaster, by raising up its edges next the bark, care should be taken, where that happens, to rub it over with the finger when occasion may require, (which is best done when moistened by rain,) that the plaster may be kept whole, to prevent the air and wet from penetrating into the wound.”

BOOK II. unbarked them, as I observed in some goodly Ashes at Calsiobury, (near the garden of that late noble Lord, and lover of planting, the Earl of Essex,) and are therefore to be destroyed by stopping up their entrances with tar and goose-dung, or by conveying the fumes of brimstone into their cells. Cantharides attack the Ash above all other Botts of the Beetle kind. Chafers, &c. are to be shaken down and crushed; and when they come in armies, (as sometimes in extraordinary droughts,) they are to be driven away or destroyed with smoke, which also kills gnats and flies of all sorts. Note, That the Rose-bug never, or very seldom, attacks any other tree whilst that sweet bush is in flower. Whole fields have been freed from worms by the reek and smoke of ox-dung wrapt in mungy straw, well soaked with strong lye.

Earwigs and snails do seldom infest forest-trees, but those which are fruit-bearers, and are destroyed by setting boards or tiles against the walls, or the placing of Neat-hoofs, or any hollow thing upon small stakes; also by enticing them into sweet waters, and by picking the snails off betimes in the morning, and rainy evenings. I advise you to visit your Cypreses trees on the first rains in April; you shall sometimes find them covered with young snails no bigger than small peas. Lastly, branches, buds, and leaves suffer extremely from blasts, caterpillars, locusts, rooks, &c. Note, that you should visit the boards, tiles, and hoofs, which you set for the retreat of those insects, in the heat of the day, to shake them out, and kill them.

The blasted parts of trees, and gum, should be cut away to the quick; and to prevent it, smoak them in suspicious weather, by burning moist straw with the wind, or rather the dry and superfluous cuttings of aromatic plants, such as Rosemary, Lavender, Juniper, Bays, &c. I use to whip and chastise my Cypreses with a wand, after their winter-burnings, till all the mortified and scorched parts fly off in dust, as long almost as any will fall, and observe that they recover and spring the better. Mice, moles, and pismires cause the jaundice in trees, known by the discolour of the leaves and buds.


The moles do much hurt, by making hollow passages, which grow musty; but they may be taken in traps, and killed, as every woodman

knows: It is certain that they are driven from their haunts, for a time, by garlick, and other heady smells, buried in their passages. CHAP. VII.

Mice and rats are taken with traps, or by sinking some vessel almost level with the surface of the ground, the vessel half full of water, upon which let there be strewed some hulls or chaff of oats; also with bane, powder of orpiment in milk, and aconites mixed with butter: copperas or green glass broken with honey, morsels of sponge chopped small and fried in lard, &c. are very fit baits to destroy these nimble creatures, which else soon will ruin a semination of nuts, acorns, and other kernels, and in a night or two, rob the largest beds of a nursery, carrying the seeds away by thousands to their cavernous magazines, to serve them all the winter: I have been told that Hop branches stuck about trees, preserve them from these thievish creatures.

Pismires are destroyed with scalding water, and disturbing their hills, or rubbing the stem with cow-dung, or washing the infested parts with a decoction of Tithymale; and this will insinuate, and chase them quite out of the chinks and crevices, without prejudice to the tree, and it is a good prevention of other infirmities; also by laying soot, sea-coal, sawdust, or refuse tobacco where they haunt, often renewed, especially after rain; for becoming moist, the dust and powder harden, and then they march over it.

Caterpillars are destroyed by cutting off their webs from the twigs before the end of February, and burning them; the sooner the better. If they be already hatched, wash them off with water, in which some of the caterpillars themselves and garlick have been bruised; the juice of rue, decoctions of coloquintida, hemp-seed, wormwood, tobacco, walnut-shells when green, with the leaves of sage, urine and ashes, make good aspersions. Take of two or three of the ingredients, of each an handful; make them boil in two pails of water for half an hour, then strain the liquor, and sprinkle it on the trees infected with caterpillars, the black flea, &c. In two or three times it will clear them, and should be used about the time of blooming. Another method is to choak and dry them with smoak of galbanum, shoe-soals, and hair; and some affirm, that planting Piony near them is a certain remedy; but there is no re-

BOOK II.  medy so facile as the burning them off with small wisps of dry straw, which in a moment rids you.

Rooks do in time, by pinching off the buds and tops of trees for their nests, cause many trees and groves to decay. Their dung propagates nettles and weeds, and choaks young seedlings. They are to be shot, and their nests demolished. The Bullfinch and Titmouse also eat off and spoil the buds of fruit-trees; these are prevented by clappers, or caught in the wire mouse-trap with teeth, after being baited with a piece of rusty bacon; also with lime-twigs. But if cattle break in before the time, *conclamatum est*, especially goats, whose mouths and breath is so poisonous to trees, that they never thrive well after; and Varro affirms, if they but lick the Olive-trees, they become immediately barren^c. And now we have mentioned barrenness, we do not reckon trees to be sterile, which do not yield a fruitful burden constantly every year (as Juniper and some Annotines do) no more than of pregnant women; whilst that is to be accounted a fruitful tree which yields its product every second or third year, as the Oak and most foresters do; no more may we conclude that any tree or vegetable is destitute of seeds, because we see them not so perspicuously with our naked eyes, by reason of their exility, as with the nicest examination of the microscope.

Another touch at the winds; for though they cannot properly be said to be infirmities of trees, yet they are amongst the principal causes that render trees infirm. I know no surer protection against them, than, as we said, to shelter and stake the trees whilst they are young, till they have well-established roots; and with this caution, that in case any goodly tree (which you would desire especially to preserve and redrefs) chance to be prostrated by some impetuous and extraordinary storm, you be not over-hasty to carry him away, or despair of him. First then, let me persuade you to poll him close, and so let him lie some time; for by this means many vast trees have raised themselves by the vigour only of

^c The antients considered the teeth of goats as particularly injurious to Vines. For which reason that animal was sacrificed to Bacchus:

Non aliam ob culpam Baccho caper omnibus aris
Ceditur.

the remaining roots, without any other assistance; so as people have pronounced it miraculous, as I could tell you by several instances, besides, what Theophrastus relates, lib. v. cap. xix. of that huge *Platanus* which rose in one night in his observation. And this puts me in mind of what I remember the very learned critic *Palmerius* affirms of an Oak, subverted by a late tempest near *Breda*, (where this old soldier militated under Prince *Maurice*, when the town was besieged by the famous *Marquis Spinola*.) which tree, after it had lain prostrate about two months, (the side branches pared off,) rose up of itself, and flourished as well as ever. Which event was thought so extraordinary, that the people reserved sprigs and boughs of it, as sacred reliques; and this he affirms to have seen himself. I take the more notice of these accidents, that none who have trees blown down, where it may cause a deformed gap in some avenue near their seats, may altogether despair of their resurrection, with patience and timely freeing them. And t' e lke to this I find happened in more than one tree near *Bononia* in Italy, in 1657, when a turbulent gust almost quite eradicated a very large tract of huge *Poplars*, belonging to the *Marchioness Elephantucca Spada*. These universally erected themselves again, after they were beheaded, though they lay even prostrate.—*Pliny*, the Naturalist, says, *Prostratas restitui plerumque, et quadam terræ cicatrice vivescere, vulgare est. Et familiarissimum hoc Platanis; que plurimum ventorum concipiunt propter densitatem ramorum: quibus amputatis, levatæ onere in sua scrobe reponuntur. Factumque jam est hoc in Juglandibus, Oleisque, ac multis aliis. Est in exemplis, et sine tempestate, ullave causa alia quam prodigii, cecidisse multas ac sua sponte resurrexisse. Factum hoc Populi Rom. Quiritibus ostentum Cimbricis bellis Nuceriæ in luco Junonis, Ulmo, postquam etiam cacumen amputatum erat, quoniam in aram ipsam procumbebat, restituta sponte, ita ut protinus floret: a quo deinde tempore Majestas Populi Romani resurrexit, que ante vastata cladibus fuerat. Memoratur hoc idem factum et in Philippis, Salice prociua atque detruncata: et Stagiris in Museo populo alba: omnia fausti ominis. Sed maxime mirum, Antandri Platanus etiam circumdolutis lateribus restibilis sponte facta, viteque reddita longitudine quindecim cubitorum, crassitudine quatuor ulnarum.* Lib. xvi. cap. xxxvii.

But as we have farther instances than these, and so very lately as that dreadful storm happening November 26, 1703, when, after so many thousand Oaks and other timber-trees were quite subverted, a most

BOOK II. famous and monstrous Oak, growing at Epping in Essex, (blown down,) raised itself, and withstood that hurricane. These, amongst many others, are the infirmities to which forest-trees are subject whilst they are standing: and when they are felled they are liable to the worm, especially if cut before the sap be perfectly at rest:—To prevent or cure it in the timber, I commend this secret as the most approved :

Let common yellow sulphur be put into a glass cucurbit, upon which pour so much of the strongest aqua-fortis, as may cover it three fingers deep; Distil this to dryness, which is done by two or three rectifications. Let the sulphur remaining in the bottom (being of a blackish or sad red colour) be laid on a marble, or put into a glass, where it will easily dissolve into oil: With this anoint what is either infected, or to be preserved of timber. It is a great and excellent arcanum for tinging the wood with no unpleasant colour, by no art to be washed out; and such a preservative of all manner of woods, nay, of many other things, as ropes, cables, fishing nets, masts of ships, &c. that it defends them from putrefaction, either in waters under or above the earth, in the snow, ice, air, winter or summer. It were superfluous to describe the process of the aqua-fortis; it shall be sufficient to let you know, that our common copperas makes this aqua fortis well enough for our purpose, being drawn over by a retort: and for sulphur, the island of St. Christopher's yields enough (which hardly needs any refining) to furnish the whole world.—This secret, for the curious, I thought fit not to omit; though three or four anointings with linseed oil has proved very effectual, and is more compendious. It was experimented in a Walnut table, where it destroyed millions of worms immediately, and is to be practised for tables, tubes, mathematical instruments, boxes, bedsteads, chairs, rarities, &c. Oil of walnuts will doubtless do the same, is sweeter, and a better varnish; but above all is commended oil of Cedar^f, or that of Juniper; whilst oil of Spike does the cure as effectually as any.

But after all these sweeping plagues and destructions inflicted on trees, braving all human remedies, such frosts, as not many years* since

^f Sic ex Cedro oleum, quod cedreum dicitur, nascitur; quo reliquæ res cum sunt unctæ, uti etiam libri, a tinea et a carie non lædantur.—VITRUV.

happened, left such marks of their deadly effects, not sparing the goodliest and most flourishing trees, timber, and other of the stoutest kind, as some ages will hardly repair : nay, it was observed, that the Oak in particular, counted the most valiant and sturdy of the whole forest, was more prejudiced with this excessive cold, and the drought of the year ensuing, than any of the most nice and tender constitution ; always here excepting, as to an universal strages, the hurricane of Sept. 1703, which begins the epocha of the calamities which have since followed, not only by the late tempest about August last*, but by that surprising blast accompanied doubtless by a fiery spirit, which smote the most flourishing foresters and fruit-trees, burning their buds and leaves to dust and powder, not sparing the very fruit. This being done in a moment, must be looked upon as a plague not to be prevented : In the mean-time, that the malignity proceed no farther, it may be advisable to cut and top the summits of such tender mural trees, rare shrubs, &c. as have most suffered, and are within reach, rubbing off the scorplings in order to a new spring.

* 1703.

There were, in my remembrance, certain prayers, litanies, and collects, solemnly used by the parish-minister in the field, at the limits of their perambulations on the Rogation days, from an antient and laudable custom of above one thousand years, introduced by Avitus, the pious Bishop of Vienna, in a great dearth, unseasonable weather, and other calamities, (however in tract of time abused by many gross superstitions and insignificant rites, in imitation of the Pagan Robigalia,) upon which days, about the ascension and beginning of spring especially, prayers were made, as well deprecatory of epidemical evils, amongst which blasts and smut of corn were none of the least, as supplicatory for propitious seasons, and blessings on the fruits of the earth. Whether there was any peculiar office, besides those for Ember-weeks, appointed, I do not know ; but the pious and learned Bishop of Winchester, (Andrews,) has, in his devotions, left us a prayer so apposite and comprehensive for these emergencies, that I cannot forbear the recital :

REMEMBER, O Lord, to renew the year with thy goodness, and the season with a promising temper ; for the eyes of all wait upon thee, O Lord ; thou givest them meat ; thou openest thy hand, and fillest all things living
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BOOK II. *with thy bounty. Vouchsafe therefore, O Lord, the blessings of the heavens, and the dews from above : The blessings of the springs, and the deep from beneath : The returns of the sun, the conjunctions of the moon : The benefit of the rising mountains, and the lasting hills : The fulness of the earth, and all that breed therein :*

*A fruitful season,
Temperate air,
Plenty of corn,
Abundance of fruits,
Health of body, and
Peaceable times ;
Good and wise government,
Prudent counsels,*

*Just laws,
Righteous judgments,
Loyal obedience,
Due execution of justice,
Sufficient store for life,
Happy births,
Good and fair plenty,
Breeding and institution of children.*

That our sons may grow up as the young plants, and our daughters may be as the polished corners of the temple : That our garners may be full and plentiful with all manner of store : That our sheep may bring forth thousands : That our oxen may be strong to labour : That there be no decay ; no leading into captivity ; no complaining in our streets : But that every man may sit under his own vine, and under his own fig-tree, in thankfulness to thee ; sobriety, and charity to his neighbour ; and in whatsoever other estate thou wilt have him, therewith to be contented : And this for Jesus Christ his sake, to whom be glory for ever. Amen.

Hitherto I have spoken of trees, their kinds, and propagation in particular. I shall now say a word or two concerning their ordering in general, as it relates to Coppices, Lopping, Felling, &c. After this I shall add something concerning their uses as to fuel, &c. and cast such accidental lessons into a few aphorisms as could not well be more regularly inserted. I shall next give some serious observations in reference to the main design and project of this discourse, as it concerns the improvement of his Majesty's Forests for the honour and security of the whole kingdom. And, lastly, I shall put a conclusion to this work with an historical account of the sacredness and use of **STANDING GROVES.**

S I L V A.

DENDROLOGIA.

BOOK THE THIRD.

CHAPTER I.*Of COPPICES.*

SYLVA CÆDUA is (as Varro defines it,) as well Coppice to cut for fuel, as for use of timber; and we have already showed how it is to be raised, both by sowing and planting. I shall only here add, that if, in their first designation, they be so laid out as to grow for several falls, they will both prove more profitable and more delightful: More profitable because of their annual succession; and more pleasant, because there will always remain some of them standing; and if they be so cast out, as that you leave straight and even intervals of eighteen or twenty feet for grass, between spring-wood and spring-wood, securely fenced and preserved, the pastures will lie both warm, and prove of exceeding delight to the owner. These spaces are likewise useful, and necessary for cartway, to fetch out the wood at every fall. There is not a more noble and worthy husbandry than is this, which rejects no sort of ground nor situation, (though facing the east is esteemed best for both timber and underwood,) as we have abundantly showed; since even the most boggy places may be so drained and cast, as to yield their increase by planting the drier sorts upon the ridges and banks which you cast up, where they will thrive exceedingly: And then Willow, Sallow, Alder, Poplar, Sycamore, Black Cherry, &c. will shoot tolerably well on the lower and more uliginous; with this caution, that for the first two years

BOOK III. they be kept diligently weeded and cleansed, which is as necessary as fencing and guarding from cattle. Our ordinary coppices are chiefly upon Hasel, or the Birch; but if amongst the other kinds, store of Ash, (which I most prefer, for a speedy and erect growth,) Chesnut, Sallow, and Sycamore, (at least one in four,) were sprinkled in the planting, the profit would soon discover a difference, and well recompense the industry. Others advise us to plant shoots of Sallow, Willow, Alder, and all the swift growing trees, being of seven years growth, sloping off both the ends towards the ground, to the length of a billet, and burying them a reasonable depth in the earth. This will cause them to put forth seven or eight branches, each of which will become a tree in a short time, especially if the soil be moist. The nearest distance for these plantations ought never to be less than five feet at first, since every felling renders them wider for the benefit of the timber, even to thirty or forty feet, in five or six fellings.

Though it be almost impossible for us to prescribe at what age it were best husbandry to fell coppes, (as we at least call best husbandry,) that is, for most and greatest gain, since the markets, and the kinds of wood, and emergent uses do so much govern; yet coppes are sometimes of a competent stature after eight or nine years from the acorn; and so every eight or ten years successively will rise better and better. But this had need be an extraordinary ground, otherwise you may do well to allow them twelve or fifteen to fit them for the ax; but those of twenty years standing are better, and far advance the price, especially if Oak, and Ash, and Chesnut be the chief furniture; and be sure you shall lose nothing by this patience, since, all accidents considered, the profit arising from coppes so managed (be the ground almost never so poor,) shall equal, if not exceed, what is usually made by the plough or grazing. Some of our old clergy spring-woods heretofore have been let rest till twenty-five or thirty years, and have proved highly worth the attendance; for by that time, even a seminary of acorns will render a considerable advance, as I have already exemplified in the Northamptonshire Lady. And if coppes were so divided, as that every year there might be some felled, it were a continual and a present profit. Seventeen years growth affords a tolerable fell. Supposing the copse of seventeen acres, one acre might be yearly felled for ever, and so more, according to proportion:

but though the seldom fall yields the more timber, yet the frequent makes the underwood the thicker; therefore at ten or twelve years growth, says Mr. Cook, make the fall in shallow ground, and fourteen in deeper.— If many timber-trees grow in your copses which are to be cut down, fell both them and the under-wood, as near the ground as may be; but this is to be understood where the wood is very thick; otherwise, it is advisable to stock up the thinner, especially in great timber, and to set in the holes Elm, Cherry, Poplar, Sallow, Service; and so these trees, which are apt to grow from the running-root, thicken the wood exceedingly; whilst the very roots will pay for the grubbing, and yield you some feet of the best timber; whereas being let stand, nothing would have grown. If the ground be a shallow soil, forbear filling the holes quite, but set some running-wood in the loosened earth, and the ends of the old roots being cut, will furnish the sides of the holes speedily. In thin copses, it is profitable to lay some boughs athwart, which will be rooted to advantage against next fall. All rotten stubs among our under-woods should be extirpated, to make way for seedlings, and young roots to spring and run: The cutting slanting, smooth and close, is of great importance; and frequent felling gives way and air to the subnascent seedlings, and the rest will make lusty shoots.

As to what numbers and scantlings you are to leave on every acre, the statutes are our general guides, at least the legal. It is a very ordinary copse which will not afford three or four firsts, that is, bests; fourteen seconds, twelve thirds, eight wavers, &c. according to which proportions the sizes of young trees in copping are to succeed one another. By the statute of 35 Henry VIII. in copses or under-woods, felled at twenty-four years growth, there were to be left twelve standills, or stores of Oak, upon each acre; in defect of so many Oaks, the same number of Elms, Ash, Asp, or Beech; and they to be such as are of likely trees for timber, and of such as have been spared at some former felling, unless there were none; in which case they are to be *then* left, and so to continue without felling, till they are ten inches square within a yard of the ground. Copses above this growth felled, to leave twelve great Oaks; or in defect of them, other timber-trees, as above, and so to be left for twenty-years longer, and to be inclosed seven years.

In sum, you are to spare as many likely trees for timber as with discretion you can. In the mean time, there are some who find it not so profitable to permit so many timber-trees to stand in the heart of copses, but on the skirts, and near the edges, where their branches may freely spread and have air, without dripping and annoying the subnascent crop: nor should they be shred, which commonly makes them grow knotty.— This is a note of the ingenious Mr. Nourse.

Now as to the felling, (beginning at one side, that the carts may enter without detriment to what you leave standing,) the under-wood may be cut from January at the latest, till Mid-March or April; or from Mid-September, till near the end of November; so as all be avoided by Midsummer at the latest, and then fenced, (where the rows and brush lie longer unbound, or made up, you endanger the loss of a second spring,) and not to stay so long as usually they are a-clearing, that the young and the seedlings may not suffer the least interruption; and, if the winter, previous to your felling copses, you preserve them well from cattle, it will recompense your care.

It is advised not to cut off the browse-wood of Oaks in copses, but to suffer it to fall off, as where trees stand very close it usually does: I do not well comprehend why yet it should be spared so long.

When you espie a cluster of plants growing as it were all in a bunch, it shall suffice that you preserve the fairest sapling, cutting all the rest away. And if it chance to be a Chesnut, Service, or like profitable tree, clear it from the droppings and incumbrances of these trees, that it may thrive the better: Then, as you pass along, prune and trim up all the young wavers, covering such roots as lie bare and exposed with fresh mould. There are some who direct the lopping of young Oaks at a competent distance from the stem, and that while the wounds are healing, this would advantage the under-wood; but I cannot say it would be without prejudice to timber.

Cut not above half a foot from the ground, nay the closer the better, and that to the south, slope-wise, stripping up such as you spare from their extravagant branches, water-boughs, &c. that hinder the growth of others. Always remember (before you so much as enter upon this

work,) to preserve sufficient plash-pole about the verge and bounds of the copse for fence and security of what you leave; and for this, something less than a rod may suffice: Then raking your wood clear of spray, claps, and all incumbrances, shut it up from the cattle; the longer the better. CHAP. I.

By the statute, men were bound to inclose copses after felling, of or under fourteen years growth, for four years: Those above fourteen years growth, to be sixteen years inclosed; and for woods in common, a fourth part to shut up; and at felling, the like proportion of great trees to be left, and seven years inclosed; This was enlarged by 13 Eliz. Your elder under-woods may be grazed about July: But for a general rule new-weaned calves are the least noxious to newly-cut spring-woods, where there is abundance of grafs; and some say, colts of a year old; but then the calves must be driven out in May at farthest, though the colts be permitted to stay a while longer; but of this, every man's experience will direct him; and surely, the later you admit beasts to graze, the better. For the measure of fuel, these proportions were to be observed.

Statutable billet should hold three feet in length, and seven inches and a half in compass; *ten* or *fourteen* as they are counted for *one*, *two*, or *three*, &c. A stack of wood (which is the boughs and offal of the trees to be converted to charcoal, is four yards long, three feet and a half high, (in some places but a yard,) and as much over: In other places, the cord is four feet in height, and four feet over; or, to speak more geometrically, a solid made up of three dimensions, four feet high, four feet broad, and eight feet long; the content one hundred and twenty-eight cubic feet.—Faggots ought to be a full yard in length, and two feet in circumference, made round and not flat; for so they contain less fuel, though appearing equal in the bulk.

In the mean-time it were to be wished that some approved experiments were sedulously tried, with the advice of skilful and ingenious physicians, for the making of beer without hops; as possibly with the White Marrubium, a plant of singular virtue, or with dried Heath-tops, viz. that sort which bears no berries, or the like, far more wholesome, and less bitter than either Tamarisk, Carduus, or Broom, which divers have essayed; it might prove a means to save a world of fuel, and in divers

BOOK 111. places, young timber and copse-wood, which is yearly spent for poles, especially in countries where wood is very precious^g. Note, That the woodland measure, by statute, is computed after eighteen feet the perch.

‡ Hops were introduced, about two centuries and a half ago, from Flanders, and from that time have been assiduously cultivated in this kingdom. The duties arising from this article are so considerable, that all public brewers are enjoined under a severe penalty to use no other bitters for their malt liquors. In a year of moderate fertility, an acre of hops is supposed to produce ten hundred weight, which may be estimated at three pounds per hundred. Of this sum, one moiety goes clear into the pocket of the cultivator, and the other moiety is employed in the discharge of rent, tithe, and all other expences, except the duty by excise. It is computed that the duty, upon an average, amounts to 50,000l. per ann. a sum too considerable to be lost by permitting other bitter herbs to be substituted in the place of hops.

C H A P. II.

Of PRUNING.

THERE can nothing certainly be more necessary, in order to pruning, than the knowledge of the course and nature of the sap, which not being as yet so universally agreed on, after innumerable trials and experiments, leads our arborators into many errors and mistakes. I have in this forest-work occasionally recited the various opinions of several, leaving them to the determination of the learned and judicious, as a considerable part of Natural Philosophy; Dr. Grew, Malpighius, De la Quinteny, and what is found dispersed in the Philosophical Transactions by our Plant Anatomists; without charging this chapter with repetitions. And the same I have done likewise as to Astrological Observations, Positions of the Stars, and Planetary Configurations, Exhalations, and Dominant Power; though, in compliance to custom, I now and then forbear to abdicate our country planter's Goddes; contenting myself with the wholesomeness of the air we breathe in, and the goodness of the soil. I shall therefore, in the first place, speak of the manual operation of pruning, and other instructions as they afterwards occur.

CHAP. II.

PUTATIO, or Pruning, is the purgation of trees in general from what is superfluous. The ancients found such benefit in pruning, that they feigned a Goddess presided over it, as Arnobius tells us: and, in truth, it is in the discreet performance of this work, that the improvement of our timber and woods does as much consist, as in any thing whatsoever. A skilful planter should therefore be early at this work.

It is a misery to see how our fairest trees are defaced and mangled by unskilful wood-men and mischievous borderers, who go always armed with short hand-bills, hacking and chopping off all that comes in their way; by which our trees are made full of knots, stubs, boils, cankers, and deformed bunches, to their utter destruction. Good husbands should be ashamed of it; though I would have no woodman pretend to be without all his necessary furniture, when he goes about this work; which I, once for all, reckon to be the hand-bill, hatchet, hook, hand-

BOOK III. saw, an excellent pruning-knife, broad chisel and mallet, all made of the best steel and kept sharp ; and thus he is provided for greater, or more gentle executions, purgations, recisions, and coertions ; and it is of main concern, that the proper and effectual tool be applied to every work ; since heavy and rude instruments do but mangle and bruise tender plants ; and if they be too small, they cannot make clear and even work upon great arms and branches. The knife is for twigs and spray ; the chisel for larger arms, and such amputations as the ax and bill cannot well operate upon. As much to be reprehended are those who either begin this work at unseasonable times, or so maim the poor branches, that either out of laziness, or want of skill, they leave most of them stubs, and instead of cutting the arms and branches close to the bole, hack them off a foot or two from the body of the tree, by which means they become hollow and rotten, and are so many conduits to receive the rain and the weather, which conveys the wet to the very matrix and heart, deforming the whole tree with many ugly botches, which shortens its life, and utterly mars the timber. I know Sir H. Platt tells us, the Elm should be so lopped, but he says it not of his own experience, as I do. And here it is that I am, once for all, to warn our disorderly husbandmen from coveting to let their lops grow to an extraordinary size before they take them off, as conceiving it furnishes them with the more wood for the fire ; not considering how such ghastly wounds mortally affect the whole body of the tree, or at least do so decay their vigour, that they hereby lose more in one year than the lop amounts to, should they pare them off sooner, and when the scars might be covered : In the mean while that young Oaks prosper much in growth, by timely pruning, the industrious Mr. Cook observes ; whereas some other trees, as the Hornbeam, &c. though they will bear considerable lops, when there is only the shell of the tree standing, yet it is much to its detriment, especially to the Ash, which if once it comes to take wet by this means, rarely produces more lop to any purpose ; above all, if it decay in the middle, it is then fitter for the chimney, than to stand and cumber the ground : The same may be pronounced of most trees, which would not perhaps become dotards in many ages, but for this covetous barbarity and unskilful handling.

By this animadversion alone, it were easy for an ingenious man to understand how trees are to be governed ; which is, in a word, by

sparing great lops, cutting clean, smooth and close, making the stroke upward, and with a sharp bill, so as the weight of an untractable bough do not splice and carry the bark with it, which is both dangerous and unsightly. The Oak will suffer itself to be made a Pollard; that is, to have its head quite cut off, and it may be good for mast, if not too much pruned, but not for timber: But the Elm so treated will perish to the foot; and certainly become hollow at last, if it escape with life.

The proper season for this work is, for old trees earlier, for young later, as a little after the change in January or February; some say in December, the wind in a gentle quarter:

———Tum stringe comas, tum brachia-tonde:

—————Tum denique dura

Exerce imperia, et ramos compesce fluentes.

GEORG. II.

But this ought not to be too much in young fruit-trees, after they once come to form a handsome head; in which period you should but once pare them over about March, to cover the stock the sooner, if the tree be very choice. To the aged, this is plainly a renewing of their youth, and an extraordinary refreshment, if taken in time, and that their arms be not suffered to grow too great and large; in which case the member must not be amputated too near the body, but at some distance——*ne pars sincera trahatur*: and remember to cut smooth, and sloping upwards, if upright boughs, otherwise downwards; and be sure to emplaster great wounds to keep out the wet, and hasten the covering of the bark: besides, for interlucation, remove exuberant branches, *et spissæ nemorum comæ*, where the boughs grow too thick and are cumbersome, to let in the sun and air. This is of great importance; and so is the sedulous taking away of suckers, water-boughs, fretters, &c. and for the benefit of tall timber, the due stripping up the branches, and rubbing off the buds to the heights you require. Yet some do totally forbear the Oak, especially if aged, observing that they much exceed in growth such as are pruned; and in truth, such trees as we would leave for shade and ornament, should be seldom cut, but the browse-wood cherished and preserved as low towards the ground as may be, for a more venerable and solemn shade; and therefore I did much prefer the walk of Elms in St. James's Park, as it lately grew branchy, intermingling their reverend

BOOK III. trefses, before the present trimming them up so high; especially, since I fear the remedy comes too late to save their decay (could it have been avoided,) if the amputations of such overgrown parts as have been cut off, should not rather accelerate it, by exposing their large and many wounds to the injuries of the weather, which will endanger the rotting of them, beyond all that can be applied by tar, or otherwise, to protect them. I do rather conceive their infirmities to proceed from what has not long since been abated of their large spreading branches, to accommodate with the mall; as any one may conjecture by the great impression which the wet has already made in those incurable scars, that being now multiplied, must needs the sooner impair them; the roots having likewise infinitely suffered by many disturbances about them. In all events this walk might have enjoyed its goodly canopy, with all their branchy furniture for so many ages to come, for it is hardly one since first they were planted: But this defect is providently and nobly supplied by their successors the Lime-trees, which will sooner accomplish their perfection, by taking away the Chesnut-trees, which will else do them prejudice.

But it is now, and never till now, that those walks and ranks of trees, and other royal amenities, are sure to prosper, whilst they are entirely under the care and culture of the most industrious and knowing Mr. Wise, to whom, and to his partner Mr. London, I not only acknowledge myself particularly obliged, but the whole nation, for what they have contributed to the sweetest, most useful, and most innocent diversions of life, gardens and plantations.

One should be cautious in heading timber-trees, especially the pithy, unless where they grow very crooked; in which case abate the head with an upward slope, and cherish a leading shoot. The Beech is very tender of its head.

It is by the discreet leaving the side-boughs in convenient places, sparing the smaller, and taking away the bigger, that you may advance a tree to what determined height you desire: Thus, bring up the leader, and when you would have that spread and break out, cut off all the side-boughs, and especially at Midsummer, if you espy them breaking out. Young trees may every year be pruned, and as they grow older at

longer intervals, as at three, five, seven, or sooner, that the wounds may recover, and nothing be deformed. CHAP. II.

Evergreens do not well support to be decapitated; side-boughs they freely spare in April, and during the spring; and if you cut at first two or three inches from the body, and the next spring after close to the stem, covering the wounds with wax, or well-tempered clay, the most tender may suffer such amputations without prejudice.

That the side and collateral branches of the Fir cut, or broken off, spring no more; and though the tops sometimes do, yet they never prosper to beautiful and erect heads, in which consists the grace of that beautiful tree.

Another caution is, that you be sure to cut off such tender branches to the quick, which you find have been cropt by goats, or any other cattle who leave a drivel where they bite; which not only infects the branches, but sometimes endangers the whole; the reason is, that the natural sap's recourse to the stem communicates the venom to all the rest, as the whole mass and habit of animal blood is by a gangrene or venereal taint.

Divers other precepts of this nature I could here enumerate, had not the great experience, faithful and accurate description how this necessary work is to be performed, set down by our countryman honest Lawson, prevented all that the most inquisitive can suggest: The particulars are so ingenious and highly material, that you will not be displeas'd to read them in his own style and character^b.

All ages, saith he, by rules and experience do consent to a pruning and lopping of trees; yet have not any that I know described unto us (except in dark and general words) what, or which are those superfluous boughs which we must take away; and that is the

^b Lawson's Book is entitled, *A New Orchard and Garden*. It was published in 1597.—Another edition appeared in 1623.

most chief end and needful point to be known in lopping: And we may well assure ourselves (as in all other arts, so in this) there is a vantage and dexterity by skill; an habit by practice out of experience, in the performance hereof, for the profit of mankind: Yet do I not know (let me speak it with patience of our cunning Arborists) any thing within the compass of human affairs so necessary, and so little regarded; not only in orchards, but also in all other timber-trees, where or whatsoever.

Now to our purpose:

How many forests and woods, wherein you shall have for one lively thriving tree, four (nay sometimes twenty-four) evil-thriving, rotten, and dying trees, even whiles they live; and instead of trees, thousands of bushes and shrubs! what rottenness! what hollow-ness! what dead arms! withered tops! curtailed trunks! what loads of moss! Drooping boughs and dying branches shall you see every where! and those that in this sort are in a manner all unprofitable boughs, cankered arms, crooked, little, and short boles. What an infinite number of bushes, shrubs, and scrags of Hasels, Thorns, and other unprofitable wood, which might be brought by dressing to become great and goodly trees! Consider now the cause.

The lesser wood hath been spoiled with careless, unskilful, and untimely stowing; and much also of the great wood. The greater trees at the first rising, have filled and overladen themselves with a number of wasteful boughs and suckers, which have not only drawn the sap from the bole, but also have made it knotty, and themselves and the bole mossy, for want of dressing; whereas, if in the prime of growth, they had been taken away close, all but one top, and clean by the bulk, the strength of all the sap should have gone to the bulk, and so he would have recovered and covered his knots, and have put forth a fair, long, and straight body,


for timber profitable, huge, great of bulk, and of infinite last. CHAP. II.

If all timber-trees were such (will some say) how should we have crooked wood for wheels, coorbs, &c.?

Answ. Dress all you can, and there will be enough crooked for those uses.

More than this, in most places they grow so thick, that neither themselves, nor earth, nor any thing under or near them can thrive; nor sun, nor rain, nor air can do them, nor any thing near, or under them, any profit or comfort.

I see a number of hags, where out of one root you shall see three or four (nay more, such is men's unskilful greediness, who, desiring many, have none good) pretty Oaks, or Ashes, strait and tall; because the root at the first shoot gives sap amain: But if one only of them might be suffered to grow, and that well and cleanly pruned, all to his very top, what a tree should we have in time? And we see by those roots continually and plentifully springing, notwithstanding so deadly wounded, what a commodity should arise to the owner, and the commonwealth, if wood were cherished and orderly dressed: The waste boughs closely and skilfully taken away, would give us store of fences and fuel; and the bulk of the tree in time would grow of huge length and bigness: But here, methinks, I hear an unskilful Arborist say, that trees have their several forms, even by nature; the Pear, the Holly, the Asp, &c. grow long in bulk, with few and little arms: The Oak by nature broad, and such like. All this I grant: But grant me also, that there is a profitable end and use of every tree, from which if it decline, though by nature, yet man by art may, nay must, correct it. No other end of trees I never could learn, than

BOOK III.  good timber, fruit much and good, and pleasure: Uses physical
hinder nothing a good form :

Neither let any man ever so much as think, that it is unprofitable, much less impossible, to reform any tree of what kind soever : For, believe me, I have tried it : I can bring any tree (beginning betime) to any form. The Pear and Holly may be made to spread, and the Oak to close.

Thus far the good man out of his eight and forty years experience concerning timber trees : He descends then to the orchards ; which, because it may likewise be acceptable to our industrious planter, I thus contract.

“ Such as stand for fruits should be parted from within two feet, or thereabouts, of the earth ; so high, as to give liberty to dress the root, and no higher ; because of exhausting the sap that should feed his fruit ; for the bole will be first, and best served and fed, being next to the root, and of greatest substance. These should be parted in two, three, or four arms, as your grafts yield twigs ; and every arm into two or more branches, every branch into his several cyons ; still spreading by equal degrees, so as his lowest spray be hardly without the reach of a man’s hand, and his highest not past two yards higher : That no twig, (especially in the midst) touch his fellow ; let him spread as far as his list, without any master-bough, or top, equally ; and when any fall lower than his fellows, (as they will with weight of fruit) ease him the next spring of his superfluous twigs, and he will rise : When any mount above the rest, top him with a nip between your fingers, or with a knife : Thus reform any cyon ; and as your tree grows in stature and strength, so let him rise with his tops but slowly and easily, especially in the midst, and equally in breadth also, following him upward, with lopping his under-growth, and water-boughs, keeping the same distance of two yards, not above three in any wise, betwixt the lowest and highest twigs.

“ Thus shall you have handsome, clear, healthful, great, and lasting trees.

“ Thus will they grow safe from winds, yet the top spreading.

CHAP. II.

“ Thus shall they bear much fruit ; I dare say, one as much as five of our common trees, all his branches loaden.

“ Thus shall your bole, being low, defraud the branches but little of their sap.

“ Thus shall your trees be easy to drefs, and as easy to gather the fruit from, without bruising the cyons, &c.”

The fittest time of the moon for the pruning is (as of grafting) when the sap is ready to stir, not proudly stirring, and so to cover the wound ; and here, for the time of day, we may take Columella, *frondem medio die arborator ne cædito*. Lib. xi. Old trees should be pruned before young plants ; and note, that wheresoever you take any thing away, the sap the next summer will be putting ; be sure therefore when he puts to bud in any unfit place, you rub it off with your finger ; and if this be done for three or four years at Midsummer, it will at last wholly clear the side-boughs, and exalt the growth of the stem exceedingly ; and this is of good use for Elms, and such trees as are continually putting forth where they have been pruned. Thus begin timely with your trees, and you may bring them to what form you please. If you desire any tree should be taller, let him break or divide higher : This for young trees. The old are reformed by curing of their diseases, of which we have already discoursed. There is this only to be considered, in reference to foresters, out of what he has spoken concerning fruit-trees ; that (as has been touched) where trees are planted for shadow and mere ornament, as in walks and avenues, the Brouse-wood, as they call it, should most of it be cherished ; whereas in fruit and timber-trees, Oak excepted, it is best to free them of it. As for Pollards, (to which I am no great friend, because it makes so many scrags and dwarfs of many trees, which would else be good timber, endangering them with drips, and the like injuries) they should not be headed above once in ten or twelve years, at the beginning of the spring, or end of the fall : And note, that all coppicing and cutting close invigorates the roots and the stem of whatsoever grows weak and unkindly ; but you must then take care it be not overgrown with weeds or grafts. Nothing, says my Lord Bacon, (Exper. 586) causes

BOOK III. trees to last so long, as the frequent cutting; every such diminution is a re-invigoration of the plant's juice, so that it neither goes too far, nor rises too faintly, when it is timely refreshed with this remedy; and therefore we see that the most antient trees in churchyards, and about old buildings, are either Pollards or Dotards, seldom arising to their full altitude. It is true, as Mr. Nourse observes, that Elm and Oak frequently pollarded and cut, hindering their mounting, increases the bulk and circumference, and makes a show of substance, when all the while it is but a hollow trunk, filled with its own corruption, spending the genuine moisture which should grow to the growth of the arms and head, and interior substance of useful timber.

For the improvement of the speedy growth of trees, there is not a more excellent thing than the frequent rubbing of the bole or stem with some piece of hair-cloth, or ruder stuff, at the beginning of spring: Some I have known done with seal's skin; the more rugged bark with a piece of coat of mail, which is made of small wire: This done when the body of the tree is wet, as after a soaking rain, yet so as not to excorticate, or gall the tree, has exceedingly accelerated its growth (as I am assured to a wonderful and incredible improvement) by opening the pores, freeing them of mofs, and killing the wormⁱ.

Lastly, Frondation, or the taking off some of the luxuriant branches and sprays of such trees, especially whose leaves are profitable for cattle, is a kind of pruning; and so is the scarrifying and cros hatching of some

ⁱ It is abundantly evident that all trees inspire and expire from pores in their bark as well as their leaves, so that whatever interrupts either of these processes, must occasion disease. Mofs not only stops up the pores of the bark, but, by being a parasitical plant supports its own growth by drawing nourishment from the tree on which it is placed. Plants are never healthy but when their stems are clean, so that we should bestow every attention towards keeping them so. Mr. Evelyn very judiciously recommends rubbing the stems, in order to keep the trees in a growing and healthy state: But notwithstanding the justness of this idea, it of necessity becomes limited and confined. In the 67th vol. of the Philosophical Transactions for the year 1777, there is inserted a curious letter upon this subject from Mr. Marsham to the Lord Bishop of Bath and Wells, from which it appears that the growth of trees may be considerably increased by washing and rubbing their bark. A continuation of Mr. Marsham's experiment is inserted in the 71st volume of the same Transactions.

fruit-bearers, and others, to abate that *φυλλομανία*, which spends all the juice in the leaves, to the prejudice of the rest of the parts. CHAP. II.

But after all this, let us hear what the learned and experienced Squire Brotherton has observed upon this article of pruning, and particularly of the taking off the top: That those trees which were so used, some years before the severe frost of 1684, died; those not so pruned, escaped: And of other trees (having but a small head left) the rest of the boughs cleared, the tops flourished, and the loose branches shread perished, and the unpruned escaped: Moreover, when the like pruning was tried on trees twenty feet high, the difference of the increase was visible the following summer; but within seven or eight years time the difference was exceedingly great, and even prodigious, both in bark and branch, beyond those trees that had been pruned.

This, and the like, belonging to the care of the Wood-ward, will mind him of his continual duty; which is to walk about and survey his young plantations daily; and to see that all gaps be immediately stopped; trespassing cattle impounded; and (where they are infested) the deer chased out, &c. It is most certain that trees, preserved and governed by this discipline, and according to the rules mentioned, would increase the beauty of forests, and value of timber, more in ten or twelve years, than all other imaginable plantations (accompanied with our usual neglect) can do in forty or fifty.

To conclude: In the time of this work, our ingenious Arborator should frequently incorporate, mingle, and unite the arms and branches of some young and flexible trees, which grow in consort, and near to one another, by entering them into their mutual barks with a convenient incision: this, especially about fields and hedge-rows, for fence and ornament. Dr. Plot mentions some that do naturally, or rather indeed accidentally, mingle thus; nay, and so embrace and coalesce, as if they issued out of the bowels of one another: Such are two Beeches in the way from Oxford to Reading at Cain-End; the bodies of which trees springing from different roots, after they have ascended parallel to the top, strangely unite together a great height from the ground, a transverse piece of timber entering at each end of the bodies of the trees, and growing jointly with them: The same is seen in Sycamores at New

BOOK III. College Gardens. I myself have woven young Ash-poles into twists of three and four braids, like women's hair, when they make it up to fillet it under their coifs, which have strangely incorporated and grown together without separation; but these are rather for curiosity, than of advantage for timber.

Trees will likewise grow frequently out of the bole of the other; and some roots will penetrate through the whole length of the trunk, till, fastening in the very earth, they burst the including tree, as it has happened in Willows, where an Ash-tree has sprung likely from some key or seed dropt upon the rotten head of it: But this accident not so properly pertaining to this chapter, I conclude with recommending the bowing and bending of young timber-trees, especially Oak and Ash, into various flexures, curbs, and postures, which may be done by humbling and binding them down with tough bands and withs, or hooks rather, cut skrew-wise, or slightly haggled and indented with a knife, and so skrewed into the ground, or by hanging of weighty stones to the tops or branches, till the tenor of the sap, and custom of being so constrained, do render them apt to grow so of themselves, without power of redressing. This course would wonderfully accommodate the ship-builder with materials for knee-timber, and prove useful to the wheel-wright, as it would conform the wood to their moulds, save infinite labour, and abbreviate the work of hewing and waste :

—————*adco in teneris consuescere multum est.*

Virgil, it seems, knew it well, and for what purpose :

*Continuò in silvis magna vi flexa domatur
In burim, et curvi formam accipit Ulmus aratri.*

GEORG. II.

When in the woods with mighty force they bow
The Elm, and shape it to the crooked plow.

CHAPTER III.

Of the AGE, STATURE, and FELLING of TREES.

THE Age of trees, except of the Coniferous, (for the most part known by the degrees of their tapering branches) is vulgarly reckoned by the number of solar revolutions, or circles; the former bark being digested and compacted into a ligneous and woody substance, is annually invested by a succeeding bark, which yet in some trees is not finished so soon as in others, as we find in the Oak, Elm, Pine, Plum-tree, &c. which exceed one another in growth, however co-equal in years: But of this hereafter. In the mean time, it is not till a tree is arrived to his perfect age and full vigour, that the Lord of the forest should consult or determine concerning a felling; for there is certainly in trees, as in all things else, a time of increment or growth; a status or season when they are at best, (which is also that of felling) and a decrement or period when they decay. To the first of these they proceed with more or less velocity, as they consist of more strict and compacted particles, or are of a slighter and more lax contexture, by which they receive a speedier or slower defluxion of aliment. This is apparent in Box and Willow; the one of a harder, the other of a more tender substance; but as they proceed, so they likewise continue. By the state of trees I would signify their utmost effort, growth, and maturity, which are all of them different as to time and kind; yet do not I intend by this any period or instant in which they do not continually either improve or decay, (the end of one being still the beginning of the other) but farther than which their natures do not extend; but immediately (though to our senses imperceptible) through some infirmity (to which all sublunary things are obnoxious) dwindle and impair, either through age, defect of nourishment, by sickness, and decay of principal parts; but especially, and more inevitably, when violently invaded by mortal and incurable infirmities, or by what other extinction of their vegetative heat, subtraction or obstruction of air and moisture, which making all motions whatsoever to cease and determine, is the cause of their final destruction.

Our honest countryman, to whose experience we have been obliged for something I have lately animadverted concerning the pruning of trees,

CHAP. III.
AGE.

BOOK III. does, in another chapter of the same treatise, speak of the age of trees. The discourse is both learned, rational, and full of encouragement; for he does not scruple to affirm, that even some fruit-trees may possibly arrive to a thousand years of age; and if so fruit-trees, (whose continual bearing does so much impair and shorten their lives, as we see it does their form and beauty) how much longer might we reasonably imagine some hardy and slow-growing forest-trees may probably last? I remember Pliny tells us of some Oaks growing in his time in the Hercynian forest,^k which were thought coeuous with the world itself; their roots had even raised mountains, and where they encountered, swelled into goodly arches like the gates of a city: But our more modern author's calculation for fruit-trees, (I suppose he means Pears, Apples, &c.) is three hundred years for growth, as much for their stand, as he terms it, and three hundred for their decay, which does in the total amount to no less than nine hundred years. This conjecture is deduced from Apple-trees growing in his orchard, which having known for forty years, and upon diligent inquiry of sundry aged persons, of eighty years and more, who remembered them trees all their time, he finds by comparing their growth with others of that kind, to be far short in bigness and perfection, viz. by more than two parts of three, yea, albeit those other trees have been much hindered in their stature through ill government and misordering: And this to me seems not at all extravagant, since I find mention of a Pear-tree near Rofs in Herefordshire, which being of no less than eighteen feet circumference, and yielding seven hogsheads of cyder yearly, must needs have been of very long standing and age, though perhaps not so near Methusalah's.

To establish this, he assembles many arguments from the age of animals, whose state and decay double the time of their increase by the same proportion. "If then (saith he) those frail creatures, whose bodies are nothing in a manner but a tender rottenness, may live to that age, I see not but a tree of a solid substance, not damnified by heat or cold, capable of, and subject to any kind of ordering or dressing, feeding

^k In eadem Septentrionali plaga, Hercyniæ Silvæ roborum vastitas intacta avis, et congenita mundo, prope immortalis sorte miracula excedit. Constat attolli colles occursantium inter se radicibus repercutis: aut ubi secuta tellus non sit, arcus ad ramos usque, et ipsos inter se rixantes, curvari portarum patentium modo, ut turmas equitum transmittant. Plin. l. xvi. c. ii.

naturally, and from the beginning disburthened of all superfluities, eased of, and of his own accord avoiding the causes that may annoy him, should exceed the life of other creatures by very many years. What else are trees in comparison with the earth, but as hairs to the body of man? And it is certain, that (without some distemper, or forcible cause, the hairs dure with the body, and are esteemed excrements but from their superfluous growth." So as he resolves, upon good reason, that fruit-trees, well ordered, may live a thousand years and bear fruit; and the longer the more, the greater and the better, (for which an instance also in Dr. Beal's Herefordshire Orchards, p. 21, 22.) because his vigour is proud and stronger when his years are many. Thus you shall see old trees put forth their buds and blofsoms both sooner and more plentifully than young trees by much; and I sensibly perceive my young trees to enlarge their fruit as they grow greater. And if fruit-trees continue to this age, how many ages is it to be supposed strong and huge timber-trees will last; whose mafsy bodies require the years of divers Methusalahs, before they determine their days; whose sap is strong and bitter; whose bark is hard and thick, and their substance solid and stiff; all which are defences of health and long life? Their strength withstands all forcible winds; their sap of that quality is not subject to worms and tainting; their bark receives seldom or never by casualty any wound; and not only so, but they are free from removals, which occasion the death of millions of trees; whereas the fruit-tree, in comparison, is little, and frequently blown down; his sap sweet, easily and soon tainted; his bark tender, and soon wounded; and himself used by man as man uses himself; that is, either unskillfully or carelessly." Thus he. But Vofsius de Theolog. Gent. lib. v. cap. v. gives too little age to Ashes when he speaks but of one hundred years, (in which, as in the rest, he seems to agree with my Lord Bacon, Hist. Vitæ et Mort. Art. i.) and to the Medica, Pyrus, Prunus, Cornus, but sixty. He had as good have held his peace; even Rosemary has lasted amongst us a hundred years.

I might to this add much more, and truly with sufficient probability, that timber-trees (especially such as be of a compact, resinous, or balsamical nature, of which kind are the Yew, Box, Hornbeam, White Thorn, Oak, Walnut, Cedar, Juniper, &c.) are capable of very long duration and continuance. Those of largest root, (a sign of age) are

BOOK III. longer lived than the shorter; the dry than the wet; and the gummy than the watery; the sterile, than the fruitful: I do not conclude from Pliny's Hercynian Oaks, or the Turpentine-tree of Idumæa, which Josephus ranks also with the creation. I mentioned a Cypress, yet remaining somewhere in Persia near an old sepulchre, whose stem is as large as five men can encompass, the boughs extending fifteen paces every way; this must needs be a very old tree, believed by my author little less than two thousand five hundred years of age. Of such another Dr. Spon, in his voyage into Greece, speaks, which, by its spreading seems to be of the Savine kind; and, in truth, as to the age and duration, Cypress, Cedar, Box, Ebony, Brasil, and other exceedingly hard and compact (with some resinous) woods, growing chiefly in both East and West Indies, must needs be of wonderful age. The particulars were too long to recount of the old Platanus set by Agamemnon, mentioned by Theophrastus, the Herculean Oaks, the Laurel near Hippocrene, the Vatican Ilex, and the Vine which was grown to that bulk and woodiness as to make a statue of Jupiter, and columns in Juno's temple: at present it is found that the great doors of the cathedral at Ravenna are made of such Vine-tree planks, some of which are twelve feet long, and fifteen inches broad, the whole soil of that country producing Vines of prodigious growth. Such another, in Margiana, is spoken of by Strabo, that was twelve feet in circumference. Pliny mentions one of six hundred years old in his time; and at Ecoan, the late Duke of Montmorency's house, is a table of a very large dimension, made of the like plant; and that which renders it the more strange, is, that a tree growing in such a wreathed and twisted manner, rather like a rope than timber, and needing the support of others, should arrive to such a bulk and firm consistence; but so it is, and Olearius affirms, that he found many Vines near the Caspian Sea, whose trunks were as big about as a man. And the old Lotus-trees, recorded by Valerius Maximus, and the Quercus Mariana, celebrated by the Prince of Orators, Pliny's huge Larix, and what grew in the Fortunate Islands, with that enormous tree Scaliger reports was growing in the Troglodytic India, were famous for their age. St. Hierom affirms he saw the Sycamore that Zaccheus climbed up to behold our LORD ride in triumph to Jerusalem: But that's nothing for age to the Olive under which our blessed Saviour agonized, still remaining, as they say, in the garden to which he used to resort. At the same rate, Surius tells of other Olive-trees at Nazareth, and of the cursed Fig-

tree, whose stump was remaining above 1500 years. Not to omit that other Fig-tree, yet standing near Cairo, which is said to have opened in two to receive and protect the blessed Virgin and holy Babe, as she was flying into Egypt; but is now showed whole again, as Monconys, who saw it, but believed nothing of it, tells the story. There is yet there a tree of the same kind, which measures seventeen paces in circumference. And now in the Aventine Mount they show us the *Malus Medica*, planted by the hand of St. Dominic, and another in the monastery at Fundi, where Thomas Aquinas lived, planted by that Saint, 1278. In Congo they speak of trees capable of being excavated into vessels that would contain two hundred men a-piece. To which add those superannuated *Tilias* now at Basil, and that of Ausburgh, under whose prodigious shade they so often feast, and celebrate their weddings; because they are all of them noted for their reverend antiquity, that of Basil branching out one hundred paces diameter, from a stem of about twenty feet in circle, under which the German Emperors have sometimes eaten; and to such trees it seems they paid divine honours, as the nearest emblems of eternity, *et tanquam sacras ex vetustate*, as Quintilian speaks. And like to these might that *Cypress* be which is celebrated by Virgil, near to another monument¹.

But we will spare our reader, and refer him that has a desire to multiply examples of this kind, to those undoubted records our naturalist mentions in lib. xvi. chap. xliv. where he shall read of Scipio Africanus's Olive-trees; Diana's Lotus; the Ruminal Fig-tree, under which the bitch wolf suckled the founder of Rome and his brother, lasting (as Tacitus calculated) eight hundred and forty years, putting out new shoots, and presaging the translation of that Empire from the Cæsarian line, happening in Nero's reign: The *Ilex*, of prodigious antiquity, as the *Hetruscan* Inscription remaining on it imported. But Pausanias, in his *Arcadics*, thinks the *Samian Vitex*, of which already, to be one of the oldest trees growing, and the *Platan* set by Menelaus: To these he adds the *Delian Palm*, coevous with Apollo himself, and the *Olive* planted by *Minerva*,

¹ ————— *juxtaque antiqua cupressus,
Religione patrum multos servata per annos,*

BOOK III. according to their tradition; the over-grown Myrtle; the Vatican and Tiburtine Holm, and especially that near to Tusculum, whose body was thirty-five feet about; besides divers others which he there enumerates in a large chapter. And what shall we conjecture of the age of Xerxes's Platanus, in admiration whereof he staid the march of so many hundred thousand men for so many days; by which the wise Socrates was used to swear. And certainly a goodly tree was a powerful attractive, when that prudent Consul Papienus Crispus, fell in love with a prodigious Beech of a wonderful age and stature, (which he used to sleep under, and would sometimes refresh it with pouring wine at the roots,) and that wise Prince Francis I. with an huge Oak, which he caused to be so curiously immured at Bourges.

STATURE. We have already made mention of Tiberius's Earch, intended to be employed about the Naumachia, which being one hundred and twenty feet in length, bare two feet diameter nearly all that space, (not counting the top,) and was looked upon as such a wonder, that though it was brought to Rome to be used in that vast fabric, the Emperor would have it kept *propter miraculum*; and so it lay unemployed till Nero built his amphitheatre. To this might be added the mast of Demetrius's Galeasse, which consisted of but one Cedar; and that of the float which wafted Caligula's obelisks out of Egypt, four fathoms in circumference. We read of a Cedar growing in the Island of Cyprus, which was one hundred and thirty feet long, and eighteen in diameter; and such it seems there are some yet growing on Mount Lebanon, (though very few in number) one of which our late traveller, Mr. Maundrel*, affirms himself to have measured of twelve yards six inches in girt, sound, and at six yards from the ground divided into five limbs each of which was equal to a great tree. We read also of the Plane in Athens, whose roots extended thirty-six cubits farther than the boughs, which were yet exceedingly large; and such another was that most famous tree at Velitæ, whose arms stretched out eighty feet from the stem; but these trees were solid. Let us calculate from the hollow. Besides those mentioned by Pliny, in the Hercynian Forest, the Germans had castles in Oaks, and (as now the Indians) some Puntis or Canoes of excavated Oak, which would well contain thirty, some forty persons. Such were the ancient *μουσωνα*, in use yet about Cephalonia, as Sir George Wheeler observed; and such the *Ἀφρα Πλάνα* used by those of Cyprus. But what

Journey to
Jerusalem, p.
110.

were these to a canoe in Congo, which was made to hold two hundred men? The Lician Platanus recorded by Pliny, and remaining long after his days, had a room in it of eighty-one feet in compass, adorned with stately seats and tables of stone; and it seems it was so glorious a tree both in body and head, that Licinius Mucianus (three times consul and governor of that province) used to feast his whole retinue in it, choosing rather to lodge in it, than in his golden-roofed palace*. And of later date, that vast Cerrus in which an Eremite built his cell and chapel, so celebrated by the noble Fracastorius in his Poem Malteide. Cant. viii.

* Lib. xii.

But for these capacious hollow trees we need go no farther than our own country; there being, besides that which I mention in Gloucestershire, an Oak at Kidlington-Green in Oxfordshire, which has been frequently used (before the death of the late Judge Morton, near whose house it stood) for the immediate imprisonment of vagabonds and malefactors, till they could conveniently be removed to the county gaol: And such another prison Dr. Plott does, in his excellent history of Oxfordshire, mention out of Ferdinand Hertado in Moravia, to be made out of the trunk of a Willow, twenty-seven feet in compass. But not to go out of our promised bounds, the learned Doctor speaks of an Elm growing on Blechington-Green, which gave reception and harbour to a poor great-bellied woman, whom the inhospitable people would not receive into their houses, who was brought to-bed in it of a son, now a lusty young fellow. This puts me in mind of that (I know not what to call it) privilege belonging to a venerable Oak, lately growing in Knoll-Wood, near Trely-Castle in Staffordshire, of which, I think, Sir Charles Skrymsher is owner; that upon oath made of a bastard's being begotten within the reach of the shade of its boughs, (which I assure you at the rising and declining of the sun is very ample,) the offence was not obnoxious to the censure of either Ecclesiastical or Civil Magistrate.—These, with our historian, I rather mention for their extravagant use, and to refresh the reader with some variety, than for their extraordinary capacity: because such instances were innumerable, should we pretend to illustrate this particular with more than needs.

And now I have spoken of Elms, and other extravagancies of trees, there stands one (as this curious observer notes) in Binsey Common,

BOOK III. six yards in diameter near the ground, which it is conjectured has been so improved by raising an earthen bank, or seat, about it, which has caused it to put forth into spurs, it not being so considerable in the higher trunk.

Compare me then with these that nine-fathom-deep tree spoken of by Josephus Acosta ; the Mastick-tree, seen and measured by Sir Francis Drake, which was four and thirty yards in circuit ; those of Nicaragua and Gambia, which seventeen persons could hardly embrace : Among these may come in the Cotton-tree described by Dampier. In India, says Pliny, *Arbores tantæ proceritatis traduntur, ut sagittis superjaci nequeant* ; and adds, (which I think material, and therefore add also,) *Hæc facit ubertas soli, temperies cæli, et aquarum abundantia*. Such were those trees in Corsica, and near Memphis, recorded by Theophrastus, &c. and for prodigious height, the two and three hundred feet unparalleled Palms Royal described by Capt. Ligon, growing in our plantations of the Barbadoes ; or those goodly masts of Fir, which I have seen and measured, brought from New England ; and what Bembus relates of those twenty-fathomed Antarctic trees ; or those of which Cardan writes, called Ceiba, which rising in their several stems each of twenty feet in compass, and as far distant each from other, unite in the bole at fifteen feet height from the ground, composing three stately arches, and thence ascending in a shaft of prodigious bulk and altitude. Such trees of thirty-seven feet diameter, an incredible thing, Scaliger (his antagonist) speaks of, *ad Gambæ fluvium*. Matthiolus mentions a tree growing in the Island of Cyprus, which contained one hundred and thirty feet high sound timber : And upon Mount Ætna, in Sicily, is a place called by them *Gli tre Castagne*, from three Chesnut-trees there standing, where in the cavity of one, yet remaining, a considerable flock of sheep is commonly folded. Kircher's words are these, as seen by himself: *Et quod forsân παραδεισος videri possit, ostendit mihi viæ dux, unius Castaneæ Corticem tantæ amplitudinis, ut intra eam integer pecorum grex à pastoribus, tanquam in Caula commodissima, noctu includeretur*. China Illust. p. 185. But this, as I remember, was lately ruined by the direful conflagration about Cattanea^m. And what may we conceive of those trees in the Indies, one

^m The Eruption of Mount Ætna that, in the year 1669, overwhelmed the city of Cattanea, did not destroy any of these memorable Chesnut-trees, as Mr. Evelyn supposes. They are

of whose nuts hardly one man is able to carry; and which are so vast, as they depend not, like other fruit, by a stalk from the boughs, but are produced out of the very body and stem of the tree, and are sufficient to feed twenty persons at a meal? There were trees found in Brazil, that sixteen men could scarcely fathom about: and the Jesuits caused one of these to be felled, for being superstitiously worshipped by the savages, which was one hundred and twenty feet in circumference. The Mexican Emperor is said to have had a tree in his garden, under whose shade a thousand men might sit at a competent distance.

CHAP. III.


We read of a certain Fig in the Caribbee Islands, which emits such large buttresses, that great planks for tables and flooring are cleft out of them, without the least prejudice to the tree; and that one of these does easily shelter two hundred men under them: And in Nieuhoff's voyage

still in being, and frequently visited by the curious and enterprising traveller. In the year 1770 Mr. Brydone made an accurate examination of them, and in an elegant history of his travels, entitled *A Tour through Sicily and Malta*, has favoured us with the following account:

“ From this place it is not less than five or six miles to the great Chestnut-trees, through forests growing out of the lava, in several places almost impassable. Of these trees there are many of an enormous size; but the *Castagno de Cento Cavalli* is by much the most celebrated. I have even found it marked in an old map of Sicily, published near an hundred years ago; and in all the maps of *Ætna*, and its environs, it makes a very conspicuous figure. I own I was by no means struck with its appearance, as it does not seem to be one tree, but a bush of five large trees growing together. We complained to our guides of the imposition; when they unanimously assured us, that by the universal tradition and even testimony of the country, all these were once united in one stem; that their grandfathers once remembered this, when it was looked upon as the glory of the forest, and visited from all quarters; that for many years past it had been reduced to the venerable ruin we beheld. We began to examine it with more attention, and found that there is an appearance that these five trees were really once united in one.— The opening in the middle is at present prodigious; and it does indeed require faith to believe, that so vast a space was once occupied by solid timber. But there is no appearance of bark on the inside of any of the stumps, nor on the sides that are opposite to one another. Mr. Glover and I measured it separately, and brought it exactly to the same size, viz. two hundred and four feet round. If this was once united in one solid stem, it must with justice indeed have been looked upon as a very wonderful phenomenon in the vegetable world, and deservedly styled the glory of the forest.

“ I have since been told by the Canonica Recupero, an ingenious ecclesiastic of this place, that he was at the expence of carrying up peasants with tools to dig round the *Castagno de Cento Cavalli*, and he assures me, upon his honour, that he found all these

BOOK III.

to the East Indies, there is mention of the Kynti, a kind of Oak, which yield planks of four feet breadth, and forty in length. Strabo, I remember, Geog. lib. xv. talks of fifty horsemen under a tree in India: His words are, ἄνθ' ὑπ' ἐν δένδρῳ μετημύριζεν σιαζόμενος ἰσπίδας πενήκοντα; and of another that shaded five stadia at once; and in another place of a Pine about Ida, which measured twenty-four feet diameter, and of a monstrous height: To these may be added the *Arbor de Rayz*, a certain tree growing in the East Indies, which propagates itself into a vast forest (if not hindered) by shooting up, and then letting a kind of gummy string to fall and drivel from its branches, which takes root in the ground again, and in this process spreads a vast circuit; the stems of some of which are reported to be upwards of six feet diameterⁿ. To this may be added the *Balete*, described by Mr. Ray, (Append. vol. III.) and what he cites of Melchior Barros, who found trees proof against weapons, resisting the

“stems united below ground in one root. I alleged that so extraordinary an object must “have been celebrated by many of their writers. He told me that it had, and produced “several examples; Philoteo, Carrera, and some others. Carrera begs to be excused “from telling its dimensions, but he says he is sure there was wood enough in that “one tree to build a large palace. Their poet Bagolini too has celebrated a tree of the “same kind, perhaps the same tree*; and Mafsa, one of their most esteemed authors, “says he has seen solid Oaks upwards of forty feet round; but adds, that the size of the “Chesnut-trees was beyond belief, the hollow of one of which, he says, contained three “hundred sheep, and thirty people had often been in it on horseback. I shall not pretend “to say, that this is the same tree he means; or whether it was ever one tree or not. There “are many others that are well deserving the curiosity of travellers. One of these, about “a mile and a half higher on the mountain, is called *Il Castagno del Galea*; it rises from one “solid stem to a considerable height, after which it branches out, and is a much finer object “than the other. I measured it about two feet from the ground; it was seventy-six feet “round. There is a third called *Il Castagno del Nave*, that is pretty nearly of the same size. “All these grow on a thick rich soil, formed originally, I believe, of ashes thrown out by “the mountain.”

* Supremos inter montes monstrosior omni
 Monstrosi ferum stipitis Etna dedit.
 Castaneam genuit, cujus modo concava cortex
 Turmam equitum haud parvam continet, atque greges.

ⁿ Mr. Marsden, in his History of Sumatra, gives the dimensions of one of these trees growing near Mancee, twenty miles west of Patna in Bengal. Diameter 370 feet. Circumference of the shadow at noon, 1116 feet. Circumference of the several stems, in number fifty or sixty, 921 feet. Under this tree sat a naked Takir, who had occupied that

force of any edged tool, being of a consisture so hard: But even this, and all we have hitherto produced, is nothing to what I find mentioned in the late Chinese History, (as it is set forth upon occasion of the Dutch Embafsy) where they tell us of a certain tree called *Ciennich*, (or the tree of a thousand years) in the province of *Sachu*, near the city of *Kien*, which is so prodigiously large, as to shroud two hundred sheep under one only branch of it, without being so much as perceived by those who approach it. And to conclude with yet a greater wonder, of another in the province of *Chekiang*, whose amplitude is so stupendously vast, as fourseore persons can hardly embrace. These gigantick trees the Chinese timber merchants transport on floats, upon which they build huts and little cottages, where they live with their families, floating many thousand miles till all be sold, as *Le Compte* tells us. In the mean time we must not omit the strange and incredible bulk of some Oaks standing lately in Westphalia, whereof one served both for a castle and fort; and another there, which contained in height one hundred and thirty feet, and, as some report, thirty feet diameter; also another which yielded one hundred wane load. I have read of a table of Walnut-tree, to be seen at *St. Nicholas's* in *Lorraine*, which held twenty-five feet broad, all of a piece, and of competent length and thicknefs, rarely flecked and watered: *Seamozzi* the Architect reports he saw it. Such a monster that might be, under which the Emperor *Frederick III.* held his magnificent feast in 1472. We will now endeavour to give a taste of more fresh observations, and to compare our modern timber with the antient, and that not

situation for twenty years; but he did not continue there the whole year, for his vow obliged him to lie, during the four cold months, up to his neck in the waters of the river *Ganges*. p. 131. Milton represents our first parents as making use of the leaves of this tree, as soon as they became conscious of shame:

The Fig-tree; not that kind for fruit renown'd;
 But such as at this day to Indians known
 In Malabar, or Decan, spreads her arms,
 Branching so broad and long, that in the ground
 The bending twigs take root, and daughters grow
 About the mother tree, a pillar'd shade
 High over-arch'd, and echoing walks between.

PARADISE LOST.

BOOK III. only abroad, but without travelling into foreign countries for these wonders.

What goodly trees were of old adored, and consecrated by the Druids, I leave to conjecture from the stories of our ancient Britains, who, had they left records of their prodigies in this kind, would doubtless have furnished us with examples as remarkable for the growth and stature of trees, as any which we have deduced from the writers of foreign countries; since the remains of what are yet in being (notwithstanding the havock which has universally been made, and the little care to improve our woods) may stand in fair competition with any thing that antiquity can produce.

There is somewhere in Wales an inscription extant, cut into the wood of an old beam thus :

SEXAGINTA PEDES FUERANT IN STIPITE NOSTRO,
EXCEPTA COMA QUÆ SPECIOSA FUIT.

This must needs have been a noble tree, but not without later parallels; for to instance in the several species, and speak first of the bulks of some immense trees, there was standing an old decayed Chesnut at Fraiting in Essex, whose very stump did yield thirty sizable load of logs. I could produce you another of the same kind in Gloucestershire, which contains within the bowels of it a pretty wainscotted room enlightened with windows, and furnished with seats, &c. to answer the Lycian Platanus lately mentioned.

But whilst I am on this period, see what a Tilia that most learned and obliging person Sir Thomas Brown, of Norwich, describes to me in a letter just now received.

“ An extraordinary large and stately Tilia, Linden, or Lime-tree, there groweth at Depeham, in Norfolk, ten miles from Norwich, whose measure is this : The compass, in the least part of the trunk or body, about two yards from the ground, is at least eight yards and a half; about the root near the earth, sixteen yards; about half a yard above that, near twelve yards in circuit; the height to the uppermost boughs about thirty

yards. This surmounts the famous Tilia of Zurich, in Switzerland; and uncertain it is whether in any Tilicetum or Lime-walk abroad it be considerably exceeded: Yet was the first motive I had to view it not so much the largeness of the tree, as the general opinion that no man could even name it; but I found it to be a Tilia Fœmina; and (if the distinction of Bauhinus be admitted from the greater and lesser leaf) a Tilia Platyphyllos, or Latifolia; some leaves being three inches broad; but to distinguish it from others in the country, I called it Tilia Colofsæa Depehamensis."

A Poplar-tree, not much inferior to this, he likewise informs me grew lately at Harling, by Thetford, at Sir William Gaudy's gate, blown down by that terrible hurricane about four years since*.

* 1660.

Thus that learned person. From these instances, I am not apt so much to admire what is pretended so mightily to exceed the refreshing shades of some of our Oaks, Beeches, Elms, and other ample umbrages, if diligently compared, as I am to impute it to what the younger Pliny attributes to men's affecting novelties, that *tanta suarum rerum satietas, aliarumque aviditas*.

But here does properly intervene the *Linden* of Schalouse, in Swifse, under which is a bower composed of its branches, capable of containing three hundred persons sitting at ease; it has a fountain set about with many tables, formed only of the boughs, to which they ascend by steps, all kept so accurately, and so very thick, that the sun never looks into it. But this is nothing to that prodigious Tilia of Neustadt, in the Duchy of Wirtemberg, so famous for its montrosity, that even the city itself receives a denomination from it, being called by the Germans *Neustadt under grossen Linden*, or Neustadt by the great Lime-tree. The circumference of the trunk is twenty-seven feet four fingers; the ambitus, or extent of the boughs, four hundred and three *feré*; the diameter, from south to north, one hundred and forty-five; from east to west, one hundred and nineteen feet; set about with divers columns and monuments of stone, (eighty-two in number at present, and formerly above an hundred more) which several Princes and Noble Persons have adorned, and celebrated with inscriptions, arms, and devices, and which, as so many pillars, serve likewise to support the umbragious and venerable

BOOK III. boughs; and that even the tree had been much ampler, the ruins and distances of the columns declare, which the rude soldiers have greatly impaired.

* 1679. By the date of the antientest columns, yet entire *, may be conjectured how goodly a tree it was above one hundred and twenty years ago. The inscriptions on the several arms and supporters are as follow:

D. V. H. Z. W. CLL.—*Graff zu Leuchtenberg*. 1591. 1583. 1575. *Albert von Rosenberg Ritter*. 1591. *Wolff Keidel alter Furlentium*. 1555. (Some report he planted it.) *Hans Heinric vonder Tana*. 1583. *Conrad von Flbeg*. 1575. *Fritz Nerter von Herteneh*. 1575. *Wirich von Gemmingen*. 1575. *Bartol*—*Mot*. 1555. V. *Hans Funk der zeit Burgermeister Die erst*. 1555. *Hans Ulrich Stigilheimer zu Durathenig Fuctlicher. hr. Hoffmeister*. 1591.

Præsul de Langheim rediens Cisterliæ ab urbe
Pyramidem hanc posuit flammis Cœlestibus auctam.
Sentiat hæc etiam Numen spirabile toto
Pectore, et illius semper sit munere felix.

Johann. Aht zu Langh. 1601. *Joh. Aht zu Schoenthal*. 1584. *Eberhard von Gimmingen*. 1555. *David von Helbstad Amtman. Graff Fridrich zu Mompelyard. Hans Henrick von Lammestein. Sigismund Signiger*. L. H. Z. W. A. 353. G. L. *Mary Graff au Brandenb*. 1562. *Georg. Ernest Graff zu Henneb. Herr zu Aschaff b*. 1575. *Michel Helmning Statt-schreiber*. 1555. *Hans Ulrick von Steine*. 1575. *Daniel von Helmstatt. zu Kappenaw*. 1556.—*Stamel von Reischach*. 1575. *Willhelm von Crombach*. 1588. *Bernolph von Gammingen*. 1588. *Schweiker Wumbold von Umstatt*. 1591. *Heinrich Link Pfarrer zu Uden. Andreas von Oberbach Forstmeist. zu Neu-statt. Neubrecht Bart Keller. zu Neu-statt*. 1557.—*Ernberg. Thomas Busch von Schorndorff. Wolfgang von Gemmingen*. 1588. *Feit Kumeter Forstmeister*. 1551 and 1530.

After this we might forbear the naming that at Tillburgh, near Buda in Hungary, growing in the middle of the street, extending to sixty-two paces from the stem, sustained by twenty-eight columns: nor that nearer us, at Cleves in the Low Countries, a little without the entrance into the town, cut in eight faces supported with pillars, and containing a room in

the middle, the head of the tree curiously shaped. I say, I need not have charged this paragraph with half these, but to show how much more the Lime-tree seems to be disposed to be brought into these arborious wonders, than other trees of slower growth; and yet I am told of a White Thorn, at Worms in Germany, planted in the centre of the quadrangle of the great church, whose branches, held up with stone, are in circle fifty paces: Several more occur, too tedious to recite. But what is all this, take the most spreading of them, to what we shall show, whilst that of Neustadt comes not yet by forty feet near to the dimensions of an Oak standing lately in Worksop Park, belonging to his Grace the Duke of Norfolk, Earl Marshal of England, spreading almost three thousand yards square, and under the shade whereof near a thousand horse might commodiously stand at once. But, besides the gigantic Lime-tree, there is likewise a White-Thorn, brought (as the tradition goes) a small twig out of Palestine, *Anno* 1470, by Eberhard, first Duke of Wirtemberg, (and planted near Tubing, where he founded St. Peter's Monastery) the branches whereof being sustained by forty columns of stone, is yet* a flourishing tree. It is probable that of Glastonbury is of this kind, and above a thousand years antienter, if the report be true. At Forti grows a Filbert whose trunk is as big as three men's middles: Near Efsling is a Juniper-tree of almost two feet diameter in the lower trunk, and very tall. These prodigies, with several more, we have from Dr. Faber, Physician to Frederic Duke of Wirtemberg, and collected by the late industrious Jesuit Schotti, in his Appendix ad Lib ii. De Mirabilibus Miscellaneis. Nor may here that goodly Birch-tree be forgotten, which growing in one of the courts of the palace of Augsburg, is so spreading, as that the branches will cover with its shade three hundred and sixty-five tables, even as many as there are days in the year, as Tavernier tells us in his Travels. Mr. Cook, in his ingenious and useful Treatise, mentions a Witch Elm growing within these three or four years in Sir Walter Baggot's park in the county of Stafford, which, after two men had been five days felling, lay forty yards in length, and was at the stool seventeen feet diameter: It broke in the fall fourteen load of wood; forty-eight in the top: Yielded eight pair of naves, eight thousand six hundred and sixty feet of boards and planks: It cost ten pounds seventeen shillings the sawing; the whole esteemed ninety-seven tuns. This was certainly a goodly stick!

* 1670.

BOOK III.

What other prodigious trees do at present, and did formerly, abound in that country, may be seen in Dr. Plot's Natural History. Such was an Oak at Narbury, of fifteen yards in girth, which being felled, two men at either side on horseback could not see one another: Also an Ash of eight feet diameter, the timber of which was valued at thirty pounds.

I am told even of a Withy-tree, to be seen somewhere in Berkshire, which is increased to a most stupendous bulk; and of two Witch Hasel-trees of prodigious size, growing in Oaksey-Park, belonging to Sir Edward Pooles, near Malmesbury in Wiltshire, not inferior to the largest Oaks: But these, for arriving hastily to their *acme* and period, and generally not so considerable for their use, I pass to the Ash, Elm, Oak, &c.

There were of the first of these divers which measured in length one hundred and thirty-two feet, sold lately in Essex; and in the manor of Horton (to go no farther than the parish of Ebslam in Surrey, belonging to my brother Richard Evelyn, Esq.) there are Elms standing in good numbers, which would bear almost three feet square for more than forty feet in height, which is, in my judgment, a very extraordinary matter.—They grow in a moist gravel, and in the hedge-rows.

Not to insist upon Beech, which are frequently very large, there are Oaks of forty feet high and five feet diameter yet flourishing in divers old parks of our Nobility and Gentry; and Firs of one hundred and fifty feet in height, which are exceeded by one growing in a wood about Bern, by almost one hundred feet, as Chabrous tells us.

A large and goodly Oak there is at Reedham, in Sir Richard Berney's Park of Norfolk, which I am informed was valued at forty pounds the timber, and twelve pounds the lopping wood.

Nor are we to overpass those memorable trees which so lately flourished in Dennington Park near Newbury; amongst which three were most

* My very excellent friend Mr. Marsham, of Stratton, near Norwich, informs me that in the year 1767, he measured an Ash-tree in Benel churchyard, North Britain, which, at five feet from the ground, was sixteen feet nine inches in girth. The tree was then in a flourishing and growing state.

remarkable from the dedication of the ingenious planter (if tradition hold) the famous English Bard, Geoffrey Chaucer; of which one was called the King's, another the Queen's, and a third Chaucer's Oak. The first of these was fifty feet in height before any bough or knot appeared, and cut five feet square at the butt end, all clear timber. The Queen's was felled since the wars, and held forty feet of excellent timber, straight as an arrow in growth and grain, and cutting four feet at the stub, and near a yard at the top; besides a fork of almost ten feet clear timber above the shaft, which was crowned with a shady tuft of boughs, amongst which, some were on each side curved like rams horns, as if they had been so industriously bent by hand. This Oak was of a kind so excellent, cutting a grain clear as any clap-board, (as appeared in the wainscot which was made thereof,) that it is a thousand pities some seminary of the acorns had not been propagated, to preserve the species. Chaucer's Oak, though it were not of these dimensions, yet was it a very goodly tree.: And this account I received from my most honoured friend Phil. Packer, Esq. whose father (as lately the Gentleman his brother,) was proprietor of this park: But that which I would further remark, upon this occasion, is the bulk and stature to which an Oak may possibly arrive within less than three hundred years, since it is not so long that our poet flourished, (being in the reign of King Edward III.) if at least he were indeed the planter of those trees, as it is confidently affirmed. I will not labour much in this inquiry, because an implicit faith is here of great encouragement; and it is not to be conceived what trees of a good kind, and in apt soil, will perform in a few years; and this, I am informed, is a sort of gravelly clay, moistened with small and frequent springs. In the meanwhile, I have often wished that Gentlemen were more curious of transmitting to posterity such records, by noting the years when they begin any considerable plantation, that the ages to come may have both the satisfaction and encouragement by more accurate and certain calculations. Henry Ranjovius planted a grove in Ditmarsh, Anno 1580, of Oak, Fir, Beech, Birch, &c. and erected a stone with this inscription, (which I mention not for its elegancy, but example) *An. Dom. 1580. Quercus, Abietes, Betulas, &c. Plantavit: Annus et Initium sationis adscribi iussit, ut earum Aetatem exploraret posteritas; quod in omnia Orbis secula aeternae Divinitati commendat*, as I find recorded by that industrious Genealogist, Scipio Amiratus of Florence. But the only instance I know of the like in our own country is in the park of Althorp in Northampton-

BOOK III. shire, the magnificent seat of the Right Hon. the Earl of Sunderland.—
 I find a Jewish tradition, cited by the learned Bochart, that Noah planted the trees (he supposes Cedars) of which he afterwards built the ark that preserved him: Nor was it esteemed any diminution for Princes themselves to plant trees with that hand which held the sceptre and reins of empire: So as in the Voorhout of the Hague, stands a tree placed there by the hands of the Emperor Charles, which is yet in its prime growth, and no small boast of the good people.

But before we go farther with the history of the stature and magnitude of trees, we are not to conclude as if all those trees and plants, which arrive to that enormous stature and bulk we have mentioned, were not to be found in other countries, both of the same and other species; but that even those exotics, and divers of our own, which seem pigmies and dwarfs, compared to those giants in their native climate, are so much greater than in ours; since we find what we account but shrubs, are divers of them well-grown trees, and prosper into useful timber; such as Juniper, (emulating the tall Cedar) Sabine, Tamarisk, Cornel, Phillyrea, Granade, Lentiscus, Thuya, Laurel, Bays, and even Rosemary, (and other fruitexes and ligneous plants) superior in growth and stature (than with us) where they spontaneously emerge. Thus not only the White-Mulberry wonderfully outstrips ours, but those of much smaller stature. The Arbutus, growing on Mount Athos, becomes a spreading tree. The Cypress in Candy comes to timber, fit for vast beams and planks of four feet breadth. The Larch over-tops the Fir. Even the Myrtle, with us but a bush, makes staves for spears. The Oleander, *et Hamilis Genista*, nay, the Rhododendron, make posts and rafters. Even herbaceous Suffrutages, and amongst the culinary furniture, a grain of Mustard has sprung up to a tree, whose branches afforded harbour to the birds of the air; and the very Hyfsop made the stalk that carried a sponge to the mouth of our blessed Lord on the cross^p. We are told by

^p Some critics upon this passage of St. John (*), taking the Hyfsop of Judæa to be the same plant and of the same growth with ours, have conceived, either that the Hyfsop was not used as the means of lifting up the sponge, or, that the word *Hyfsop* is not the true reading of the text. These two opinions have given rise to many ingenious observations

* John xix. 29.

Josephus, that in the palace of Macherus, there was growing a plant of Rue, equal for height and thickness to any Fig-tree; it was still remaining in the time of Herod, and would have stood longer, had not the Jews cut it down. Jos. Antiq. Bell. Jud. lib. vii. cap. vi. How these, and indeed all other vegetables differ in the north from those of the south, growing on the same mountain, Monsieur Brenier has shown us;

and conjectures which it is no part of our business to retail. The following remarks, perhaps, may incline the reader to think that the Hyfsop of Judæa, that is, *azoub*, was not the same with our Hyfsop, or, however, of a much superior growth, and therefore that the *καλαμος* of St. Matthew (b), and the *ισσωπος* of St. John, may be the same.

The Jews reckon four, Kimchi says seven, species of Hyfsop. It appears from the Talmud, that Hyfsop was gathered not only for the use of the table, but also for wood; *i. e.* I suppose, they used it for *fuel*, as the Egyptians did the reed and the papyrus (c): it is mentioned also among the reeds and boughs, with which the Jews covered their booths at the feast of Tabernacles.—In the 1 Kings iv. 33, Hyfsop of one species, though it stands opposed to the Cedar of Lebanon, appears to have been classed by Solomon among *trees*. It is no objection to this remark, that it is called the Hyfsop that *springeth out of the wall*; for the original might, with equal justice, have been rendered *that groweth AGAINST or BY the wall*; and, perhaps, *that groweth upon ruins*, viz. out of the rubbish; or, *that groweth upon or by the ramparts*, viz. of Jerusalem, or any other city; that is, of which there is abundance without the walls of the city, or which is known to grow in such situations. It is true that the word, which is here translated *trees*, appears from a passage in the book of Joshua (d), to comprehend under it the *stalks of flax*: In this, however, there is nothing inconsistent with the opinion that the *Hyfsop of the wall* was an arborescent plant, holding, according to Solomon's arrangement, the lowest place in that class, of which the Cedar of Lebanon held the highest: for why may not the flax of Palestine have been as much a tree, as the mustard of it was? However, if any thing that was called *Hyfsop* in the East, was of a growth as great only as that of *our flax*, St. John's *ισσωπος* may be the same with the *καλαμος* of St. Matthew; for it might afford a stalk of length and strength sufficient to raise the sponge to the mouth of a person hanging on the cross. But there is reason to believe *more* than this concerning the *Hyfsop of the wall*; for if it had not been a tree properly so called, the *Seventy* (e), and *Josephus* (f), who could not but be acquainted with the ordinary productions of their own country, in translating this passage, could never have rendered by the terms *ξύλον* and *δένδρον*, that Hebrew word *Otz*, that comprehends both the Cedar and the Hyfsop. To this we may add, that *Isaac Ben Qawan* (g), according to *Bochart*'s

^b Matt. xxvi. 48.—^c Ulpian in Digest. lib. xxxii. leg. 55. sect. 5. Ed. Amst. *Corporis juris civilis* 1700, p. 573. vol. 1.—^d Joshua ii. 6.—^e Greek version of 1 Kings iv. xxxiii.—^f Joseph. Antiq. Jud. lib. viii. cap. 2. sect. 5. p. 419. 1 vol. Ed. Haverc.—^g Bochart. *Hierozoicon*. 1^o. lib. ii. cap. 50. p. 590.

BOOK III. some are nipt and starved with that *penetrabile frigus*, and others ruined by the scorching heat, quite changing almost their very nature and constitution; some of them are dry, yielding nothing but leaves; others of the same species are gummy, juicy, and succulent. The *Lentiscus* yields *Mastich* in Cio; in Italy, the Oak bears Galls; and the *Fraxinus* exudes *Manna* in Calabria: Thus do *Cælum* and *Solum* govern the Vegetable

Latin version of his Arabic, says, "That the dry *Hyfsop* grows upon the mountains of Jerusalem, and extends its branches over the ground to the length of a cubit, or near it." *Ben Owan* was upon the spot; he speaks from his own knowledge, and I apprehend that his cubit wanted but two or three inches of two English feet. *Christ* was crucified upon the mountains where this *Hyfsop* grew, and there can be no doubt, that if the *branch* was not sufficient for the purpose of which St. John speaks, the *stem*, however, could not *but* be so. Suppose the *Hyfsop* of the East to be the same plant with ours, that it might, nevertheless, be of much larger growth, seems probable, from this circumstance, that the *Mustard* was. *Lightfoot* and *Tremellius* have quoted two passages from the *Talmud*, in one of which we are told of a *Mustard-tree*, one of the boughs of which covered the tent of a potter: and in the other, of another tree of the same kind, the owner of which was wont to climb it, as men climb up a fig-tree. Now, though these stories may deserve no *farther* credit, yet certainly so much is due to them, as to induce us to believe that the *Mustard* was a large, tall, strong plant. To have feigned such exaggerations concerning a plant which never had these characters, could only have discredited and disgraced both the authors and the propagators of the story. Pliny, in the ninth chapter of the nineteenth book of his *Natural History*, says, that at *Rosea*, in the country of the *Sabines*, the hemp plant grows to the height of a tree. And *Maldonat*, a Spanish Commentator, says, that in Spain he has often seen the *Mustard* used instead of wood for heating large ovens to bake bread; that he has seen large woods of *Mustard*, (*magnas sylvas*) and birds sitting upon the trees, though he never observed that they built their nests in them. To this we may add what is said of the *Milium*, and the *Sesamum* by *Herodotus*^b, whose credulity, as to what he heard, is indeed blameable enough; but whose veracity, as to what he saw, is not to be called in question. Speaking of the country about *Babylon*, he says, "How great a tree proceeds from the *Milium*, and from the *Sesamum*, though I know certainly, I will not say, being well persuaded that with those who have never been in this country, what I have said of its wheat and barley, will meet with little credit." Innumerable instances may be produced to show that soil and climate are capable of making *that* a large tree in one country, which is only a shrub in another; and why may not the same law operate with the same force upon the *herbaceous* vegetable? Nay soil alone, in the *same* climate, produces a wonderful diversity of dimension. The *Marygold*, which, in a moist and fat earth, rises two feet high, scarce exceeds the same number of inches in a dry and gravelly soil.

^b Herod. Clío. Ed. fol. Gronovii, p. 78.

kingdom, for the mutual supply of the most useful productions, especially those of the forest, without which there could be no commerce in the world; for so has Providence ordained.

CHAP. III.

There was in Cunsborough (sometime belonging to my Lord of Dover) several trees bought by a Cooper, of which he made ten pounds per yard for three or four yards, as I have been credibly assured. But where shall we parallel that mighty tree which furnished the main-mast to the Sovereign of our seas, which being one hundred feet long save one, bare thirty-five inches diameter; yet was this exceeded in proportion and use by that Oak which afforded those prodigious beams that lie 'thwart her. The diameter of this tree was four feet nine inches, which yielded four square beams of four and forty feet long each of them. The Oak grew about Framlingham, in Suffolk; and indeed it would be thought fabulous to recount only the extraordinary dimensions of some timber-trees growing in that country, and the excessive sizes of these materials, had not mine own hands measured a plank, more than once, of above five feet in breadth, nine and an half in length, and six inches thick, all entire and clear, not reckoning the slab. This plank, cut out of a tree felled by my grandfather's order, was made a pastry-board, and lay on a frame of solid brick-work at Wotton, in Surrey, where it was so placed before the room was finished about it, or wall built, and yet abated by one foot shorter, to confine it to the intended dimensions of the place; for at first it held this breadth, full ten feet and an half in length: By an inscription cut in one of the sides, it had lain there above an hundred years. To this may be added that table of one plank, of above seventy-five feet long, and a yard broad through the whole length, now to be seen in Dudley-Castle Hall, which grew in the park described by Dr. Plott in his Natural History of Staffordshire.

To these I might add a Yew-tree^a in the church-yard of Crowhurst, in the county of Surrey, which I am told is ten yards in compass; but especially that superannuated Yew-tree growing now in Braburne church-yard, not far from Scot's-Hall in Kent; which being fifty-eight feet

^a The ingenious Mr. Pennant, in his *Tour in Scotland*, mentions a Yew-tree in Fotheringal Church-yard, whose ruins measured fifty-six feet and a half in circumference.

BOOK III. eleven inches in the circumference, will bear near twenty feet diameter, as it was measured first by myself imperfectly, and then more exactly for me, by order of the late Right Hon. Sir George Carteret, Vice-Chamberlain to his Majesty, and late Treasurer of the Navy: Not to mention the goodly planks, and other considerable pieces of squared and clear timber, which I observed to lie about it, that had been hewed and sawn out of some of the arms, only torn from it by impetuous winds.— Such another monster, I am informed is also to be seen in Sutton church-yard, near Winchester. To these we add what we find taken notice of by the learned and industriously curious Dr. Plot, in his Natural History of Oxfordshire; particularly an Oak between Newnham Courtney, and Clifton, spreading, from bough-end to bough-end, eighty-one feet, shading in circumference five hundred and sixty square yards of ground, under which two thousand four hundred and twenty men may commodiously stand in shelter. And a bigger than this may be seen near the gate of the water-walk at Magdalen-College, whose branches shoot sixteen yards from the stem^r; likewise another at Rycote, in Lord Norris's park, extending its arms fifty-four feet, under which three hundred and four horses, or four thousand three hundred and seventy-four men may sufficiently stand. This is that *Robur Britannicum* so much celebrated by the late author of Dodona's Grove, and under which he leans contemplating in the frontispiece. But these (with infinite others which I am ready to produce,) might fairly suffice to vindicate and assert our proposition, as it relates to modern examples, and sizes of timber-trees, comparable to any of the antients, remaining upon laudable and unsuspected records, were it not great ingratitude to conceal a most industrious and no less accurate account, which comes to my hands from Mr. Halton, Auditor to the Right Honourable the Most Illustrious and Noble Henry Duke of Norfolk, Earl Marshal of England.

IN SHEFFIELD, LORDSHIP.

In the Hall-park, near unto Rivelin, stood an Oak which had eighteen yards without bough or knot, and carried a yard and six inches square at the said height or length, and not much bigger near the root; it sold

The names of the persons who gave intelligence of the particulars.
Edw. Rawson.

* This celebrated tree was blown down on the 29th day of June, 1789, after having continued on classic ground near 500 years. It was generally known by the title of "Addison's Oak," he having shown an affection for it by placing a bench under its shade, on which he frequently reposed himself after walking.

twelve years ago for eleven pounds. Consider the distance of the place and country, and what so prodigious a tree would have been worth near London.

CHAP. III.

In Firth's Farm, within Sheffield Lordship, about twenty years since, a tree blown down by the wind made, or would have made, two forge-hammer beams; and of those, and the other wood of that tree, there was worth, or made, fifty pounds; and Godfrey Frogat, who is now living, did oft say he lost thirty pounds by the not buying of it.

Capt. Bullock.

A hammer-beam is not less than seven yards and a half long, and four feet square at the barrel.

In Sheffield park, below the Manor, a tree was standing which was sold by one Gifford, (servant to the then Countess of Kent) for two pounds ten shillings, to one Nicholas Hicks, which yielded of sawn wair fourteen hundred, and, by estimation, twenty cords of wood.

A wair is two yards long and one foot broad, six score to the hundred: so that in the said tree were ten thousand and eighty feet of boards, which, if any of the said boards were more than half an inch thick, renders the thing yet more admirable.

Ed. Morphy,
Woodward.

In the upper end of Rivelin stood a tree, called the Lord's Oak, of twelve yards about, and the top yielded twenty-one cord; cut down about thirteen years since.

In Sheffield park, Ann. 1646, stood above one hundred trees worth a thousand pounds; and there are yet two worth above twenty pounds.—Still note the place and market.

In the same park, about eight years ago, Ralph Archdall cut a tree that was thirteen feet diameter at the kerf, or cutting-place near the root.

In the same park two years since, Mr. Sittwell, with Jo. Magson, did choose a tree, which, after it was cut, and laid aside flat upon level ground, Samuel Staniforth, a keeper, and Edward Morphy, both on horseback, could not see over the tree one another's hat crowns. (And

BOOK III. such another was the Narbury Oak, mentioned in a former part of this chapter.) This tree was afterwards sold for twenty pounds.

In the same park, near the old Ford, is an Oak-tree, yet standing, of ten yards circumference ¹.

John Halton. In the same park, below the Conduit plain, is an Oak-tree which bears a top, whose boughs shoot from the bole some fifteen and some sixteen yards.

Then admitting fifteen yards and a half for the common, or mean extent of the boughs from the bole, which being doubled, is thirty-one yards; and if it be imagined for a diameter, because the ratio of the diameter to the circumference is $\frac{7}{22}$, it follows

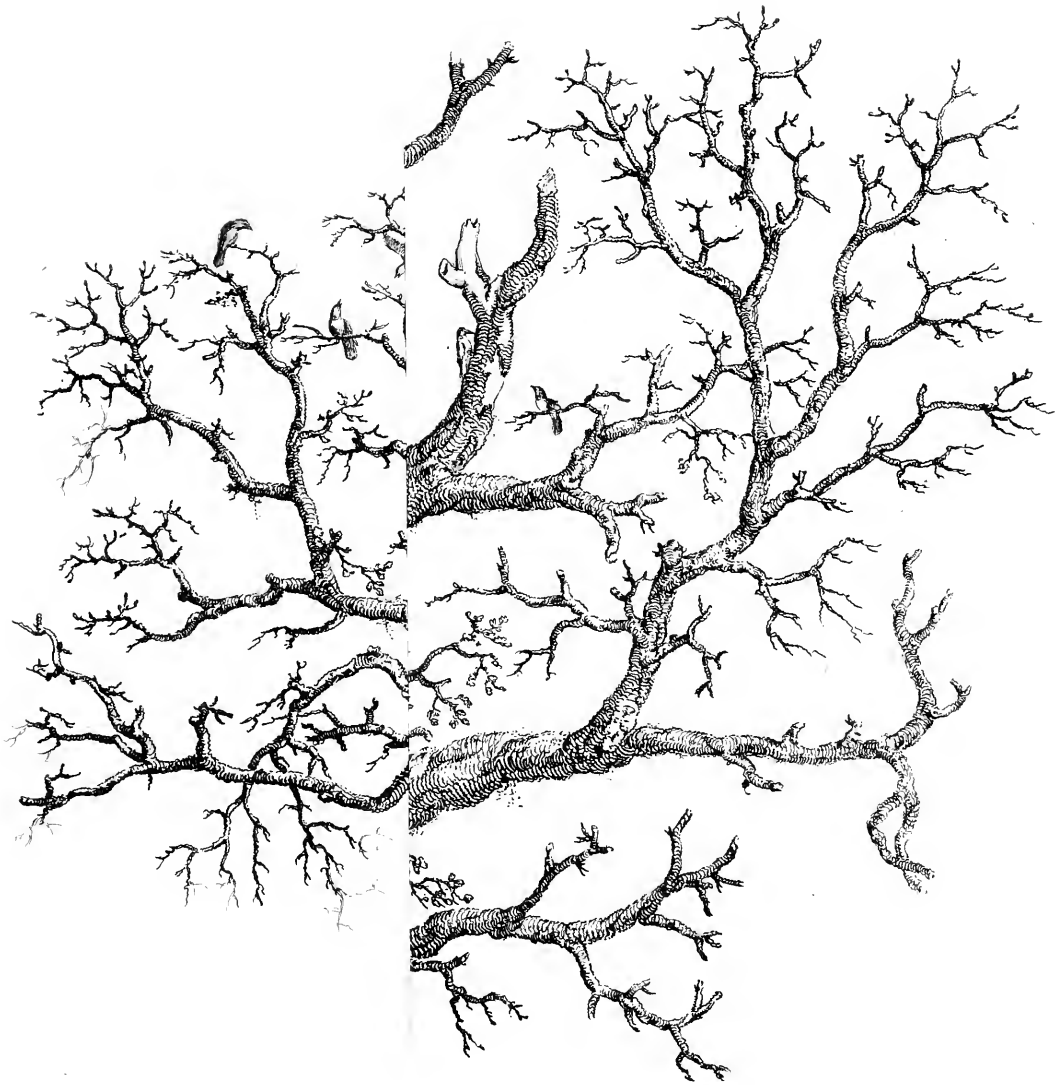
• My ingenious friend Mr. Marsham informs me, that there is now growing in Holt Forest, near Bentley, a vigorous and healthy Oak, which at five feet from the ground, measures thirty-three feet eight inches in girth; however, neither this, nor any of the Oaks mentioned by Mr. Evelyn, bear any proportion to one growing at Cowthorpe, near Wetherby, upon an estate belonging to the Right Hon. Lady Stourton. The dimensions are almost incredible. Within three feet of the surface (1776) it measured sixteen yards in circumference, and close by the ground, twenty-six yards. Its height is about eighty feet, and its principal limb extends sixteen yards from the bole. Throughout the whole tree, the foliage is extremely thin, so that the anatomy of the ancient branches may be distinctly seen in the height of summer. *Trunco, non frondibus, efficit umbram.*—LUCAN. This venerable tree must once have been the pride of the forest, but now

————— the gray mofs mars his rine,
His bare boughs are beaten with stormes,
His top is bald and wasted with wormes,
His honour decay'd, his branches sere.

SPENSER.

The following is an account of six large Oaks in Kedleston Park, in 1784.

TREES.	Main Height. Ft. In.	Timber Height. Ft. In.	4 Feet. Girth. Ft. In.	8 Feet. Girth. Ft. In.	12 Feet. Girth. Ft. In.
No. 1.	118 1	81 9	22 3	19 6	16 3
No. 2.	111 6	85 1	20 4	17 8	15 0
No. 3.	100 4	85 0	23 1	19 9	16 5
No. 4.	98 5	70 0	18 1	17 2	15 7
No. 5.	98 4	89 0	23 9	18 8	15 6
No. 6.	93 0	73 0	23 7	19 11	16 2
Total	619 8	483 10	131 1	112 8	94 11



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Then admitting fifteen yards and a half for the common, or mean extent of the boughs from the bole, which being doubled, is thirty-one yards; and if it be imagined for a diameter, because the ratio of the diameter to the circumference is $\frac{11}{33}$, it follows

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A Winter View of the Carwithorpe Oak.

J. M. Ford

113. 355. :: 31. 97 $\frac{44}{113}$ yards, which is the circumference belonging CHAP. III.
 this diameter. 

Then further it is demonstrable in geometry, that half the diameter multiplied into half the circumference, produces the area or quantity of the circle, and that will be found to be $754\frac{44}{113}$, which is 755 square yards *feré*.

Then lastly, if a horse can be limited to three square yards of ground to stand on, (which may seem a competent proportion of three yards long, and one yard broad) then may two hundred and fifty-one horses be well said to stand under the shade of this tree. But of the more northern cattle, certainly above twice that number.

WORKSOP PARK.

In this park, at the corner of Bradshaw-rail, lieth the bole of an Oak- Hen. Homer,
 tree, which is twenty-nine feet about, and would be found thirty if it could be justly measured, because it lieth upon the ground; and the length of the bole is ten feet, and no arm or branch upon it.

In the same park, at the White Gate, a tree did stand that was from Jo. Hall.
 bough-end to bough-end (that is from the extreme ends of two opposite Geo. Magson.
 boughs,) one hundred and eighty feet; which is witnessed by Jo. Magson and George Hall, and measured by them both.

Then because 180 feet, or 60 yards, is the diameter, 30 yards will be the semi-diameter: And by the former analogies

$$113. 355 : : 60. 188\frac{1}{2} \text{ and } 1. 30 : : 94\frac{1}{4}. 2827\frac{1}{2}$$

That is the content of ground upon which this tree perpendicularly drops, is above 2827 square yards, which is above half an acre of ground: and the assigning three square yards (as above) for an horse, there may 942 be well said to stand in this compass.

In the same park (after many hundreds sold and carried away) there is Jo. Magson.
 a tree which did yield quarter-cliff bottoms that were a yard square; and

BOOK III. there is of them to be seen at Worksop at this day, and some tables made of the same quarter-cliff likewise.

In the same park, in the place there called the Hawk's Nest, are trees 40 feet long of timber, which will bear two feet square at the top end or height of forty feet.

If then a square, whose side is two feet, be inscribed in a circle, the proportions at that circle are,

	Feet.
Diameter	2 : 8284
Circumference	8 : 8858
Area	6 : 2831

* A statutable ton of timber is by some reckoned forty-three feet of solid : and to a load fifty.

And because a ton of timber is said to contain forty solid feet, one of these columns of Oak will contain above six tons of timber, and a quarter* ; in this computation they are taken to be Cylinders, and not tapering like the segments of a Cone.

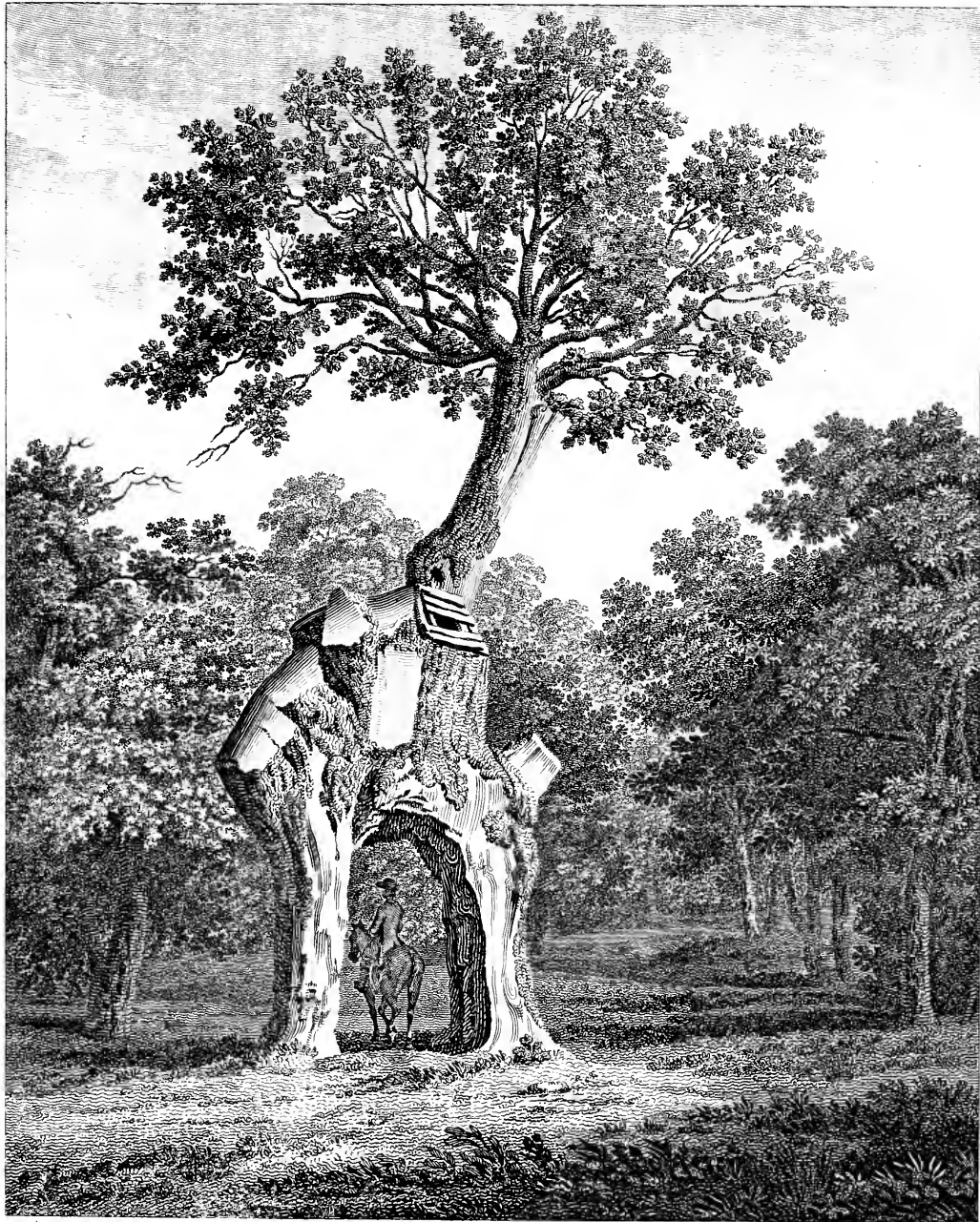
WELBECK LANE.

The Oak which stands in this Lane, called Greendale Oak, hath at these several distances from the ground these circumferences :

	Feet.	Feet. Inches.
at 1	33	: 1
at 2	28	: 5
at 6	25	: 7

The breadth is, from bough-end to bough-end, diametrically 81 feet ; the height from the ground to the topmost bough, 88 feet. [This dimension taken from the proportion that a gnomon bears to the shadow.] There are three arms broken off and gone, and eight very large ones yet remaining, which are very fresh and good timber.

Eighty-eight feet is $29\frac{2}{3}$ yards, which being in this case admitted for the diameter of a circle, the square yards in that circumference will

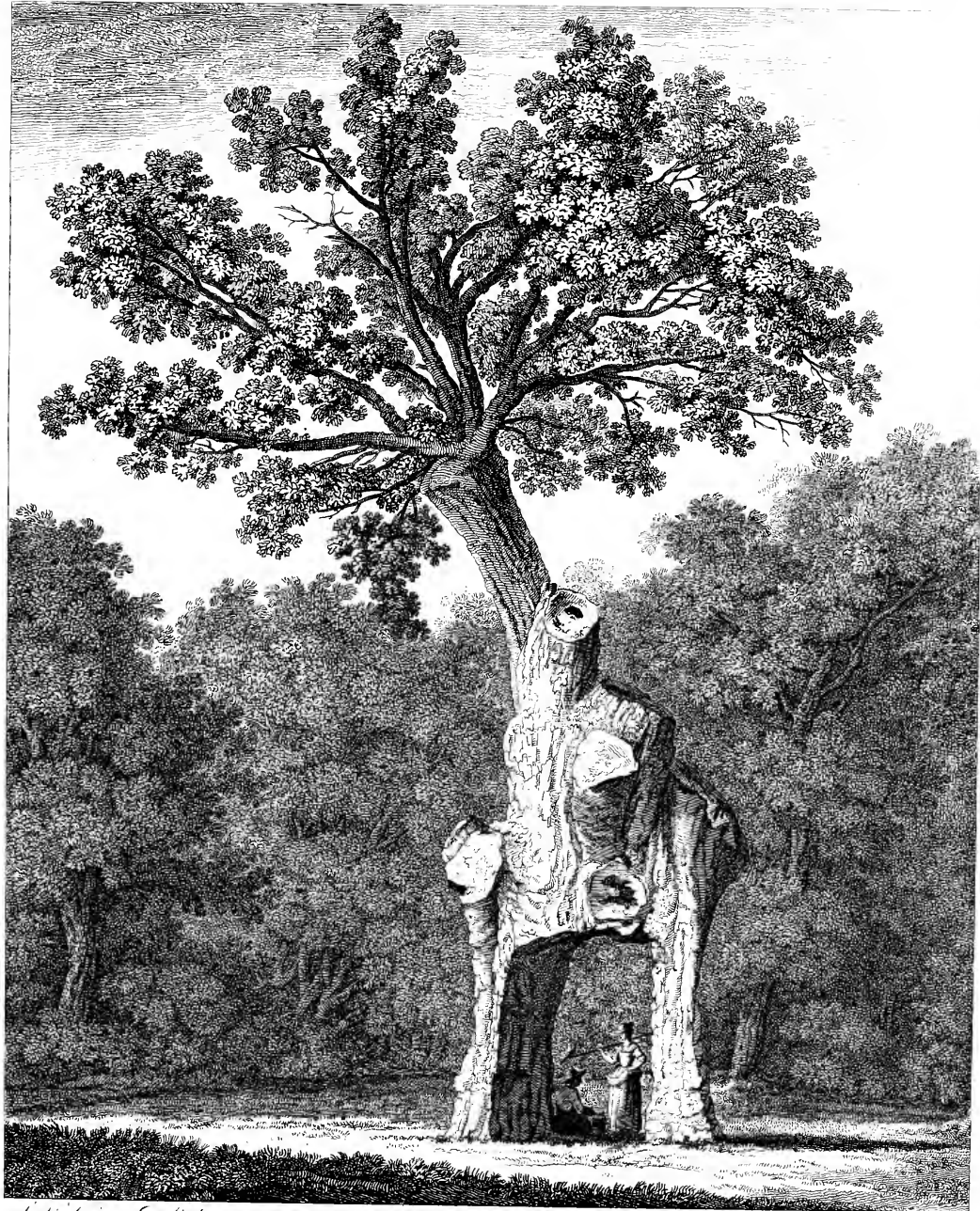


A. H. Ginnon delin 1875.

A. Washburn sculpuit.

A. North West View of the Great Oak Tree near Wellfleet.

Published Jan'y 1876 by C. Whittier & Co. No. 25, N. 2d St. New York.



Walt. Grimm's Engraving 1775

The American Engraver

A South East View of the Green Dale Oak near Wetherick.

Published and sold by G. & J. Wainwright 1820 as the Act directs.



	F 1
Diameter at a.b.....	11 .0
Diam ^r at c.d.....	14 .2
Girth upon Stretch at c.d.....	35 .0
Girth at the same place to follow the hollows of the Tree	38 .0
Height of the Tree a.e.....	53 .0
Height at a.f.....	31 .4
Height of the Chalk g.h.....	10 .2
Width at i.k.....	6 .2
Girth of the Stump c.l.....	11 .0
Height at b.d.....	13 .0



	F 1
Diameter at a. b.	12 0
Diam ^r at c. d.	11 0
Diam ^r at e. f.	13 3
Girth at c. d.	34 10
Height of the Tree g. l.	53 0
Height of the butt. g. h.	10 2
Width at i. k.	6 2

be 676 *feré*; and then allowing three yards (as before) for a beast, leaves 225 beasts, which may possibly stand under this tree ¹. CHAP. III.

But the Lord's Oak, that stood in Rivelin, was in diameter three yards and 28 inches, and exceeded this in circumference three feet, at one foot from the ground.

SHIRE-OAK.

Shire-Oak is a tree standing in the ground late Sir Thomas Hewet's, about a mile from Worksop Park, which drops into three Shires, viz. ^{Henr. Homer.} York, Nottingham, and Derby, and the distance from bough-end to bough-end is 90 feet, or 30 yards.

This circumference will contain near 707 square yards, sufficient to shade 235 horses.—Thus far the accurate Mr. Halton.

Now such venerable trees (especially conspicuously placed as this last) should be spared for the most noble and natural boundaries to great parishes, and Gentlemen's estates; famous for which is the Chesnut-tree at Tamworth, in Gloucestershire, which continued a signal boundary to that Manor in King Stephen's time, as it stands upon record. And now, before I shut up these encouraging instances, I am informed by a person of credit, that an Oak in Sheffield Park, called the Lady's Oak, when felled, contained forty-two tons of timber, which had arms that held at least four feet square for ten yards in length; the body six feet of clear timber: That in the same park one might have chosen above one thousand trees worth above six thousand pounds; another thousand worth four thousand pounds, *et sic de ceteris*. To this Mr. Halton replies, That it might possibly be meant of the Lord's Oak already mentioned to have grown in Rivelin; for now Rivelin itself is totally destitute of that issue she once might have gloried in of Oaks, there being only the Hall Park adjoining, which keeps up with its number of Oaks. And as to the computation of one thousand trees formerly in Sheffield

¹ His Grace the Duke of Portland has presented this work with two fine views of this celebrated tree, so that by comparing its present state with its antient one, we may discover the ravages that time has made upon it during a period of 120 years.

BOOK III.

Park, worth six thousand pounds, it is believed there were a thousand much above that value, since, in what is now inclosed, it is evident touching one hundred worth a thousand pounds. I am informed that an Oak, (I think in Shropshire,) growing lately in a copse of my Lord Craven's, yielded nineteen tons and a half of timber, twenty-three cord of fire-wood, two load of brush, and two load of bark: And my worthy friend, Leonard Pinckney, Esq. lately First Clerk of his Majesty's Kitchen, did assure me, that one John Garland built a very handsome barn, containing five bays, with pan, posts, beams, spars, &c. of one sole tree, growing in Worksop Park. I will close this with an instance which I greatly value, because it is transmitted to me from that Honourable and Noble Person Sir Edward Harley. "I am (says he) assured by an inquisition taken about three hundred years since, that a park of mine, and some adjacent woods, had not then a tree capable to bear acorns; yet that very park I have seen full of great Oaks, and most of them in the extremest wane of decay. The trunk of one of these Oaks afforded so much timber, as upon the place would have yielded fifteen pounds, and did completely seat with wainscot-pews a whole church. You may please, (says he, writing to Sir Robert Murray,) to remember when you were here, you took notice of a large tree, newly fallen; when it was wrought up, it proved very hollow and unsound: One of its cavities contained two hogsheads of water: Another was filled with better stuff, wax and honey: Notwithstanding all defects, it yielded, besides three tons of timber, twenty-three cords of wood. But my own trees are but chips in comparison of a tree in the neighbourhood, in which every foot forward, one with another, was half a ton of timber; it bore five feet square, forty feet long, and contained twenty ton of timber; most of it sold for one pound per ton; besides that, the boughs afforded twenty-five cords of fuel-wood: This was called the Lady-Oak. Is it not pity such goodly creatures should be devoted to Vulcan?" So far this Noble Gentleman, to which I would add *Dixit*, a deep execration of iron-mills, and I had almost said iron-masters too,

Quos ego—sed motos præstat componere—

for I should never finish, to pursue these instances through our once goodly magazines of timber for all uses, growing in this our native country, comparable, as I said, to any we can produce of elder times,

and that not only (though chiefly) for the encouragement of planters, and preservers of one of the most excellent and necessary materials in the world for the benefit of man, but to evince the continued vigour of nature, and to reproach the want of industry in this age of ours ; and (that we may return to the argument of this large chapter) to ascert the procerity and stature of trees from their very great antiquity : For certainly, if that be true, which is by divers affirmed concerning the Quercetum of Mamre, (where the Patriarch entertained his angelic guests) recorded by Eusebius to have continued till the time of Constantine the Great, we are not too prejudicately to censure what has been produced for the proofs of their antiquity ; nor for my part do I much question the authorities. But let this suffice ; what has been produced, being not only an historical speculation of encouragement and use, but such as was pertinent to the subject under consideration, as well as what I am about to add concerning the texture and similar parts of the body of trees, which may also hold in shrubs, and other ligneous plants, because it is both a curious and rational account of their anatomization, and worthy of the sagacious inquiry of that learned person, the late Dr. Goddard, as I find it entered amongst other of those precious collections of this illustrious society.

The trunk or bough of a tree being cut transversely plain and smooth, showeth several circles or rings more or less orbicular, according to the external figure, in some parallel proportion, one without the other, from the centre of the wood to the inside of the bark, dividing the whole into so many circular spaces. These rings are more large, gross, and distinct in colour and substance in some kind of trees, generally in such as grow to a great bulk in a short time, as Fir, Ash, &c. smaller or less distinct in those that either not at all, or in a longer time grow great ; as Quince, Holly, Box, Lignum Vitæ, Ebony, and the like sad-coloured and hard-woods ; so that by the largeness or smallness of the rings, the quickness or slowness of the growth of any tree may, perhaps, at certainty be estimated.

The spaces are manifestly broader on the one side than on the other, especially the more outer, to a double proportion, or more ; the inner being near an equality.

BOOK III. It is asserted, that the larger parts of these rings are on the south and sunny side of the tree, (which is very rational and probable,) insomuch, that by cutting a tree transverse, and drawing a diameter through the broadest and narrowest parts of the rings, a meridian line may be described.

The outer spaces are generally narrower than the inner, not only in their narrower sides, but also on their broader, compared with the same sides of the inner; notwithstanding which, they are for the most part, if not altogether, bigger upon the whole account.

Of these spaces, the outer extremities in Fir, and the like woods, that have them larger and grosser, are more dense, hard, and compact; the inner more soft and spongy; by which difference of substance it is, that the rings themselves come to be distinguished.

According as the bodies and boughs of trees, or several parts of the same, are bigger or lesser, so is the number, as well as the breadth of the circular spaces, greater or less; and the like according to the age, especially the number.

It is commonly and very probably asserted, that a tree gains a new ring every year. In the body of a great Oak in the New-Forest, cut *transversely even* (where many of the trees are accounted to be some hundreds of years old) three and four hundred have been distinguished. In a Fir-tree, which is said to have just so many rows of boughs about it as it is of years growth, there has been observed just *one* less immediately above one row than immediately below. Hence some probable account may be given of the difference between the outer and the inner parts of the rings, that the outermost being newly produced in the summer, the exterior superficies is condensed in the winter.

In the young branches and twigs of trees there is a pith in the middle, which in some, as Ash, and especially Elder, equals or exceeds in dimensions the rest of the substance, but waxes less as they grow bigger, and in the great boughs and trunk scarce is to be found: This gives way for the growth of the inward rings, which at first were less than the outer,

(as may be seen in any shoot of the first year) and after grow thicker, being itself absumed, or converted into wood ; as it is certain cartilages or gristles are into bones, (in the bodies of animals,) from which, to sense, they differ even as much as pith from wood.

These rings or spaces appearing upon transverse section, (as they appear elliptical upon oblique, and straight lines upon direct section,) are no other than the extremities of so many integuments, investing the whole tree, and, perhaps, all the boughs that are of the same age with any of them, or older.

The growth and augmentation of trees, in all dimensions, is acquired not only by accession of a new integument yearly, but also by the reception of nourishment into the pores and substance of the rest, upon which they also become thicker ; not only those towards the middle, but also the rest, in a thriving tree : yet the principal growth is between the bark and body, by accession of a new integument yearly, as hath been mentioned ; whence the cutting of the bark of any tree, or bough, round about, will certainly kill it.

The bark of a tree is distinguished into rings or integuments, no less than the wood, though much smaller or thinner, and therefore not distinguishable, except in the thick barks of great old trees, and toward the inside next the wood ; the outer parts drying and breaking with innumerable fissures, growing wider and deeper, as the body of the tree grows bigger, and mouldering away on the outside.

Though it cannot appear, by reason of the continual decay of it, upon the account aforesaid, yet it is probable the bark of a tree hath had successively as many integuments as the wood ; and that it doth grow by acquisition of a new one yearly on the inside, as the wood doth on the outside ; so that the chief way, and conveyance of nourishment to both the wood and the bark, is between them both.

The least bud appearing on the body of a tree, doth, as it were, make perforation through the several integuments to the middle, or very near ; which part is, as it were, a root of the bough in the body of the tree, and after becomes a knot, more hard than the other wood : when grown

BOOK III. larger, it manifestly shows itself also to consist of several integuments, by the circles appearing in it, as in the body; more hard, probably, because straitened in room for growth; as appears by its distending and buckling, as it were, the integuments of the wood about it, so implicating them the more; whence a knotty piece of wood is so much harder to cleave.

It is probable that a cion or bud, upon grafting or inoculating, doth, as it were, root itself into the stock in the same manner as the branches, producing a kind of knot.—Thus far the accurate Doctor.

To which permit me to add only (in reference to the circles we have been speaking of) what another curious inquirer suggests to us; namely, that they are caused by the pores of the wood, through which the sap ascends in the same manner as between the wood and the bark; and that in some trees the bark adheres to the wood, as the integuments of wood cleave to one another, and may be separated from each other as the bark from the outwardmost; and being thus parted, will be found on their outsides to represent the colour of the outermost, contiguous to the bark; and on the inner sides, to hold the colour of the inner side of the bark, and all to have a deeper or lighter hue on their inner side, as the bark is on that part more or less tinged; which tincture is supposed to proceed from the ascendant sap. Moreover, by cutting the branch, the ascending sap may be examined as well as the circles. It is probable, the more frequent the circles, the larger and more copiously the liquor will ascend into it; the fewer, the sooner descend from it. That a branch, of three circles, cut off at spring, the sap ascending, will be found at Michaelmas ensuing, when cut again in the same branch, or another of equal bigness, to have one more than it had at spring; and either at spring or fall to carry a circle of pricks next the bark; at other seasons a circle of wood only next it. But here the comparison must be made with distinction; for some trees do probably shoot new tops yearly till a certain period, and not after; and some have perhaps their circles in their branches decreased from their bodies to the extremity of the branch, in such œconomy and order, that, for instance, an Apple-tree shoot of this year has one circle of pricks or wood less than the graft of two years growth; and that of two years growth may, the next year, have one circle more than it had the last year; but this only till that branch shoot no more grafts, and then it is doubtful whether the outmost

twig obtains any more circles, or remains at a stay, only nourished, not augmented, in the circles. It would also be required, whether the circles of pricks increase not till Midsummer and after, and the circles of wood from thence to the following spring. CHAP. III.

I might here subjoin the vegetative motion of plants, with the diagrams of the Jesuit Kircher, where he discourses of their stupendous magnetisms, &c. could there any thing material be added to what has already been so ingeniously inquired into by the learned Dr. Grew, in his *Anatomy of Vegetables*, and that of Trunks; where experimentally, and with extraordinary sagacity, he discusses this subject, (with entire satisfaction of the inquisitive reader,) beginning at the seeds, and proceeding to the formation of the root, trunk, branches, leaves, flowers, fruit, &c. where you have the most accurate descriptions of the several vessels for sap, air, juices, with the stupendous contexture of all the organical parts, than which there can be nothing more fully entertaining: So that what Dr. Goddard, and other ingenious men have but conjecturally hinted, is by this inquisitive person (and that of the excellent Malpighius) evinced by autoptical experience, and profound research into their anatomy. To all which we may by no means forget the most Lyncean inspector Mr. Ant. Van Leuwenhoek, concerning the barks of trees, which he affirms, and experimentally convinces, that that integument, namely the bark, was produced from the wood, and not the wood from the bark. But this discourse, together with the microscopical figure, (being too long to be here inserted,) refers to that most industrious person's letter, *Transact. Numb. 296, p. 1843.* Let us therefore proceed to the Felling.


It should be in the vigour and perfection of trees that a felling should be celebrated; since, whilst our woods are growing, it is pity, and indeed too soon; and when they are decaying, too late. I do not pretend that a man who has occasion for timber is obliged to attend so many ages ere he fell his trees; but I do by this infer, how highly necessary it were that men should perpetually be planting, that so posterity might have trees fit for their service, of competent, that is, of a middle growth and age, which it is impossible they should have, if we thus continue to destroy our woods, without this providential planting in their stead, and felling what we do cut down with great discretion, and regard of the future.

BOOK III.

I know it is an objection, or rather an unreasonable excuse of the slothful neglect of successive and continual planting, that the expectation is tedious of what is not likely to be timber in our time: But this is quite otherwise, provided men would be earlier at the work, for they might have sufficient of their own planting (nay from the very rudiment and seeds) abundantly to recompense their patience and attendance, living to the age men usually attain by the common course of nature; and with how much improvement to their children and posterity. This minds me of what is reported of the Emperor Maximilian II. who by chance finding an antient husbandman setting Date-stones, he asked him what his meaning was to plant a tree that required an hundred years before it bore fruit. Sir, replies the good man, I have children, and they may have more come after them. At which the Emperor was so well pleased, that he gave him an hundred florins. Was not this like that of Laertes to Ulysses?—But to return to felling.

Such as we shall perceive to decay, should first be picked out for the ax, and then those which are in their state, or approaching to it; but the very thriving, and manifestly improving, should be indulged as much as possible. To explore the goodnefs and sincerity of a standing tree, is not the easiest thing in the world: We shall anon have occasion to mention my Lord Bacon's experiment to detect the hollownefs of timber: But there is doubtless none more infallible than the boring it with a middling piercer made augur-fashion, and by frequent pulling out, and examining what substance comes along with it, as those who bore the earth to explore what minerals the place is impregnated with, and as sound cheeses are tasted: Some again there are who, by digging a little about the roots, will pronounce shrewdly concerning the state of a tree; and if they find him perished at the top, (for trees die upwards, as men do from the feet,) be sure the cause lies deep, for it is ever a mark of great decay in the roots. There is also a swelling vein, which discovers itself eminently above the rest of the stem, though, like the rest, invested with bark, and which frequently circles about and embraces the tree, like a branch of Ivy; this is an infallible indication of hollownefs and hypocrisy within.

The time of the year for this destructive work is not usually till about the end of April, (at which season the sap does commonly rise freely,) though the opinions and practice of men have been very different.

Vitruvius is for an autumnal fall; others advise December and January. CHAP. III.
 Cato was of opinion trees should have first borne their fruit, or at least, 
 not till full ripe; which agrees with that of the architect, who begins his
 fall from the commencement of autumn to the spring, when Favonius
 begins to breathe; and his reason is, that from thence, during all the
 summer, trees are as it were going with child, and diverting all their
 nourishment to the embryo, leaves and fruit, which renders them weak
 and infirm. This he illustrates from teeming women, who during their
 pregnancy are never so healthful as after they are delivered of their
 burden, and abroad again; and for this reason (says he) those merchants
 who expose slaves to sale, will never warrant one that is with child:
 the buyer was (it seems) to stand to the hazard*. Thus he: But I re-
 member Monsieur Perrault in his pompous edition of our author, and
 learned notes upon this chapter, reproves the instance, affirming that
 women are never more sound and healthy than when they are pregnant;
 the nutrition derived to the infant being (according to him) no diminution
 or prejudice to the mother, as being but the consumption of that
 humidity which enfeebles the bearing woman; and thence infers, that
 the comparison cannot hold in trees, which become so much stronger by
 it. But to insist no longer on this; there is no doubt, that whilst trees
 abound in over-much, crude, and superfluous moisture, (though it may,
 and do contribute to their production and fertility,) they are not so fit for
 the ax as when being discharged of it, and that it rises not in that
 quantity as to keep on the leaves and fruit, those laxed parts, and vessels
 by which the humour did ascend, grow dry and close, and are not so ob-
 noxious to putrefaction and the worm. Hence it is that he cautions us
 to take notice of the moon's decline, because of her dominion over liquids,
 and directs our Woodman (some days before he fells downright) to make
 the gash or opening *usque ad mediam medullam*, to the end the whole
 moisture may extil; for that not only by the bark (which those who re-
 semble trees to animals will have to be analogous to arteries) does the
 juice drain out, but by that more fatty and whiter substance of the wood
 itself, immediately under the bark, (and which our carpenters call the sap,
 and therefore hew away as subject to rot,) which they will have to be the
 veins: It is (say they) the office of these arteries of bark, receiving nou-
 rishment from the roots, to derive it to every part of the tree, and to
 remand what is crude and superfluous by the veins to the roots again;
 whence, after it has been better digested, it is made to ascend a second
 time by the other vessels in perpetual circulation; and therefore necessary

* Vitruv.
 lib. ii. c. xix.

BOOK III. so deep an incision should be made as may serve to exhaust both the venal and arterial moisture : But for this nice speculation, I refer the curious to the already-mentioned Dr. Grew, and to the learned Malpighius, who have made other, and far more accurate observations upon this subject *. In the mean time, as to that of the worm in timber-trees, and their rotting, sometimes within, and sometimes without ; observe, that such as gape and rift outwardly, (as does that of the Oak when felled,) the sap thereby let out, the timber and heart within is found to be much more solid than that of the Chesnut and other trees that keep the moisture within ; in these, however seeming sound outwardly, the timber is frequently extremely rotted and perished. Lastly, concerning the bark, though some are for stripping it, and so to let the tree stand till about Mid-June, to preserve it from the worm, (all which time it will put forth leaves, and seemingly flourish,) yet that which is unbarked is more obnoxious to them, and contracts somewhat a darker hue ; (which is the reason so many have commended the season when it will most freely strip ;) however this were rather to be considered for such trees as one would leave round and unsquared, since we find the wild Oak, and many other sorts, felled over late, and when the sap begins to grow proud, to be very subject to the worm ; whereas, being cut about mid-winter, it neither casts, rifts, nor twines, because the cold of the winter does both dry and consolidate ; while in spring, and when pregnant, so much of the virtue goes into the leaves and branches. Happy therefore were it for our timber, if some real invention of tanning without so much bark (as the Hon. Mr. Charles Howard has most ingeniously offered) were become universal, that trees being more early felled, the timber might be better seasoned and conditioned for its various uses †. But as the custom is, men have now time to fell their woods, even from mid-winter to the spring, but never any after the summer solstice.

* The illustrious Hervey has demonstrated that the blood of all animals is made to perform a circulation by the action of the heart ; but the vegetable not being possessed of such a propelling organ, its juices do not circulate, but rise and fall in the same series of vessels. This, the Rev. Dr. Hales, in his "Vegetable Statics," has demonstrated in the most satisfactory manner.

† Mons. Buffon very justly observes, that the trees intended to be felled for service, should first be stripped of their bark, and then suffered to stand and die upon the spot before they are cut : By this means the sappy part becomes almost as hard and firm as the heart.

And now we speak of tanning, they have in Jamaica the Mangrove, Olive, and a third, whose barks tan much better than do ours in England, so as in six weeks the leather is fit to be employed to any use: They have likewise there a tree whose berries wash better and whiter than any Castile soap.

CHAP. III.

Then for the age of the moon, it has religiously been observed; so that Diana's Presidency in Sylvis was not so much celebrated to credit the fictions of the Poets, as for the dominion of that moist planet, and her influence over timber: However, experienced men commend the felling soon after a full moon, and so during all the decrease, and to let the tree lie at least three months, to render the timber strong and solid: For my part, I am not so much inclined to these criticisms, that I should altogether govern a felling at the pleasure of this mutable Lady; however, there is doubtless some regard to be had:

Nec frustra signorum obitus speculamur et ortus.

Nor is't in vain signs fall and rise to note.

As to other more recondit and deep astrological observations, minute and scrupulous, they are, perhaps, not altogether to be rejected, both as to the various configurations of the superior bodies, and operation on both vegetable and sensitive, especially as to the growth of fruit, sowing, planting, and cultivating (indicating the proper seasons, according to the accefs and recefs of the greater luminaries through the zodiack): It were ingratitude to impute it all to the superstition of the antients, or the total ignorance of causes in those great and learned men, (such as Hesiod, Virgil, Cato, Varro, Columella, Pliny, and the rest,) who have so freely left us these lessons; doubtless from their long experience, and extraordinary penetration and inquiry into nature. Let the curious then, for their better satisfaction, consult that learned treatise of judicial astrology, written by Sir Christopher Heydon.

In the mean time the old rules are these:

Fell in the decrease, or four days after the conjunction of the two great luminaries: some the last quarter of it; or (as Pliny) in the very article of the change, if possible, which happening, saith he, in the last day of the winter solstice, that timber will prove immortal: At least it should

BOOK III. be from the twentieth to the thirtieth day, according to Columella : Cato four days after the full, as far better for the growth, nay, Oak in the summer ; but all vimineous trees *silente luna*, such as Sallows, Birch, Poplar, &c. Vegetius for ship-timber, from the fifteenth to the twenty-fifth ; the moon as before : But never during the increase, trees being then most abounding with moisture, which is the only source of putrefaction : And yet it is affirmed upon unquestionable experience, that timber cut at any season of the year in the old moon, or last quarter, when the wind blows westerly, proves as sound and good as at any other period whatsoever ; nay, all the whole summer long, as in any month of the year, especially trees that bear no fruit. Theophrastus will have the Fir, Pine, and Pitch-tree felled when first they begin to bud. I enumerate them all, because it may be of great use on some public emergencies.

Then for the temper and time of day : The wind low, neither east nor west, (but west of the two) the east being most pernicious, and exposing it to the worms, and for which the best cure is, the plentiful sobbing it in water ; neither in frosty, wet, or dewy weather ; and therefore never in a forenoon, but when the season has been a good while dry and calm ; for as the rain sobs it too much, so the wind closes and obstructs the moisture from ouising out. Lastly, touching the species : Fell Fir when it begins to spring ; not only because it will then best quit its coat and strip, but for that they hold it will never decay in water ; which, howsoever deduced by Theophrastus from the old bridge made of this material over a certain river in Arcadia, cut in this season, is hardly sufficient to satisfy our inquiry.

Previous to this work of felling, take the advice of our countryman Markham, and it is not to be rejected : Survey, saith he, your woods as they stand, immediately after Christmas, and then divide the species in your mind, (I add rather in some note-book or tables,) and consider for what purposes every several kind is most useful, which you may find in the several Chapters of this Discourse under every head. After this reckon the bad and good together, so as one may put off the other, without being forced to glean your woods of all your best timber. This done, or before, you shall acquaint yourself with the marketable prices of the country where your fell is made, and that of the several sorts ; as what so many inches or feet square, and long, is worth for the several

employments: What planks, what other scantlings, for so many spokes, naves, rings, pales, poles, spurs, &c. as suppose it were Ash, to set apart the largest for the Wheel-wright, the smallest for the Cooper, and that of ordinary scantling for the ploughs, and the brush to be kidded and sold by the hundred or thousand, and so all other sorts of timber, viz. large, middling, middling stuff, and poles, &c. allowing the waste for the charges of felling, &c. all which you shall compute with greater certainty, if you have leisure, and will take the pains to examine some of the trees, either by your own fathom, or (more accurately) by girting them about with a string, and so reducing them to the square, &c. by which means you may give a near guess; or, you may mark such as you intend to fell; and then begin your sale about Candlemas till the spring; before which you must not (according as our custom is) lay the ax to the root; though some, for particular employments, as for timber to make ploughs, carts, axle-trees, naves, harrows, and the like husbandry tools, do frequently cut in October.

Being now entering with your workmen, one of the first and principal things is, the skilful disbranching of the bole of all such arms and limbs as may endanger it in the fall, wherein much forecast and skill is required of the woodman, so many excellent trees being utterly spoiled for want of this only consideration; and therefore in arms of timber which are very great, chop a nick underneath close to the bole, so meeting it with downright strokes, the arm will be severed without splicing.

We have showed why some, four or five days before felling, bore the tree cross-way; others cut a kerf round the body, almost to the very pith or heart, and so let it remain a while; by this means to drain away the moisture, which will distil out of the wounded veins, and is chiefly proper for the moister sort of trees: and in this work the very ax will tell you the difference of the sex, the male being so much harder and browner than the female: But here (and wherever we speak thus of plants,) you are to understand the analogical, not proper distinctions.

But that none may wonder why in many authors of good note, we find the fruit-bearers of some trees called males, and not rather females, as particularly the Cyprës, I shall observe that this preposterous denomination had its source from very antient custom, and was first begun in

BOOK III. Egypt, (Diodorus says in Greece) where we are told, that the father only was esteemed the sole author of generation, the mother contributing only receptacle and nutrition to the offspring, which legitimated their mixtures as well with their slaves as free-women: And upon this account it was, that even trees bearing fruit, were amongst them reputed males, and the sterile and barren ones females; and we are not ignorant how learnedly this doctrine has been lately revived by some of our most celebrated physicians. But since the same arguments do not altogether quadrate in trees, where the cõtion is not so sensible, (whatever they pretend of the Palms,) I am of opinion we might with more reason call that the female which bears any eminent fruit, seed, or egg, (from whence animals, as well as trees, not excepting man himself, as the learned Steno, Swammerdam, and others have, I think, undeniably made out) and them males which produce none: But sometimes too the rudeness or less asperity of the leaves, bark and grain, nay their medical operations, may deserve the distinction; to which Aristotle adds branchiness, less moisture, and quick maturity. Lib. 1. de Plantis. All which seems to be most conspicuous in Plum-trees, Hollies, Ashes, Quince, Pears, and many other sorts.— But I return to felling.

When this is performed, you should leave the stools as close to the ground as possible may be, especially if you design a renascency from the roots; unless you will grub for a total destruction, or the use of that part we have already mentioned, so far superior in goodness to what is more remote from the root, and besides the longer you cut and convert the timber, the better for many uses. Some are of opinion, that the seedling Oak should never be cut to improve his bole; because, say they, it produces a reddish wood, not acceptable to the workman; and that the tree which grows on the head of his mother does seldom prove good timber: It is observed, indeed, that one foot of timber near the root, (which is the proper kerf, or cutting-place,) is worth three farther off; though I know divers who think otherwise: And haply, the successor is more apt to be tender than what was cut off to give it place; but let this be inquired into at leisure. If it be a winter-fell for fuel, prostrate no more in a day than the cattle will eat in two days, I mean of the browse-wood, and when that is done, kid, and set it up on end, to preserve it from rotting.

Dr. Plot recommends the disbranching to be done in the spring before felling, whilst the tree is standing; that is, from May to Michaelmas, and so to let it continue till the next spring, and disburden them when felled, as the custom is in Staffordshire and the North, for exceedingly contributing to a dry seasoning, freeing it from the attack of worms and other accidental corruption; and thinks that the prejudice accruing thereby, as to the tanner, (in regard of the more difficult excortication) is no way to be put in balance with the advantage and improvement of the timber for paling, building of ships, houses, &c. accounting this method of that universal importance, as to merit the deliberation of a Parliament: In the meanwhile, by whatever method you proceed as to this, when once a tree is prostrate, and the bark stripped off, let it so be set as it may be best dry; then cleanse the bole of the branches which were left, and saw it into lengths for the squaring, to which belong the measure and girth, as our workmen call it, which I refer to the buyer, and to many subsidiary books lately printed, wherein it is taught by a very familiar mechanical calcule and easy method.

But by none, in my apprehension, set forth in a more facile and accurate way, than what that industrious mathematician, Mr. Leybourn, has published, in his late *Line of Proportion made Easy*, and others his labours; where he treats as well of the square as the round, as it is applicable to boards and superficals, and to timber which is hewed, or left rough, in so easy a method, as nothing can be more desired. I know our ordinary carpenters, &c. have generally upon their rulers a line, which they usually call Gunter's Line; but few of them understand how to work from it as they should: And divers country Gentlemen, Stewards, and Woodmen, when they are to measure rough timber upon the ground, confide much to the girt, which they do with a string, at about four or five feet distance from the root, or great extreme; of the string's length, they take a quarter for the true square; which is so manifestly erroneous, that thereby they make every tree, so measured, more than a fifth part less than really it is. This mistake should therefore be reformed; and it were, I conceive, worth the seller's while to inspect it accordingly: Their argument is, that when the bark of a tree is stripped, and the body hewed to a square, it will then hold out no more measure; that which is cut off being only fit for fuel, and the expence of squaring costs more than the chips are worth. To convince them of this error, I shall refer

BOOK III. and recommend them to the above-named author, and to what the industrious Mr. Cooke has so mathematically demonstrated: Where also of taking the altitude of trees, the better to judge of the worth of them, with the measuring of wood-lands, &c. together with necessary calculations for the levelling of ground, and removing of earth, drawing of plots and figures; all of which are very conducible to the several arguments of this Silvan Work. But to proceed.

If you are to remove your timber, let the dew be first off, and the south wind blow before you draw it; neither should you by any means put it to use for three or four months after, (some not till as many years) unless great necessity urge you, as it did Duillius, who, in the first Punic War, built his fleet of timber before it was seasoned, being not above two months from the very felling to the launching; the navy of Hicero was forty-five days from the forest to the sea, and that of Scipio, in the second Carthaginian War, only forty. July is a good time for bringing home your felled timber; but concerning the time and season of felling, a just treatise might be written: Let the learned therefore consult Vitruvius, particularly on this subject, lib. ii. cap. ix. Also M. Cato, cap. xvii. Plin. lib. xvi. cap. xxxix. Columella, lib. iii. cap. ii. but especially the most ample Theophrastus *quod sit isoplas*, lib. v. Note, that a ton of timber is forty solid feet, and a load fifty.

To make excellent boards and planks, it is the advice of some, you should bark your trees in a fit season, and so let them stand naked a full year before the felling; and in some cases and grounds it may be profitable: But let these, with what has been already said in the foregoing chapters of the several kinds, suffice for this article. I shall add one advertisement of caution to those noble persons and others who have groves and trees of ornament near their houses, and in their gardens in London, and the circle of it, especially if they be of great stature, and well grown, (such as were lately the groves in the several Inns of Court, nay, even that comparatively new plantation in my Lord of Bedford's Garden*, and wherever they stand in the more interior parts of this city) that they be not over hasty, or by any means persuaded to cut down any of their old trees, upon hope of new more flourishing plantations, thickening or re-

* Since the first publication of this discourse, most of those groves and trees have been cut down & the ground turned into streets.

pairing deformities, because they grew so well when first they were set: It is to be considered how exceedingly that pernicious smoke of the sea-coal is increased in and about London since they were first planted, and the buildings environing them, and inclosing it in among them, which does so universally contaminate the air, that when plantations of trees shall be now begun in any of those places, they will have much ado, great difficulty, and require a long time to be brought to perfection: Therefore let them make much of what they have; and though I discourage none, yet I can animate none to cut down the old.

And here might now come in a pretty speculation, what should be the reason after general fellings, and extirpations of vast woods of one species, the next spontaneous succession should be of quite a different sort? We see indeed something of this in our gardens and corn-fields, as the best of poets witnesseth, but that may be much imputed to the alteration, by improvement, or detriment of the soil, and other accidents.—Whatever the cause may be, since it appears not from any universal decay of nature, (sufficiently exploded,) I shall only here produce matter of fact, and that it ordinarily happens. As in some goodly woods formerly belonging to my grandfather, that were all of Oak, after felling they universally sprung up Beech; and it is affirmed by general experience, that after Beech, Birch succeeds, as in that famous wood at Tarnway, on the river Findorn in the Province of Murray in Scotland, where nothing had grown but Oak in a wood three miles in length; and haply more southerly, it might have been Beech, and not Birch till the third degradation. Birches familiarly grow out of old and decayed Oaks; but whence this sympathy and affection should proceed, is more difficult to resolve, inasmuch as we do not detect any so prolific and eminent seed in that tree. Some accidents of that nature may be imputed to the winds and the birds that frequently have been known to waft and convey seeds to places widely distant, as we have touched in the chapter of Firs. Holly has been seen to grow out of Ash, as Ash out of several trees; and I have it confidently asserted by persons of undoubted truth, that they have seen a tree cut in the middle, whose heart was Ash-wood, and the exterior part Oak, and this in Northamptonshire. And why not as well (though with something more difficulty,) as through a Willow, whose body (as is noted) it has been observed to penetrate even to the earth, detruding the

BOOK III. Willow quite out of its place; of which a pretty emblem might be conceived. But I pursue these instances no farther.

The fallen leaves of trees in woods, which lie sometimes very thick and deep, should be raked and shovelled up; being dry, are very useful for the covering of tender kitchen-garden plants, in winter, instead of litter; and the rest, if buried in some hole to rot, when dried and reduced to powder, become excellent mould. I wonder this husbandry is so much neglected.

Mr. Speechly, Gardener to his Grace the Duke of Portland, has, by his Grace's orders, communicated to me the following curious and interesting account of the use of Oak Leaves in Hot-houses:

“ I presume that the leaves of the Oak abound with the same quality as the bark of the tree, therefore the sooner they are raked up after they fall from the trees, the better, as that quality will naturally decrease during the time they are exposed to the weather. After being raked into Heaps they should immediately be carried to some place near the Hot-houses, where they must lie to *Couch*. I generally fence them round with Charcoal-hurdles, or any thing else, to keep them from being blown about the garden in windy weather. In this place we tread them well, and water them in case they happen to have been brought in dry. We make the heap six or seven feet in thicknes, covering it over with old mats, or any thing else, to prevent the upper leaves from being blown away. In a few days the heap will come to a strong heat. For the first year or two that I used these leaves, I did not continue them in the heap longer than ten days or a fortnight; but in this I discovered a considerable inconvenience, as they settled so much when got into the Hot-house, as soon to require a supply. Taught by experience, I now let them remain in the heap for five or six weeks, by which time they are properly prepared for the Hot-houses. In getting them into the Pine pits, if they appear dry, we water them again, treading them in layers exceedingly well till the pits are quite full. We then cover the whole with Tan to the thicknes of two inches, and tread it well till the surface become smooth and even. On this we place the Pine-pots in the manner they are to stand, beginning with the middle row first, and filling up the spaces between the pots with Tan. In like manner we proceed to the next row till the whole be finished; and this operation is performed in the same manner as when Tan *only* is used.

“ After this, the leaves require no farther trouble the whole season through, as they will retain a constant and regular heat for twelve months without either stirring or turning; and if I may form a judgment from their appearance when taken out, (being always entire and perfect) it is probable they would continue their heat through a second year: but as an annual supply of leaves is here easily obtained, such a trial is hardly worth the trouble of making.

“ After this, the Pines will have no occasion to be moved but at the stated times of their management, viz. at the shifting them in their pots, &c. when at each time a little

C H A P. IV.

CHAP. IV.

Of TIMBER, the SEASONING and USES, and FUEL.

SINCE it is certain and demonstrable, that all arts and artisans whatsoever must fail and cease, if there were no timber and wood in a nation; (for he that shall take his pen, and begin to set down what art, mystery, or trade belonging any way to human life, could be maintained and

fresh Tan should be added to make up the deficiency arising from the settling of the beds, but this will be inconsiderable, as the leaves do not settle much after their long *Couching*. During the two first years of my practice I did not use any Tan, but plunged the Pine-pots into the leaves, and just covered the surface of the beds, when finished, with a little saw-dust to give it a neatness. This method was attended with one inconvenience; for by the caking of the *leaves* they shrunk from the sides of the pots, whereby they became exposed to the air, and at the same time the heat of the beds was permitted to escape.

“ Many powerful reasons may be given why Oak leaves (for I have not tried any other kinds) are preferable to Tanners’ bark.

“ First, They always heat regularly; for during the whole time that I have used them, which is near seven years, I never once knew of their heating with violence; and this is so frequently the case with Tan, that I affirm, and indeed it is well known to every person conversant in the management of the Hot-house, that Pines suffer more from this one circumstance, than from all the other accidents put together—insects excepted. When this accident happens near the time of their fruiting, the effect is soon seen in the fruit, which always comes ill shaped and exceedingly small. Sometimes there will be little or no fruit at all; therefore Gardeners who make use of Tan *only* for their Pines, should be most particularly careful to avoid an over-heat at that critical season—the time of *showing* fruit.

“ Secondly, The heat of Oak leaves is constant; whereas Tanners’ bark generally turns cold in a very short time after its furious heat is gone off. This obliges the Gardener to give the Tan frequent turnings in order to promote its heating. These frequent turnings (not to mention the expence) are attended with the worst consequences; for by the continual moving of the pots backwards and forwards, the Pines are exposed, to the extremes of heat and cold, whereby their growth is considerably retarded; whereas when leaves are used, the Pines will have no occasion to be moved but at the times of potting, &c. The Pines have one particular advantage in this undisturbed situation; their roots grow through the bottoms of the pots and mat amongst the leaves in a surprising manner. From the vigour of the plants, when in this situation, it is highly

BOOK III, exercised without wood, will quickly find that I speak no paradox;) I say, when this shall be well considered, it will appear that we had better be without gold than without timber: This contemplation, and the universal use of that precious material (which yet is not of universal use till it be duly prepared) has moved me to design a solemn chapter for the seasoning, as well as to mention some farther particular application of it.

The first and chiefest use of timber was, doubtless, for the building of houses and habitations to shelter men in: It is in the first chapter of the second book, that Vitruvius shows, in what simple and plain manner our first progenitors erected their humble cottages, when, like those of Colchis and Pontus, they began to creep out of the subterranean and cavernous rocks, and laid the first groundsil upon which they placed the upright posts, and rudely framed a pointed roof, *Arboribus perpetuis planis*; (on which the critics have vext their researches;) from which mean beginning, all the superb and pompous effects of architecture have proceeded. But let us pursue our title, having before spoken concerning some preparations of standing trees designed for timber, by a half cutting, disbarking, and the seasons of drawing and using it.

SEASONING. Lay up your timber very dry, in an airy place, (yet out of the wind or sun) and not standing upright, but lying along, one piece upon another, interposing some short blocks between them, to preserve them from a certain mouldinefs, which they usually contract while they sweat, and

probable that the leaves, even in this state, afford them an uncommon and agreeable nourishment.

“ Thirdly, There is a saving in point of expence, which is no inconsiderable object in places where Tan cannot be had but from a great distance, as is the case here; the article of carriage amounting to ten shillings for each waggon-load. Indeed, this was the principal reason that first induced me to make trial of leaves.

“ My last ground of preference is the consideration that decayed leaves make good manure; whereas rotten Tan is experimentally found to be of no value. I have often tried it both on Sand and Clay, also on Wet and Dry Lands, and never could discover, in any of my experiments, that it deserved the name of a manure; whereas decayed leaves are the richest, and, of all others, the most suitable for a Garden. But this must only be understood of leaves after they have undergone their fermentation, which reduces them to a true vegetable mould, in which we experimentally know that the food of plants is contained;—but whether that food be *Oil*, *Mucilage*, or *Salt*, or a combination of all three,

which frequently produces a kind of fungus, especially if there be any sappy parts remaining. CHAP. VI.

Some there are yet, who keep their timber as moist as they can, by submerging it in water, where they let it imbibe, to hinder the cleaving; and this is good in Fir, both for the better stripping and seasoning; yea, and not only Fir, but in other timber: Lay therefore your boards a fortnight in the water, (if running, the better, as at some mill-pond head,) and then setting them upright in the sun and wind, so as it may freely pass through them, (especially during the heats of summer, which is the time of finishing buildings,) turn them daily, and, thus treated, even newly sawn boards will floor far better than a many years dry-seasoning, as they call it. But to prevent all possible accidents, when you lay your floors, let the joints be shot, fitted, and tacked down only for the first year, nailing them for good and all the next; and by this means they will lie staunch, close, and without shrinking in the least, as if they were all of one piece; and upon this occasion I am to add an observation which may prove of no small use to builders: that if one take up deal boards that may have lain in the floor an hundred years, and shoot them again, they will certainly shrink (*toties quoties*) without the former method. Amongst Wheelwrights, the water-seasoning is of especial regard, and in such esteem amongst some, that I am assured the Venetians, for their provision in the arsenal, lay their Oak some years in water before they employ it. Indeed the Turks not only fell at all times of the year, without any regard to the

I leave to philosophers to determine. This black mould is, of all others, the most proper to mix with compost earth; and I use it in general for Pines, and almost for every thing that grows in pots. For Flowers it is most excellent. The remainder of this vegetable mould may be employed in manuring the quarters of the Kitchen-Garden; for which purpose it is highly useful.

“Leaves mixed with Dung make excellent Hot-beds, —and I find that beds compounded in this manner preserve their heat much longer than when made entirely with Dung. In both cases the application of leaves will be a considerable saving of Dung, a circumstance very agreeable, as it will be the means of preventing the contests frequently observed in large families between the Superintendent of the Gardens, and the Director of the Husbandry.

“W. SPEECHLY.”

WELBECK, FEB. 20, 1776.

G g 2

BOOK III. season, but employ their timber green and unseasoned; so that though they have excellent Oak, it decays in a short time by this only neglect.

Elm felled ever so green for sudden use, if plunged four or five days in water, (especially salt water,) obtains an admirable seasoning, and may immediately be used. I the oftener insist on this water-seasoning, not only as a remedy against the worm, but for its efficacy against warping and distortions of timber, whether used within, or exposed to the air. Some again commend burying in the earth, others in wheat; and there be seasonings of the fire, as for the scorching and hardening of piles, which are to stand either in the water or the earth².

Et suspensa focus explorat robora fumus.

GEORG. I.

—————the Oak
Explore, suspended in the chimney smoke:

For that to most timber it contributes much to its duration. Thus do all the elements contribute to the art of seasoning. The learned Interpreter of Antonio Neri's *Art of Glafs*, cap. v. speaking of the difference of vegetables, as they are made use of at various seasons, observes from the Button-mould-makers, in those woods they use, that Pear-tree, cut in summer, works toughest, but Holly in the Winter; Box hardest about Easter, but mellow in the Summer; Hawthorn kindly about October, and Service-tree in summer.

And yet even the greenest timber is sometimes desirable for such as carve and turn, but it chokes the teeth of our saws; and for doors, windows, floors, and other close works, it is altogether to be rejected, especially where Walnut-tree is the material; which will be sure to shrink: Therefore it is best to choose such as are of two or three years seasoning, and that is neither moist nor over dry; the mean is best. Sir Hugh Platt informs us, that the Venetians used to burn and scorch their timber in a flaming fire, continually turning it round with an engine, till they have

² When wood is charred it becomes uncorruptible; for which reason, when we wish to preserve piles from decay, they should be charred on their outside. Oak-posts used in inclosures always decay about two inches above and below the surface. Charring that part would probably add several years to the duration of the wood.

gotten upon it an hard, black, coaly crust, and the secret carries with it great probability; for the wood is brought by it to such a hardness and dryness, that neither earth nor water can penetrate it: I myself remembering to have seen charcoal dug out of the ground amongst the ruins of antient buildings, which had in all probability lain covered with earth above fifteen hundred years ^a.

CHAP. IV.

Timber which is cleft, is nothing so obnoxious to rift and cleave as what is hewn; nor that which is squared, as what is round: and therefore where use is to be made of huge and massy columns, let them be bored through from end to end; it is an excellent preservative from splitting, and not unphilosophical; though to cure this accident painters' putty is recommended, also the rubbing them over with a wax-cloth is good; or before it be converted, the smearing the timber over with cow-dung, which prevents the effects both of sun and air upon it, if of necessity it must lie exposed. But besides the former remedies, I find this, for the closing of the chops and clefts of green timber, to anoint and supple it with the fat of powdered beef broth, with which it must be well soaked, and the chafms filled with sponges dipt into it; this to be twice done over. Some Carpenters make use of grease and saw-dust mingled; but the first is so good a way, says my author, that I have seen wind-shock timber so exquisitely closed, as not to be discerned where the defects were: This must be used when the timber is green.

We spake before of squaring; and I would now recommend the quartering of such trees as will allow useful and competent scantlings, to be of much more durability and effect for strength, than where (as custom is, and for want of observation) whole beams and timbers are applied in ships or houses, with slab and all about them, upon false suppositions of strength beyond these quarters: For there is in all trees an evident interstice, or separation between the heart and the rest of the body, which renders it much more obnoxious to decay and miscarry, than when they are treated

^a It is upwards of seventeen hundred years since the city of Herculaneum was destroyed by an eruption from Mount Vesuvius, and very lately the beams of the theatre were dug out of the ruins, completely charred by the burning Lava. Charcoal is a body of so unalterable and indestructible a nature, that none of the elements, excepting fire, can destroy it.

BOOK III. and converted as I have described it; and it would likewise save a world of materials in the building of great ships, where so much excellent timber is hewed away to spoil, were it more in practice. Finally:

I must not omit to take notice of the coating of timber in work, used by the *Hollanders*, for the preservation of their gates, portcullises, drawbridges, sluices, and other huge beams and contignations of timber exposed to the sun and perpetual injuries of the weather, by a certain mixture of pitch and tar, upon which they strew small pieces of cockle, and other shells, beaten almost to powder, and mingled with sea-sand, or the scales of iron, beaten small and sifted, which incrusts, and arms it after an incredible manner against all these assaults and foreign invaders; but if this should be deemed more obnoxious to firing, I have heard that a wash made of alum has wonderfully protected it against the assaults even of that devouring element; and that so a wooden tower or fort of the *Piræus*, the Port of Athens, was defended by *Archelaus*, a Commander of *Mithridates*, against the great *Sylla*. But you have several compositions for this purpose in that incomparable Treatise of *Naval Architecture*, written in *Low-Dutch* by *N. Witsen*, book i. chap. v. The book is in folio, and he that should well translate it into our language (which I much wonder has not yet been done) would deserve well of the public.

Timber that you have occasion to lay in mortar, or which is in any part contiguous to lime, as doors, window-cases, groundsils, and the extremities of beams, &c. have sometimes been copped with molten pitch, as a marvellous preserver of it from the burning and destructive effects of the lime; but it has since been found rather to heat and decay them, by hindering the transudation which those parts require; better supplied with loam or strewings of brick-dust, or pieces of boards; some leave a small hole for the air. But though lime be so destructive whilst timber lies thus dry, it seems they mingle it with hair, to keep the worm out of ships which they sheath for southern voyages; though it is held much to retard their course: Wherefore the *Portugueze* scorch them with fire, which often proves very dangerous; and indeed their timber being harder, is not so easily penetrable; and therefore have some been thinking of finding out some tougher sorts of materials, especially of a bitter sap; such as is reported to be the wood of a certain *Indian Pear*: and some talk of a *lixivium* to do the feat; others of a pitchy substance to be extracted out of

sea-coal; but nothing has yet been found more expedient, than the late application of thin lamins of sheet-lead, if that also be no impediment to sailing: However, there are many kinds of wood in the Western-Indies (besides the Acajou) that breed no worms, and such is the White Wood of Jamaica, proper enough to build ships. In the mean-time, let me not omit what the learned Dr. Lister, in his Notes upon Godarius of Insects, says, That he is persuaded there could not be a more probable expedient to discover what kind of timber were best for sheathing, than to tie certain polished pieces of wood (cut like tallies) to a buoy, in some waters and streams much infested with the worms; for that sort of wood which the worm should refuse, would in all reason be chosen for the use desired. The Indies being stored with greater varieties of timber than Europe, it were probable there might some be found, which that kind of river-worm will never attack ^b.

CHAP. IV.

For all uses, that timber is esteemed the best which is the most ponderous, and which, lying long, makes deepest impresson in the earth, or in the water, being floated; also what is without knots, yet firm, and free from sap, which is that fatty, whiter, and softer part, called by the antients *Alburnum*, which you are diligently to hew away.

^b Our ships of war, destined for the West-Indies, are now sheathed with plates of copper; and this improvement in Naval Architecture is found to answer the purpose of effectually preventing the ravages of the sea-worm, whereby the ships are enabled to continue longer upon their stations. This worm (*Teredo Navalis*) which is found so pernicious to the works of man, appears to have the same office allotted to it by the Author of Nature, as the *Termites* upon land: for was it not for the rapacity of the sea-worm, tropical rivers would be choaked up by the bodies of trees which are annually carried down by the rapid torrents. Wood when immersed in deep water, is almost incorruptible, but when acted upon by those numerous animals, it is soon reduced into small particles, and, mixing with the ocean, is thrown upon the shore, where the sun, air, and various insects, speedily bring about its entire dissolution, in which state it becomes vegetable earth. This is part of the regular system by which the SUPREME BEING continues, directs, and governs the works of his creation, dissolution and combination regularly following each other in endless succession:

Haud igitur penitus pereunt quæcumque videntur:
 Quando aliud ex alio reficit natura: nec ullam
 Rem signi patitur, nisi morte adjutam aliena.

LUCRET.

BOOK III.

My Lord Bacon, Exper. 658, recommends for trial of a sound or knotty piece of timber, to cause one to speak at one of the extremes to his companion listening at the other; for if it be knotty, the sound, says he, will come abrupt.

Moreover, it is expedient that you know which are the veins and which the grain in timber, because of the difficulty of working against it: Those therefore are counted the veins which grow largest, and are softer, for the benefit of cleaving and hewing; *that* the grain, or pectines, which runs in waves, and makes the diverse and beautiful chamfers which some woods abound in to admiration. The Fir-tree, horizontally cut, has two circles of different fibres, which (when the timber comes to be cleft in the middle) separate into four different waves, whence Pliny calls them *quadrifluvius*; and it is to be noted, that the nodus, and knotty part of these sort of trees, is that only which grows from the first boughs to the summit, or top, by Vitruvius termed the *Fusterna*, which both Baldus and Salmasius derive à *Fuste*. The other clean part, free of these boils, (being that which, when the sappy slab is cut away, is the best) he calls *Sapinea*. Finally; the grain of Bech runs two contrary ways, and is therefore to be wrought accordingly; and indeed the grain of all timber ought well to be observed; since the more you work according to it, especially in cleaving, and the less you saw, the stronger will be your work.

Here it may be fitly inquired, whether of all the sorts we have enumerated, the old or the younger trees do yield the fairest colour, pleasantest grain, and glofs for wainscot, cabinets, boxes, gun-stocks, &c. and what kind of Pear or Plum-tree gives the deepest red, and approaches nearest in beauty to Brasil. It is affirmed the old Oak, old Walnut, and young Ash are best for most uses, and yet for ship-carpentry this does not always hold; nor does the bigness of it so much recommend it, because it is commonly a sign of age, which (like to very old men) is often brittle and effete. Black and thorny Plum-tree is of the deepest Oriency; but whether these belong to the forest, I am not yet satisfied, and therefore have assigned them no chapter apart. But now I speak of the Plum-tree, I am assured by a worthy friend, that the gum thereof, dissolved in vinegar, has cured the most contumacious tetter, when all other remedies, outward or inwardly applied, nothing availed.

Lastly, I would also add something concerning what woods are observed to be most sonorous for musical instruments: We as yet detect few but the German Aër, which is a species of Maple, for the rims of viols, and the choicest and finest grained Fir for the bellies: The finger-boards, back, and ribs, I have seen of Yew, Pear-tree, &c. but Pipes, Recorders, and Wind-Instruments, are made both of hard and soft woods. I had lately an Organ with a set of Oaken pipes, which were the most sweet and mellow that were ever heard; it was a very old instrument, and formerly, I think, belonged to the Duke of Norfolk.

For the place of growth, that timber is esteemed best which grows most in the sun, and on a dry and hale ground; for those trees which suck, and drink little, are most hard, robust, and longer lived; instances of sobriety. The climate contributes much to its quality, and the northern situation is preferred to the rest of the quarters; so as that which grew in Tuscany was, of old, thought better than that of the Venetian side; and yet the Biscay timber is esteemed better than what they have from colder countries; and trees of the wilder kind, and barren, than the over-much cultivated and great bearers. But of this already.

To omit nothing, authors have summed up the natures of timber, as the hardest, Ebony, Box, Larch, Lotus, Terebinth, Cornus, Yew, &c. and though these indurated woods be too ponderous for ship-carpentry, yet there have been vessels built of them by the Portugueze in America; in which the planks and innermost timbers had been sawed very thin for lightness sake, and the knee-timber put together of divers small pieces, by reason of the inflexibleness of it, both which could not but render the ships very weak: In the mean-time, the perfection of these hard materials consists much in their receiving the most exquisite politure; and for this, Linsced, or the sweeter Nut-oil, does the effect best: Pliny gives us the receipt, with a decoction of Walnut-shells, and certain Wild Pears. Next to these, Oak for ships and houses, (or more minutely) the Oak for the keel, the Robur for the prow, Walnut the stern, Elm the pump. Then for bucklers and targets were commended the more soft and moist, because apt to close, swell, and make up their wounds again; such as Willow, Lime, Birch, Alder, Elder, Ash, Poplar, &c.

BOOK III.

The Robur, or Wild Oak timber, is best to stand within ground; the Quercus without; and our English, for being least obnoxious to splinter, and the Irish for resisting the worm, (tough as leather,) are doubtless, for shipping, to be preferred before all other. The Cypress, Fir, Pines, Cedar, &c. are best for posts and columns, because of their erect growth, natural and comely diminutions. Then again it is noted, that Oriental trees are hardest towards the cortex or bark, our western towards the middle, which we call the Heart; and that trees which bear no fruit, or but little, are more durable than the more pregnant. It is noted of Oak, that the knot of an inveterate tree, just where a lusty arm joins to the stem, is as curiously veined as the Walnut; which being omitted in the chapter of the Oak, I here observe. The Palmeto growing to that prodigious height in the Barbadoes, and whose top bears an excellently tasted Cabbage, grows so wonderfully hard, that an edge-tool can scarcely be forced into it.

Pines, Pitch, Alder, and Elm are excellent to make pumps and conduit-pipes, and for all water-works, &c. Fir for beams, bolts, bars, being tough, and not so apt to break as the hardest Oak: In sum, the more odoriferous trees are the more durable and lasting; and yet I conceive that well-seasoned Oak may contend with any of them, especially if preserved under ground, or kept perfectly dry. In the mean time, as to its application in shipping, the best of it ought to be employed for the keel, (that is, within, else Elm exceeds) the main beams and rafters, whilst for the ornamental parts, much slighter timber serves. One note more is requisite, namely, that great care be had to make the Trenails of the best, toughest, and sincerest part; many a vessel having been lost upon this account; and therefore dry and young timber is to be preferred for this, and for which the Hollanders are plentifully furnished out of Ireland, as Nicholas Witsen has himself acknowledged.

Is it not, after all this, to be deplored, that we, who have such perpetual use and convenience for ship-timber, should be driven to procure of foreign stores, so many thousand loads, at intolerable prices? But this we are obliged to do from the eastern countries, as far as Norway, Poland, Prussia, Dantzick, and farther, even from Bohemia, though greatly impaired by sobbing so long in the passage: But of this our most industrious

and worthy friend Mr. Pepys (late Secretary of the Admiralty) has given a just and profitable account in his Memoirs. CHAP. IV.

Here farther for the uses of timber, I will observe to our reader some other particulars, for direction both of the seller and buyer, applicable to the several species: And first of the two sorts of Lathes allowed by statute, one of five, the other of four feet long, because of the different intervals of rafters: That of five has one hundred to the bundle; that of four, one hundred and twenty, and should be in breadth one inch and an half, and half an inch thick: of either of which sorts there are three, viz. Heart-oak, Sap-lathes, and Deal-lathes, which also differ in price: The Heart-oak are fittest to lie under tiling; the second sort for plaistering of side-walls; and the third for ceilings, because they are straight and even.

Here we will gratify our curious reader with as curious an account of the comparative strength and fortitude of the several usual sorts of timber, as upon suggestions, previous to this work, it was several times experimented by the Royal Society, though omitted in the first impression, because the trials were not complete as they now thus stand in our Register^c.

^c The most accurate experiments upon the comparative strength of different kinds of wood are given by P. Van Mufschbroek, in a work entitled "Physicæ Experimentales et Geometricæ Dissertationes." Mr. Emmerson, in his "Principles of Mechanics," is the latest author upon the subject that I know of. "A piece of good Oak, an inch square, and a yard long, supported on both ends, will bear in the middle, for a very little time, about three hundred and thirty pounds avoirdupoise. This is at a medium; for there are some pieces that will carry something more, and others not so much. But such a piece of wood should not, in practice, be trusted for any length of time with above a third or fourth part of that weight. For, since this is the extreme weight which the best wood will bear, that of a worse sort must break with it. For I have found, by experience, that there is a great deal of difference in strength, in different pieces of the very same tree; some pieces I have found that would not bear half the weight others would do. The wood of the boughs and branches is far weaker than that of the body: The wood of the great limbs is stronger than that of the small ones; and the wood in the heart of a sound tree is strongest of all. I have also found, by experience, that a piece of timber that has borne a great weight for a small time, has broke with a far less weight when left upon it for a far longer time. Wood is likewise weaker when it is green, and strongest when thoroughly dried. If wood happens to be sappy, it will be weaker upon that account; and will likewise decay sooner. Knots in wood weaken it very much;

MARCH 23, 1663.

The experiment of breaking several sorts of wood was begun to be made: and there were taken three pieces of several kinds, of Fir, Oak, and Ash, each an inch thick, and two feet long; the Fir weighed $8\frac{1}{8}$ ounces, and was broken with two hundred pounds weight; the Oak weighed $12\frac{1}{2}$ ounces, broken with two hundred and fifty pounds weight; the Ash weighed $10\frac{1}{2}$ ounces, broken with three hundred and twenty-five pounds weight.

Besides, there were taken three pieces of the same sort of wood, each of half an inch thick, and one foot long; the Fir weighed one ounce, and was broken with five eights of an hundred; the Oak weighed $1\frac{1}{2}$ ounce, broken with five eights of an hundred; the Ash weighed $1\frac{1}{2}$ ounce, broken with one hundred pounds.

Again; there was a piece of Fir half an inch square, and two feet long, broken with thirty-three pounds; a piece of half an inch thick, one inch broad, and seven feet long, broken with one hundred weight edge-wise; and a piece of half an inch thick, and one and a half broad, and two feet long, broken with one hundred and twenty-five pounds weight, also edge-wise.

“also when wood is cross-grained, as it often happens in sawing, this will weaken it more or less, according as it is more or less cross the grain; and I have found, by experience, that tough wood, cross the grain, such as Elm or Ash, is from seven to ten times weaker than straight; and wood that easily splits, such as Fir, is from sixteen to twenty times weaker: and for common use, it is hardly possible to find wood but it will be subject to some of these things: Besides, when timber lies long in a building, it is apt to decay, or be worm-eaten, which must needs very much impair its strength. From all which it appears, that a large allowance ought to be made for the strength of wood, when applied to any use, especially where it is to continue for a long time.”

The following proportions of the strength of several sorts of wood are taken from

MR. EMMERSON'S TABLES:

Box, Yew, Plum-tree, and Oak	—	—	11
Elm and Ash	—	—	$8\frac{1}{2}$
Walnut and Thorn	—	—	$7\frac{1}{2}$
Red Fir, Hollin, Elder, Plane, Crab, and Apple-tree	—	—	7
Beech, Cherry-tree, and Hazle	—	—	$6\frac{1}{2}$
Alder, Aspen, Birch, White Fir, Willow or Saugh	—	—	6

The experiment was ordered to be repeated, and recommended by the President to Sir William Petty and Dr. Hook; and it was suggested by some of the company, that in these trials consideration might be had of the age, knottiness, solidity, several soils, and parts of trees, &c. and Sir Robert Murray did particularly add, that it might be observed how far any kind of wood bends before it breaks. CHAP. IV.

MARCH—1664.

The operator gave an account of more pieces of wood broken by weight, viz. a piece of Fir four feet long, two inches thick, and fifty-three ounces weight, broken with eight hundred pounds weight, and very little bending with seven hundred and fifty; by which the hypothesis seems to be confirmed, that in similar pieces the proportion of the breaking-weight is according to the basis of the wood broken. Secondly, of a piece of Fir two feet long, one inch square, cut away from the middle both ways to half an inch, which supported two hundred and fifty pounds weight before it broke, which is more by fifty pounds than a piece of the same thickness every way was formerly broken with: the difference was guessed to proceed from the more firmness of this other piece.

His Lordship, the President, was desired to contribute to the prosecution of this experiment, and particularly to consider what line a beam must be cut in, and how thick it ought to be at the extreme, to be equally strong; which was brought in April 13, but I find it not entered.

APRIL 20, 1664.

The experiment of breaking wood was prosecuted, and there were taken two pieces of Fir, each two feet long, and one inch square, which were broken, the one long-ways with three hundred pounds weight, the other transverse-ways with two hundred and fifty pounds: Secondly, two pieces of the same wood, of each three-quarters of an inch square, and two feet long, broken, the one long-ways with one hundred and twenty-five; the other transverse with one hundred pounds weight: Thirdly, one piece of two feet long and half an inch square, broken long-ways with eighty-one pounds: Fourthly, one piece cut out of a crooked Oaken billet, with an arching grain, about three quarters of an inch square, and two feet long, broken with seventy-five pounds.

JUNE 29, 1664.

There were made several experiments more of breaking wood: First, a piece of Fir, half an inch diameter, and three inches long, at which distance the weight hung, broke in the plane of the grain horizontally, with sixty-six pounds and three-quarters, whereof fifteen pounds Troy; vertically, with two pounds more. Also Fir of one quarter of an inch diameter, and an inch and a half long, broke vertically with twenty pounds, and horizontally with nineteen pounds. Elm of half an inch diameter, and three inches long, broke horizontally with forty-seven pounds; vertically with twenty-three pounds. Elm a quarter of an inch diameter, and an inch and a half long, broke horizontally with twelve pounds; vertically with twelve pounds, which is note-worthy.

JULY 6, 1664.

The experiment of breaking woods prosecuted: A piece of Oak of half an inch diameter, and three inches long, at which distance the weight hung, broke horizontally with forty-eight pounds; vertically, with forty pounds. Ash of half an inch diameter, and three inches long, horizontally with seventy-seven pounds; vertically, with seventy-five pounds. Ash of half an inch diameter, and an inch and a half long, horizontally with nineteen pounds; vertically, with ten pounds.—Thus far the Register.

In the mean-time I learn, that in the mines of Mendip, pieces of timber, of but the thickness of a man's arm, will support ten tun of earth; and that some of it has lain two hundred years, which is yet as firm as ever, growing tough and black; and being exposed two or three days to the wind and sun, scarce yields to the ax.

Here might come in the Problems of Cardinal Cusanus, in lib. iv. Idiota dial. 4to, concerning the different velocity of the ascent of great pieces of timber, before the smaller, submerged in water, as also of the weight; as *v. g.* Why a piece of wood an hundred pounds weight, poising more in the air than two pounds of lead, the two pounds of lead should seem to weigh (he should say sink) more in the water*? Why fruits, being cut off from the tree, weigh heavier than when they were growing? With several the like paradoxes, haply more curious than useful, and therefore we purposely omit them; but so may we not the recommendation

* Of the specific Gravity of timber in proportion to water, see the table in the Philosophical Transactions, n. 169, and 199.

of that useful Treatise of Duplicate Proportion, together with a new Hypothesis of Elastic or Springy Bodies, to show the strengths of timbers, and other homogeneous materials applied to buildings, machines, &c. as it is published by that admirable Genius, the learned Sir William Petty: To which we join that part of Dr. Grew's Comparative Anatomy of Trunks, as variously fitted for mechanical uses; where that most industrious and curious searcher into Nature, describes to us whence woods are soft, fast, hard, apt to be cleft, tough, durable, &c.

Lastly, Concerning squared and principal timber, for any usual buildings, these are the legal proportions, and which builders ought not to vary from.

Summers or girders from	$\left. \begin{array}{l} \text{F.} \\ 14 \\ 18 \text{ to } 20 \\ 20 \\ 23 \\ 26 \end{array} \right\}$	$\left. \begin{array}{l} \text{F.} \\ 16 \\ 20 \\ 23 \\ 26 \\ 28 \end{array} \right\}$	$\left. \begin{array}{l} \text{In length,} \\ \\ \\ \text{must be} \\ \text{in their} \\ \text{square} \end{array} \right\}$	$\left. \begin{array}{l} \text{In. In.} \\ 11 \ 8 \\ 13 \ \& 9 \\ 14 \ 10 \\ 16 \ 12 \\ 17 \ 14 \end{array} \right\}$	$\left. \begin{array}{l} \text{Joists of} \\ \\ \\ \\ \end{array} \right\}$	$\left. \begin{array}{l} \text{Feet} \\ 11\frac{1}{2} \text{ in length} \\ \\ \text{must be} \\ \text{in their} \\ 10\frac{1}{2} \text{ square} \end{array} \right\}$	$\left. \begin{array}{l} \text{In. In.} \\ 8 \text{ --- } 3 \\ 7 \text{ and } 3 \\ 6 \text{ --- } 3 \end{array} \right\}$
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Binding Joists and Trimmers from	$\left. \begin{array}{l} \text{F.} \\ 7 \end{array} \right\}$	$\left. \begin{array}{l} \text{F.} \\ \text{to } 11\frac{1}{2} \end{array} \right\}$	$\left. \begin{array}{l} \text{In length} \\ \\ \\ \text{must be} \\ \text{in their} \\ \text{square} \end{array} \right\}$	$\left. \begin{array}{l} 6 \ 5 \\ 7 \ \& 5 \\ 8 \ 5 \end{array} \right\}$	$\left. \begin{array}{l} \text{Wall-plates and beams} \\ \text{of any length, from } 15 \\ \text{feet, may have in their} \\ \text{square} \end{array} \right\}$	$\left. \begin{array}{l} \text{In. In.} \\ 7 \ 5 \\ 10 \ \& 6 \\ 8 \ 6 \end{array} \right\}$
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Purlines from	$\left. \begin{array}{l} \text{F.} \\ 15 \text{ to } 18\frac{1}{2} \\ 18 \end{array} \right\}$	$\left. \begin{array}{l} \text{F.} \\ 18\frac{1}{2} \\ 21\frac{1}{2} \end{array} \right\}$	$\left. \begin{array}{l} \text{In length, must} \\ \\ \text{have in their} \\ \text{square} \end{array} \right\}$	$\left. \begin{array}{l} 9 \text{ --- } 8 \\ \& \\ 12 \text{ --- } 9 \end{array} \right\}$
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Principal rafters cut taper from	$\left. \begin{array}{l} \text{F.} \\ 12\frac{1}{2} \\ 14\frac{1}{2} \\ 18\frac{1}{2} \text{ to } 21\frac{1}{2} \\ 21\frac{1}{2} \\ 24\frac{1}{2} \end{array} \right\}$	$\left. \begin{array}{l} \text{F.} \\ 14\frac{1}{2} \\ 18\frac{1}{2} \\ 21\frac{1}{2} \\ 24\frac{1}{2} \\ 26\frac{1}{2} \end{array} \right\}$	$\left. \begin{array}{l} \text{In length,} \\ \\ \\ \text{must have} \\ \text{in their} \\ \text{square on} \\ \text{one side} \end{array} \right\}$	$\left. \begin{array}{l} \text{In. In.} \\ 8 \ 5 \\ 9 \ 7 \\ 10 \text{ to } 8 \\ 12 \ 9 \\ 9 \ 9 \end{array} \right\}$	$\left. \begin{array}{l} \text{On} \\ \text{the} \\ \text{other} \\ \text{side} \end{array} \right\}$	$\left. \begin{array}{l} \text{Single} \\ 6 \text{ rafters} \\ 7 \text{ in} \\ 8 \text{ length} \\ 8 \text{ from} \\ 9 \ 6\frac{1}{2} \text{ to} \\ 9\frac{1}{2} \text{ ---} \end{array} \right\}$	$\left. \begin{array}{l} \text{F.} \\ 6\frac{1}{2} \\ 0 \\ 9\frac{1}{2} \end{array} \right\}$	$\left. \begin{array}{l} \text{must} \\ \text{have} \\ \text{in} \\ \text{their} \\ \text{sq.} \\ \& \end{array} \right\}$	$\left. \begin{array}{l} 5\text{---}3\frac{1}{2} \\ \\ \\ \\ \\ 5\text{---}4 \end{array} \right\}$
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Principal dischargers of any length from	$\left. \begin{array}{l} \text{Feet} \\ 10 \end{array} \right\}$	$\left. \begin{array}{l} \text{must have} \\ \text{in their} \\ \text{square} \end{array} \right\}$	$\left. \begin{array}{l} \text{Inch. Inch.} \\ 13 \text{ --- } 12 \\ 16 \text{ --- } 13 \end{array} \right\}$
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But Carpenters also work by square, which is ten feet in framing and erecting the carcase, as they call it, of any timber edifice, which is valued

BOOK III.

according to the goodness and choice of the materials, and curiosity in framing, especially roofs and stair-cases, which are of most charges. And here might also something be added concerning the manner of framing the carcasses of buildings, as of floors, pitch of roofs, the length of hips and sleepers, together with the names of all those several timbers used in fabrics totally consisting of wood; but I find it done to my hand, and published some years since, at the end of a late Translation of the first Book of Palladio; to which I refer the reader. And to accomplish our artist in timber, with the utmost which that material is capable of, I do recommend him to the study and contemplation of that stupendous roof, which now lies over the renowned Sheldonean Theatre at the University of Oxford; being the sole work and contrivement of my most Honoured Friend, Sir Christopher Wren, now worthily dignified with the superintendency of the Royal Buildings. See Dr. Plott's description of it in his Natural History of Oxfordshire, 272, 273, tab. 13, 14: also Dr. Wallis de Motu, part iii. de Vecte, cap. vi. prop. 10.

Other conversions there are of timber, of all lengths, sizes, and dimensions, for arches, bridges, floors, and flat-work, (without the supports of pillars,) tables, cabinets, inlayings, and carvings, screws, &c. with the art of Turning, to the height of which divers Gentlemen have arrived, and, for their diversion, produced pieces of admirable invention and curiosity: These, I say, belonging to the mechanic uses of timber, might enter here, with a catalogue of innumerable models and other rarities to be found in the repositories and collections of the curious: But let this suffice.

We did, in book ii. chap. i. mention certain subterranean trees, which Mr. Camden supposes grew altogether under the ground: And truly it did appear a very paradox to me, till I both saw and diligently examined that piece (plank, stone, or both shall I name it?) of Lignum Fossile taken out of a certain quarry thereof at Aqua Sparta, not far from Rome, and sent to the most incomparably learned Sir George Ent, by that obliging Virtuoso Cavalier dal Pozzo. He that shall examine the hardness, and feel the ponderousness of it, sinking in water, &c. will easily take it for a stone; but he that shall behold its grain, so exquisitely undulated and varied, together with its colour, manner of heaving, chips, and other most perfect resemblances, will never scruple to pronounce it arrant wood.

Signor Stelluti, an Italian, has published a whole Treatise expressly to describe this great curiosity: and there has been brought to our notice a certain relation of an Elm growing in Berkshire, near Farringdon, which being cut towards the root, was there plainly petrified; the like, as I once myself remember to have seen in another tree, which grew quite through a rock near the sepulchre of Agrippina (the mother of that monster Nero) at the Baia by Naples, which appeared to be all stone, and trickling down in drops of water, if I forget not. But while others have philosophized, according to their manner, upon these extraordinary concretions, see what the most industrious and knowing Dr. Hook, Curator of this Royal Society, has with no less reason, but more succinctness, observed from a late microscopical examen of another piece of petrified wood; the description and ingenuity whereof cannot but gratify the curious, who will, by this instance, not only be instructed how to make inquiries upon the like occasions, but see also with what accurateness the Society constantly proceeds in all their indagations and experiments; and with what candour they relate, and communicate them.

CHAP. IV.

“ It resembled wood, in that,

“ First, All the parts of the petrified substance seemed not at all dislocated or altered from their natural position while they were wood; but the whole piece retained the exact shape of wood, having many of the conspicuous pores of wood still remaining, and showing a manifest difference, visible enough between the grain of the wood and that of the bark, especially when any side of it was cut smooth and polite; for then it appeared to have a very lovely grain, like that of some curious close wood.

“ Next, it resembled wood, in that all the smaller, and (if so I may call those which are only to be seen by a good glass) microscopical pores of it, appeared (either when the substance was cut and polished transversely, or parallel to the pores) perfectly like the microscopical pores of several kinds of wood, retaining both the shape and position of such pores.

“ It differed from wood,

“ First, in weight; being to common water, as 5½ to 1; whereas there are few of our English woods that, when dry, are found to be so heavy as water.

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BOOK III.

“ Secondly, in hardness; being very nearly as hard as flint, and in some
 “ places of it also resembling the grain of a flint; it would very readily
 “ cut glafs, and could not, without difficulty, (especially in some parts of
 “ it) be scratched by a black hard flint; it would readily strike fire against
 “ a steel, as also against a flint.

“ Thirdly, in the closeness of it; for though all the microscopical pores
 “ of the wood were very conspicuous in one position, yet, by altering
 “ that position of the polished surface to the light, it also was manifest
 “ that those pores appeared darker than the rest of the body, only because
 “ they were filled up with a more dusky substance, and not because they
 “ were hollow.

“ Fourthly, in that it would not burn in the fire; nay, though I kept
 “ it a good while red-hot in the flame of a lamp, very intensely cast on it
 “ by a blast through a small pipe, yet it seemed not all to have diminished
 “ its extension; but only I found it to have changed its colour, and to
 “ have put on a more dark and dusky brown hue: Nor could I perceive
 “ that those parts which seemed to have been wood at first, were any thing
 “ wasted, but the parts appeared as solid and close as before. It was far-
 “ ther observable, that as it did not consume like wood, so neither did it
 “ crack and fly like a flint, or such like hard stone; nor was it long be-
 “ fore it appeared red hot.

“ Fifthly, in its dissolubleness; for putting some drops of distilled vinegar
 “ upon the stone, I found it presently to yield very many bubbles, just
 “ like those which may be observed in spirit of vinegar when it corrodes
 “ coral; though I guess many of those bubbles proceeded from the small
 “ parcels of air which were driven out of the pores of this petrified sub-
 “ stance, by the insinuating liquid menstruum.

“ Sixthly, in its rigidity and friability; being not at all flexible, but
 “ brittle like flint; insomuch, that with one knock of a hammer I broke
 “ off a small piece of it, and with the same hammer quickly beat it to
 “ pretty fine powder upon an anvil.

“ Seventhly, it seemed, to the touch, very different from wood, feel-
 “ ing more cold than wood usually does, and much like other close stones
 “ and minerals.

“ The reason of all which phænomena seems to be,
 “ That this petrified wood having lain in some place where it was well
 “ soaked with petrifying water (that is, such a water as is well impreg-
 “ nated with stony and earthy particles) did by degrees separate, by straining
 “ and filtration, or, perhaps, by precipitation, cohesion, or coagulation,
 “ abundance of stony particles from that permeating water; which stony
 “ particles having, by means of the fluid vehicle, conveyed themselves
 “ not only into the microscopical pores, and perfectly stopped them up,
 “ but also into the pores, which may perhaps be even in that part of the
 “ wood which through the microscope appears most solid, did thereby so
 “ augment the weight of the wood, as to make it above three times hea-
 “ vier than water, and perhaps six times as heavy as it was when wood:
 “ Next, they hereby so lock up and fetter the parts of the wood, that the
 “ fire cannot easily make them fly away, but the action of the fire upon
 “ them is only able to char those parts as it were; like as a piece of wood,
 “ if it be closed very fast up in clay, and kept a good while red hot in the
 “ fire, will, by the heat of the fire, be charred, and not consumed; which
 “ may perhaps be the reason why the petrified substance appeared of a
 “ blackish brown colour after it had been burnt. By this intrusion of the
 “ petrified particles, it also becomes hard and friable; for the smaller
 “ pores of the wood being perfectly stuffed up with these stony particles,
 “ the particles of the wood have few or no pores in which they can reside;
 “ and, consequently, no flection or yielding can be caused in such a sub-
 “ stance. The remaining particles likewise of the wood among the stony
 “ particles, may keep them from cracking and flying, as they do in flint.”

The casual finding of subterraneous trees has been the occasion of this curious digression, besides what we have already said in chap. xxii. book i. Now it were a strange paradox to affirm, that the timber under the ground should, to a great degree, equal the value of that which grows above the ground; seeing, though it be far less, yet it is far richer, the roots of the vilest shrub being better for its toughness, and, for ornament and delicate uses, much more preferable than the heart of the fairest and soundest tree: And many hills and other waste places, that have in late and former ages been stately groves and woods, have yet this treasure remaining, and perchance sound and unperished, and commonly (as we observed) an hindrance to other plantations; engines therefore, and expedients for the more easily extracting these cumbrances, and making riddance upon such

BOOK III. occasions, besides those we have produced, should be excogitated and inquired after, for the despatch of this difficult work.

From all these instances we may gather the necessity of a more than ordinary study and diligence in those whose profession obliges them to deal in timber; nor is it a small stock of philosophy that will enable them to skill in the nature and properties of this material, which not only concerns the Architects themselves, but their subsidiaries, viz. Carpenters, Joiners, and especially Wood-brokers. I cannot therefore but take notice, that among the ancient Sportulæ^d, bequeathed by several Founders and Found-

^d Pliny, in lib. xix. cap. ii. describes a plant called *Spartum*, of which, when maccrated, ropes were made, and which in its natural state was applied to various domestic purposes. Livy informs us, that Asdrubal laid up a considerable quantity of it for the service of his fleet, lib. xxii. cap. xx. It is probably from this plant that the terms *Sporta*, *Sportula*, &c. are derived; for it appears to have been very proper for the purpose of making baskets. Sportula is literally a little basket, and, in the Roman classics, signifies a distribution, sometimes of victuals, because they were given in such baskets, and sometimes of money. The distinction of *Patroni* and *Clientes* formed an essential part of the Roman political constitution; and whenever the latter had been employed in doing honour to their Patrons, it had been customary from early times to entertain them at supper, which, among the Romans, was the principal meal. This custom, it seems, continued to the reign of Nero; for Suetonius, lib. vi. cap. xvi. tells us, that Nero changed the public suppers into Sportulæ, which from Juvenal, sat. i. v. 95. appear to have been a distribution of victuals in the porch or front of the patron's house. Afterwards, instead of victuals, a small sum of money, forty quadrantes, which were a coin of brass or lead, in value something less than a half-penny each, was given, still under the name of Sportula, as appears from Martial, lib. iii. epig. vii.—Domitian at first seems to have pursued the practice of Nero: For it appears from Suetonius, lib. viii. cap. iv. that on a certain solemn occasion he gave victuals to the Senate and the Knights in Panaria, and to the common people in Sportellæ. The Panaria probably were vessels of a larger size, or of more elegant materials than the Sportellæ. Afterwards, however, Domitian restored the ancient custom of treating the Clients with a full meal, as we are informed by Suetonius, lib. viii. cap. vii. as well as by Martial, lib. viii. epig. l. v. 10. In this passage Martial opposes the Sportula to what he calls *recta cæna*, which it seems is what he meant, in the preceding quotation, where he makes a little distinction, by the term *falerium*, that is, victuals for a day. It appears that among the Romans, largesses of victuals or of money were very common upon solemn occasions, such as marriages, entering on public offices, or the like.—Claudius, we are told, jocularly gave the name of Sportula to a small exhibition of gladiators, without preparation, and that continued but for a short time, because, says Suetonius, *primum datoras edixerat velut ad subitam omnium; cæna; non invitare se populum*: he said he would give them such an entertainment as if the people had invited themselves to a short and hasty supper, lib. v. chap. xxi.—The

refers for the encouragement of Gardeners, there was a College or Hall, not unlike that of our Carpenters, where, upon a certain day, the fraternity not only met to feast, but, doubtless, to confer and edify one another, as appears by an ancient inscription of the Dendrophori at Putcoli, mentioned by the learned Dr. Spon *, which, for the honour of our present Discourse, we subjoin :

CHAP. IV.



EX S.C. DENDROPHORI CREATI QVI SVNT
 SVB CVRA XV VIR ST. CCVV
 PARTRON. L. AMPIVS STEPHANVS SAC.
 M. DEI QQ. DEND. DEDICATIONI HVIVS
 PANEM VINVM ET SPORTVLAS DEDIT

C. VALERIVS PICENTINVS LONGINIVS IVSTINVS
 C. IVLIVS HERCVLANVS A. FIRMIVS POLYBIVS

With many others, (a numerous catalogue of Consuls names) it being, it seems, a corporation established by the state, when they carried boughs and branches of trees in procession, and distributed a Sportula of bread and wine : But of this, and of the Fabri Tignarii, Naupegiarii, (Ship-Carpenters) and Centonarii, see this learned man's excellent dissertation.

The Jews had their feast of *Euloφogia*, mentioned by Josephus, in which they were obliged to carry wood to the temple for the maintaining the fires of the altar.

These colleges or halls were dedicated to Diana, as Goddes of the Woods, of which another Roman inscription is yet extant :

D I A N A E
 COLLEG. NAUPEGIAR.
 M. JUNIUS. BALISTUS.
 ET. Q. AVILLIUS. EROS.
 II. VIR. D.D.

younger Pliny, in book x. ep. cxvii. writes from Bithynia to Trajan, to ask the Emperor's opinion concerning the custom that prevailed there of distributing a Denarius or two, a coin in value about sevenpence, on occasion of taking the manly robe, of entering on a magistracy, or dedicating a public work ; which larges the critics on this author have not hesitated to call Sportulæ, probably with sufficient reason, though that word does not occur in the epistle, notwithstanding that it has been referred to by some authors as justifying the application of this term in the very extensive sense of any kind of gift on any public occasion.—In the Greek Glosses, Sportula is rendered sometimes a distribution of silver.

BOOK III.

FUEL.

For the use of our chimneys, and maintainance of fire, the plenty of wood for fuel, rather than the quality, is to be looked after; and yet there are some greatly to be preferred before others, as harder, longer lasting, better heating, and more cheerfully burning; for which we have commended the Ash, &c. in the foregoing paragraphs, and to which I pretend not here to add much for the avoiding repetitions, though even an history of the best way of charring would not misbecome this discourse.

But something more is to be said, sure, concerning the felling of *Lignum*, fuel-wood; for so critics would distinguish it from *Materia*, timber. Benedictus Cursius, Hortor. lib. viii. cap. xi. reckons up what woods make the best firing: Also of coaling, *et de facibus*, clearing, and what else belongs to *ἑυρολογία*, especially for the use of sacrifices*, which had their particular sorts, as in the temple Despæne in Arcadia, where they were prohibited the burning of Olive-wood, the Vaticanatic Laurel, the Thick-rind Oak, or any fungous, or rotten wood, but were obliged to use what was well dried, and apt to kindle without smoaking. In the sacrifice of Jupiter they used White Poplar, and the Pine on the Altar of Ceres. The Persian Magi burnt their sacrifices with Myrtle and the boughs of Laurel; and, in general, all the sacrifices offered up to the Pagan Gods were lighted with that wood which was sacred to the particular Deity. Of all which to particularize, let the curious inquire. We proceed therefore with what concerns this most useful chapter.

* V. Eustath. in Odyf. iii.

And first, that our Fuelist begin with the under-wood: Some conceive between Martinmas and Holy-Rood; but generally with Oak as soon as it will strip, but not after May; and for Ashes, betwixt Michaelmas and Candlemas. Let these be so felled as that the cattle may have the browsing of them, for in winter they will not only eat the tender twigs, but even the very moss; but fell no more in a day than they can eat for this purpose. This done, kid or bavin them, and pitch them upon their ends, to preserve them from rotting: Thus the under-wood being disposed of, the rest will prosper the better; and besides, it otherwise does but rot upon the earth, and destroy that which would spring. If you head or top for the fire, it is not amiss to begin three or four feet above the timber, if it be considerable: but in case they are only shaken trees and hedge-rows, strip them even to thirty feet high, because they are usually full of boughs; and it were good to top such as you perceive to wither

at the tops, a competent way beneath, to prevent their sickness downwards, which will else certainly ensue; whereas by this means even dying trees may be preserved many years to good emolument, though they never advance taller; and being thus frequently shred, they will produce more than if suffered to stand and decay: This is a profitable note for such as have old, doating, or any ways infirm wood. In other fellings, some advise never to commence the disbranching from the top; for though the incumbency of the very boughs upon the next, cause them to fall off the easier, yet it endangers the splicing of the next, which is very prejudicial, and therefore advise the beginning at the nearest. And in cutting for fuel, you may, as at the top, so at the sides, cut a foot or more from the body; but never when you shred timber-trees. We have said how dangerous it is to cut for fire-wood when the sap is up; it is a mark of improvident husbands; besides, it will never burn well, though abundance be congested. Lastly, remember that the east and north winds are unkind to the succeeding shoots.

Thus we have endeavoured to prescribe the best directions we could learn concerning this necessary subject. And in this penury of that dear commodity, and to incite all ingenious persons, studious of the benefit of their country, to think of ways how our woods may be preserved, by all manner of arts which may prolong the lasting of our fuel, I would give the best encouragements. Those that shall seriously consider the intolerable misery of the poor Cauchi, (the then inhabitants of the Low Countries,) described by Pliny, lib. xvi. cap. i. (how opulent soever their late industry has rendered them) for want only of wood for fuel, will have reason to deplore the excessive decay of our former store of that useful commodity; and by what shifts our neighbours, the Hollanders, do yet repair that defect, be invited to exercise their ingenuity: The process of which is casting the die, or square of the turf, in four equal quarters; and to build them so up, (as our brickmakers do their crude ware,) that they may have the free intercourse of the air till they are dry. See Quicciardius, in his Description of Holland, or Du Cange's Glosary, verbo Turba. But besides the dung of beasts *, and the peat and turf (which we may find in our ouzy lands and heathy commons) for their chimneys, they make use of stoves, both portable and standing; and truly the more frequent use of those inventions in our great wasting cities, (as the custom is through all Germany,) as also of those new and excellent ovens invented

* In many places (where fuel is scarce) poor people spread Fern and Straw in the ways and paths where cattle dung and tread, and then clap it against a wall till it be dry: but that of hogs is very noisome.

BOOK III. by Dr. Keffler, for the incomparably baking of bread, &c. would be an extraordinary expedient of husbanding our fuel, as well as the right mingling, and making up of charcoal-dust and loam, as it is hinted to us by Sir Hugh Platt, and is generally used in Maestricht, Liege, and the country about it; than which there is not a more sweet, lasting, and beautiful fuel. The manner of it is thus:

Take about one third part of the smallest of any coal, (pit, sea, or charcoal,) and commixing it very well with loam, (whereof there is in some places to be found a sort somewhat more combustible,) make it up into balls (moistened with a little urine of man or beast) as big as an ordinary goose-egg, or somewhat bigger; or, if you will, in any other form, like brick-bats, &c. Expose these in the air till they are thoroughly dry; they may be built into the most orderly fires you can imagine, will burn very clear, give a wonderful heat, and continue a very long time. But first you must make the fire of charcoal, or small-coal, covering it with your eggs, hot-flots, or hovilles, as they are called, and building them up in pyramids, or what shape you please; they will continue a glowing, solemn, and constant fire for seven or eight hours, without being stirred; then encourage and recruit the innermost with a few fresh eggs, and turn the rest, which are not yet quite reduced to cinders. This mixture is devised to slacken the impetuous devouring of the fire, and to keep the coals from consuming too fast^e.

^e About Bristol, Brislington, and other places of the west of England, they make coal balls of their culm, or small refuse coal, which would not otherwise be saleable. The way in which these balls are prepared, is to take a certain quantity of the culm, to which they add an equal quantity of sleet, or mud, which the tide leaves on the sea-shore. After mixing them grossly with shovels, they blend them with their hands more perfectly, and mould them into balls of six inches in diameter. And in making them up, they work as much culm into the sleet with their hands, as they possibly can without making them crumbly. These balls may be burnt immediately, or they may be laid up and kept as long as the owner pleases. This kind of fuel makes a pleasant, fierce, and good fire, and emits no disagreeable fumes. Coal balls are made in Wales, particularly about Carmarthen, in another way. Instead of sleet, they there use clay, allowing two parts culm to one of clay. To the heap they add a sufficient quantity of water, tempering all together in the manner of mortar. When sufficiently mixed they form the whole into balls. These last-mentioned balls, made with clay, do not make so pleasant a fuel as those made with sleet, because the clay is apt to send forth a stinking smoke, especially if the balls are burnt before they are dry; yet notwithstanding this inconvenience, they make a cheap and good fuel.

Two or three short billets, covered with charcoal, last much longer, and with more life, than twice the quantity by itself, whether charcoal alone or billet; and the billets under the charcoal being undisturbed, will melt as it were into charcoals of such a lasting size. CHAP. IV.

If small-coals be spread over the charcoal, where you burn it alone, it will bind it to longer continuance; and yet more, if the small-coal be made of the roots of Thorns, Briers, and Brambles. Consult Lord Bacon, Exp. 775.

The *Quercus Marina* (wrack or sea-weed) which comes in our oyster-barrels, laid under Newcastle coal to kindle it, (as the use is in some places,) will, as I am informed, make it out-last two great fires of simple coals, and maintain a glowing luculent heat without waste. This sort of fuel is much made use of in Malta and the Islands thereabout, especially to burn in their ovens; and the Peasant who first brought it into custom, I find highly commended by an Author, as a great Benefactor to his country. The manner of gathering it, is to cut it in summer-time from the rocks, whereon it grows abundantly, and bringing it in boats or otherwise to land, spread and dry it in the sun like hay, turning and cocking it till it be fully cured. It makes an excellent fire alone, and roasts to admiration; and when all is burnt, the ashes make one of the best manures for land in the world for the time they continue in virtue. This fuel adds much life, continuance, and aid to our sullen sea-coal; and if the main ocean should afford fuel, (as the Barnacles and Soland-geese are said to do in some parts of Scotland with the very sticks of their nests) we in these Isles may thank ourselves if we be not warm. These few particulars I but mention to animate improvements, and encourage ingenious attempts to detect more cheap and useful processes for ways of charring coals, peat, and the like fuliginous materials, as the accomplished Mr. Boyle has intimated to us in the fifth of those his precious Essays concerning the usefulness of Natural Philosophy, part ii. chap. vii. to which I refer the curious. In the mean time, were not he worthy a statue of gold, that (salvo to our Newcastle trade and seminary of mariners) should in this penury of fire-wood about so monstrous a devourer as this vast city, (poisoned with smoke and soot) find out an expedient that should, within the space of five and twenty years, free it from all this hellish and pernicious fog, by furnishing it with

BOOK III. fuel sufficient to feed and maintain all its hearths and fires with sweet and wholesome billet? This the ingenious Mr. Nourse seems to demonstrate, and I think not impossible, whilst my *Fumifugium*^f is long since vanished in *Aura*. There is no very great store of wood about Madrid, where the winters are sharp, and so very piercing, that there is spent no less than four millions of arrobas of charcoal, (every arroba being three quarters of our bushel, and pays to the King a Real before it comes into the town, or is sold): It is charred of the *Enzina*, or Cork-tree: besides which they use very little fuel-wood, it being exceedingly hard, and consequently lasting and sweet.—But to return to the law.

By the preamble of the statute of 7 Edward VI. one may perceive (the measures compared) how plentiful fuel was in the time of Edward IV. to what it was in the reigns of his successors: This suggested a review of sizes, and a reformation of abuses; in which it was enacted, that every sack of coals should contain four bushels; every Taleshide to be four feet long, besides the carf; and if named of one, marked one, to contain sixteen inches circumference, within a foot of the middle; if of two marks, twenty-three inches; of three, twenty-eight; of four, thirty-five; of five, thirty-eight inches about, and so proportionably.

Billets were to be of three feet, and four inches in length: The single to be seventeen inches and an half about; and every billet of one cast (as

^f Mr. Evelyn wrote a Treatise in 1661, entitled *Fumifugium*, recommending a method to prevent the bad effects of smoke in the city of London. In that work he considers the great quantities of smoke, which in large towns daily ascend into the atmosphere, as likely to produce infectious diseases; but that opinion does not seem well founded. On the contrary, these acid steams correct and neutralize the volatile Alkali, which in all large towns arises in abundance from putrid substances, and which, if not corrected, would be productive of disease, by affording a putrefactive ferment to all living bodies under the influence of a putrid disposition:

Did not the acid vigour of the mine,
 Roll'd from so many thund'ring chimneys, tame
 The putrid steams that overswam the sky;
 This caustic venom would perhaps corrode
 Those tender cells that draw the vital air,
 To vain with all their unctuous rills bedew'd.

they term the mark) to be ten inches about ; of two cast, fourteen inches, and to be marked (unless for the private use of the owner) within six inches of the middle ; of one cast, within four inches of the end, &c. CHAP. IV.


Every bound faggot should be three feet long ; the band twenty-four inches in circumference, besides the knot.

In the 43d Eliz. the same statute (which before only concerned London and its suburbs) was made more universal, and that of Edw. VI. explained with this addition : For such Taleshides as were of necessity to be made of cleft-wood, if of one mark, and half round, to be nineteen inches about ; if quarter-cleft, eighteen inches and an half : Marked two, being round, it shall be twenty-three inches compass ; half-round, twenty-seven ; quarter-cleft, twenty-six : Marked three, round, twenty-eight ; half-round, thirty-three ; quarter-cleft, thirty-two : Marked four, being round, thirty-three inches about ; half-round, thirty-nine ; quarter-cleft, thirty-eight : Marked five, round, thirty-eight inches about ; half-round, forty-four ; quarter-cleft, forty-three. The measure to be taken within half a foot of the middle of the length mentioned in the former statute.

Then for the billet, every one named a single, being round, to have seven inches and an half circumference ; but no single to be made of cleft-wood : If marked one, and round, to contain eleven inches compass ; if half-round, thirteen ; quarter cleft, twelve and an half.

If marked two, being round, to contain sixteen inches ; half-round, nineteen ; quarter-cleft, eighteen and an half ; the length as in the statute of King Edward VI.

Faggots to be every stick of three feet in length, excepting only one stick of one foot long, to harden and wedge the binding of it ; this to prevent the abuse, too much practised, of filling the middle part and ends with trash and short sticks, which had been omitted in the former statute. Concerning this and the dimensions of wood in the stack, see Coppices, chap. i. book iii. to direct the less-instructed purchaser : And I have been the more particular upon this occasion, because nothing is more deceitful than our fuel brought in billet by the notch, as they call it in London ; for by the vile iniquity of some wretches marking the billets as they come to the wharf, Gentlemen are egregiously cheated. I could produce

BOOK III.  an instance of a friend of mine, and a Member of this Society, of which the wood-monger has little cause to brag, since he never durst come at him, or challenge his money for the commodity he brought, because he durst not stand to the measure.

At Hall, near Foy, there is a faggot which consists of but one piece of wood, naturally grown in that form, with a band wrapped about it, and parted at the ends into four sticks, one of which is subdivided into two others: It was carefully preserved many years by an Earl of Devonshire, and looked on as portending the fate of his estate, which is since indeed come into the hands of four Cornish Gentlemen, one of whose estates is likewise divided betwixt two heirs. This we have out of Camden, and I here note for the extravagancy of the thing; though as to the verity of such portents from trees, &c. I do not find upon inquiry (which I have diligently made of my Lord Brereton) that there is any certainty of the rising of those logs in the lake belonging to that noble person, so as still to premonish the death or the heir of that family, how confidently soever reported; though sometimes it has happened, but the event is not constant. To this class may be referred what is affirmed concerning the fatal prediction of Oaks bearing strange leaves, which may be inquired of; and of accidents fasciating the boughs or branches of trees, as noticed by Dr. Plott in Willows and other soft woods, especially in an Ash at Biseter uniformly wreathed two or three times round: Such a curiosity also hangs up in the Portico of the Physic-Garden at Oxford, in a top branch of Holly, which shows it likewise happening sometimes even to harder woods; and it is probable that such as we sometimes find so *helically* twisted, have received some blast that has contracted the fibres, and curled them in that extravagant manner. Wonderful contortion and perplexity of the parts of trees may be seen and admired in Tæda roots, especially in that given to the Royal Society by the Right Hon. the Lord Somer, (the late most learned president) and now amongst the natural rarities of the Repository.

I will now describe to you the mystery of Charring, (whereof something was but touched in the process of extracting tar out of the Pines) as I received it from a most industrious person.

Of charcoal there is usually made three sorts, viz. one for the Iron-works, a second for Gunpowder, and a third for London and Court, besides small-coals, of which we shall also speak in due place.

We will begin with that sort which is used for the Iron-works, because the rest are made much after the same manner, and with very little difference. CHAP. IV.

The best wood for this is good Oak, cut into lengths of three feet, as they size it for the stack: This is better than the cord-wood, though of a large measure, and much used in Essex.

The wood being cut, and set in stacks ready for the coaling, choose out some level place in the coppice, the most free from stubs, &c. to make the hearth on: In the midst of this area drive down a stake for your centre, and with a pole, having a ring fastened to one of the extremes, (or else with a cord put over the centre) describe a circumference from twenty or more feet semi-diameter, according to the quantity of your wood designed for coaling, which being near, may conveniently be charred on that hearth; and which at one time may be twelve, sixteen, twenty, twenty-four, even to thirty stacks: If twelve therefore be the quantity you will coal, a circle, whose diameter is twenty-four feet; will suffice for the hearth; if twenty stacks, a diameter of thirty-two feet; if thirty, forty feet; and so proportionably.

Having thus marked out the ground with mattocks, hoes, and fit instruments, bare it of the turf, and of all other combustible stuff whatsoever, which you are to rake up towards the periphery, or outside of the circumference, for an use to be afterwards made of it, planeing and levelling the ground within the circle: This done, the wood is to be brought from the nearest part where it is stacked, in wheel-barrows; and first the smallest of it placed at the utmost limit, or very margin of the hearth, where it is to be set long-ways, as it lay in the stack; the biggest of the wood pitch, or set up on end round about against the small wood, and all this within the circle, till you come within five or six feet of the centre; at which distance you shall begin to set the wood in a triangular form till it come to be three feet high: Against this again, place your greater wood almost perpendicular, reducing it from the triangular to a circular form, till, being come within a yard of the centre, you may pile the wood long-ways, as it lay in the stack, being careful that the ends of the wood do not touch the pole, which must now be erected in the centre, nine feet in height, that so there may remain a round hole, which is to be formed in working up the stack-wood for a tunnel, and the more

BOOK III. commodious firing of the pit, as they call it, though not very properly. This provided for, go on to pile, and set your wood upright to the other as before, till, having gained a yard more, you lay it long-ways again, as was showed: And thus continue the work, still interchanging the position of the wood till the whole area of the hearth and circle be filled and piled up at the least eight feet high, and so drawn in by degrees in piling, that it resemble the form of a copped household loaf, filling all inequalities with the smaller trunchcons till it lie very close, and be perfectly and evenly shaped. This done, take straw, haume, or fern, and lay it on the outside of the bottom of the heap, or wood, to keep the next cover from falling amongst the sticks; upon this put the turf, and cast on the dust and rubbish which was grubbed and raked up at the making of the hearth, and reserved near the circle of it; with this cover the whole heap of wood to the very top of the pit or tunnel to a reasonable and competent thickness, beaten close and even, that so the fire may not vent but in the places where you intend it; and if, in preparing the hearth, at first there did not rise sufficient turf and rubbish for this work, supply it from some convenient place near to your heap. There be who cover this again with a sandy or finer mould, which, if it close well, need not be above an inch or two thick. This done, provide a screen by making light hurdles with slit rods and straw of a competent thickness to keep off the wind, and broad and high enough to defend an opposite side to the very top of your pit, being eight or nine feet, and so as to be easily removed, as need shall require, for the *luing* of your pit.

When now all is in this posture, and the wood well ranged and closed, as has been directed, set fire to your heap; but first you must provide you a ladder to ascend the top of your pit; this they usually make of a curved tiller, fit to apply to the convex shape of the heap, and cut it full of notches for the more commodious setting their feet whiles they govern the fire above; therefore now they pull up and take away the stake which was erected in the centre to guide the building of the pile and cavity of the tunnel: This done, put in a quantity of charcoals, (about a peck) and let them fall to the bottom of the hearth; upon them cast in coals that are fully kindled; and when those which were first put in are beginning to sink, throw in more fuel, and so, from time to time, till the coals have universally taken fire up to the top; then cut an ample and reasonable thick turf, and clap it over the hole, or

mouth of the tunnel, stopping it as close as may be with some of the former dust and rubbish. Lastly, with the handles of your rakes, or the like, you must make vent-holes, or registers, (as our chymists name them) through the stuff which covers your heap to the very wood, these in rangers of two or three feet distance, quite round within a foot (or thereabout) of the top, though some begin them at the bottom: A day after, begin another row of holes a foot and a half beneath the former, and so more till they arrive to the ground, as occasion requires. Note, That, as the pit does coal and sink towards the centre, it is continually to be fed with short and fitting wood, that no part remain unfired; and if it chars faster at one part than at the other, there close up the vent-holes, and open them where need is. A pit will in this manner be burning off and charring five or six days; and as it coals, the smoke, from thick and gross clouds, will grow more blue and livid, and the whole mass sink accordingly, so as by these indications you may the better know how to stop and govern your spiracles. Two or three days it will only require for cooling, which, the vents being stopped, they assist by taking now off the outward covering with a rabil or rubber; but this not far above the space of one yard breadth at a time; and first they remove the coarsest and grossest of it, throwing the finer over the heap again, that so it may neither cool too hastily, nor endanger the burning and reducing all to ashes, should the whole pit be uncovered and exposed to the air at once; therefore they open it thus round by degrees.

When now, by all the former symptoms, you judge it fully charred, you may begin to draw, that is, to take out the coals, first round the bottom, by which means the coals, rubbish, and dust, sinking and falling in together, may choke and extinguish the fire.

Your coals sufficiently cooled, with a very long-toothed rake and a vann, you may load them into the coal-wains, which are made close with boards purposely to carry them to market. Of these coals the grossest sort are commonly reserved for the forges and iron-works, the middling and smoother put up in sacks, and carried by the colliers to London and the adjacent towns: Those which are charred of the roots, if picked out, are accounted best for chymical fires, and where a lasting and extraordinary blast is required.

Coal for the powder-mills is made of Alder-wood (but Lime-tree were much better, had we it in that plenty which we easily might) cut,

BOOK III.

stacked, and set on the hearth like the former; but first the wood ought to be wholly disbarked, which work is to be done about Midsummer before, and being thoroughly dry, it may be coaled in the same method, the heap or pile only somewhat smaller, by reason that they seldom coal above five or six stacks at a time, laying it but two lengths of the wood one above the other, in form somewhat flatter on the top than what we have described; likewise do they fling all their rubbish and dust on the top, and begin not to cover at the bottom, as in the former example. In like sort, when they have drawn up the fire in the tunnel, and stopped it, they begin to draw down their dust by degrees round the heap, and this proportionably as it fires, till they come about to the bottom; all which is despatched in the course of two days. One of these heaps will char threescore sacks of coal, which may all be carried at one time in a waggon; and some make the court-coals after the same manner.

Lastly, Small coals are made of the spray and brush-wood, which is stripped off from the branches of copse-wood, and which is sometimes bound up into bavins for this use, though also it be as frequently charred without binding, and then they call it *cooming* it together. This they place in some near floor, made level and freed of incumbrances, where, setting one of the bavins, or part of the spray, on fire, two men stand ready to throw on bavin upon bavin, as fast as they can take fire, which makes a very great and sudden blaze, till they have burnt all that lies near the place, to the number (it may be) of five or six hundred bavins: But before they begin to set fire, they fill great tubs or vefsels with water, which stand ready by them, and this they dash on with a great dish or scoup so soon as ever they have thrown on all their bavins, continually plying the great heap of glowing coals, which gives a sudden stop to the fury of the fire, whiles with a great rake they lay and spread it abroad, and ply their casting of water still on the coals, which are now perpetually turned by two men with great shovels, a third throwing on the water. This they continue till no more fire appears, though they cease not from being very hot; after this they shovel them up into great heaps, and, when they are thoroughly cold, put them up in sacks for London, where they use them amongst divers artificers, both to kindle great fires, and to temper and anneal their several works. Lastly, this is to be observed, that the wood which yields the finest coal is more flexible and gentle than that which yields the contrary.

The best season for the fetching home of other fuel is in June, the ways being then most dry and passable; yet I know some good husbands will begin rather in May, because fallowing and stirring of ground for corn comes in the ensuing months, and the days are long enough, and swains have then least to do.

CHAP. IV.

And thus we have seen how for House-bote, and Ship-bote, Plough-bote, Hey-bote, and Fire-bote, the Planting and Propagation of Timber and Forest-trees is requisite; so as it was not for nothing that the very name (which the Greeks generally applied to timber) ὕλη, by synecdoche, was taken always *pro materia*; since we hardly find any thing in nature more universally useful; or, in comparison with it, deserving the name of Material; it being, in truth, the mother-parent and (metaphorically) the passive principle ready for the form.

To complete this chapter of the universal use of trees, and the parts of them, something I could be tempted to say concerning staves, wands, &c. their antiquity, use, divine, domestic, civil, and political; the time of cutting, manner of seasoning, forming, and other curious particulars, (how dry soever the subject may appear) both of delight and profit; but we reserve it for some more fit opportunity, and perhaps it may merit a peculiar treatise, as acceptable as it will prove amusing.

We have already spoken of that modern art of *tapping* trees in the spring, by which doubtless, some excellent and specific medicines may be attained, as (before) from the Birch, for the stone; from Elms and Elder, against fevers; so from the Vine, the Oak, and even the very Bramble, besides the wholesome and pleasant drinks, spirits, &c. that may possibly be educed out of them. This we leave to the industrious; satisfying ourselves that we have been among the first who have hinted and published the ways of performing it.

Let us now sum up all the good qualities and transcendent perfections of trees, in the harmonious Poets' Concert of Elogies:

—————dant utile lignum
 Navigiis Pinos, domibus Cedrosque Cupressosque;
 Hinc radios trivere rotis, hinc tympana plaustris
 Agricolaræ, & pandas ratibus posuere carinas.



Viminibus Salices sæcundæ, frondibus Ulmi:
 At Myrtus validis hastilibus, et bona bello
 Cornus: Ityræos Taxi torquentur in arcus.
 Nec Tiliæ læves, aut torno rasile Buxum,
 Non formam accipiunt, ferroque cavantur acuto:
 Nec non et torrentem undam levis innatat Alnus
 Mifsa Pado; nec non et apes examina condunt
 Corticibusque cavis, vitiosæque Ilicis alveo.

GEORG. II.

——Pines are for masts an useful wood,
 Cedar and Cypress, to build houses good:
 Hence covers for their carts, and spokes for wheels
 Swains make, and ships do form their crooked keels:
 With twigs the Sallows, Elms with leaves are freight;
 Myrtles stout spears, and Cornel good for fight:
 The Yews into Ityrean bows are bent;
 Smooth Limes and Box, the Turner's instrument
 Shaves into form, and hollow cups does trim;
 And down the rapid Po light Alders swim:
 In hollow bark bees do their honey stive,
 And make the trunk of an old Oak their hive.

The most ingenious Ovid introduces the miraculous groves raised by the melodious song of Orpheus:

—————Non Chaonis abfuit arbos,
 Non nemus Heliadum, non frondibus Æsculus altis.
 Nec Tiliæ molles, nec Fagus, et innuba Laurus.
 Et Coryli fragiles, et fraxinus utilis hastis,
 Enodisque Abies, curvataque glandibus Ilex,
 Et Platanus genialis, Acerque coloribus impar,
 Amnicolæque simul Salices, et aquatica Lotos,
 Perpetuoque virens Buxus, tenuisque Myricæ.
 Et bicolor Myrtus, et baccis cærula Tinus:
 Vos quoque flexi-pedes Hedera venistis, et una
 Pampinæ vites, et amictæ Vitibus Ulmi:
 Ornique, et Piceæ, Pomoque onerata rubenti
 Arbutus, et lentæ victoris præmia Palmæ:
 Et succincta comas, hirsutaque vertice Pinus
 Grata Deum matri.

MET. 7.

—————nor trees of Chaony,
 The Poplar, various Oaks that pierce the sky,
 Soft Linden, smooth-rind Beech, unmarried Bays,
 The brittle Hazel, Ash, whose spears we praise,

Unknotty Fir, the solace shading Planes,
 Rough Chesnuts, Maple fleck'd with different grains,
 Stream-bordering Willow, Lotus loving lakes,
 Tough Box, whom never sappy spring forsakes,
 The slender Tamarisk, with trees that bear
 A purple Fig, nor Myrtles absent were.
 The wanton Ivy wreath'd in amorous twines,
 Vines bearing grapes, and Elms supporting Vines,
 Straight Service-trees, trees dropping pitch, fruit-red
 Arbutus, these the rest accompanied.
 With limber Palms, of victory the prize,
 And upright Pine, whose leaves like bristles rise,
 Priz'd by the Mother of the Gods——

SANDYS.

This incomparable Poet is imitated by our divine Spencer, where he brings his gentle Knight into a shady grove, praising

———the trees so straight and hy,
 The sayling Pine, the Cedar proud and tall,
 The Vine-prop Elme, the Poplar never dry,
 The builder Oake, sole King of Forrests all,
 The Aspine good for staves, the Cyprefs funeral.
 The Laurell, meed of mighty conquerors
 And poets sage, the Firre that weepeth still,
 The Willow worne of forlorne paramours,
 The Eugh obedient to the bender's will,
 The Birch for shaftes, the Sallow for the mill,
 The Mirrhe sweet bleeding in the bitter wound,
 The war-like Beech, the Ash for nothing ill,
 The fruitful Olive, and the Platane round,
 The carver Holme, the Maple seeldom inward sound.

CANTO I.

And in this symphony might the noble Tasso bear likewise his part, but that these are sufficient, *et tria sunt omnia.*

What now remains, concerns only some general precepts, and directions applicable to most of that we have formerly touched; together with a brief of what farther laws have been enacted for the improvement and preservation of woods; and which having despatched, we shall with a short Parænesis, touching the present ordering and disposing of the Royal Plantations, for the future benefit of the Nation, put an end to this rustic Discourse.

C H A P. V.

APHORISMS, or certain General Precepts, of Use to the foregoing Chapters.

TRY all sorts of seeds, and by their thriving you shall best discern what are the most proper kinds for grounds,

Quijpe solo natura subest—

and of these design the main of your plantation. Try all soils, and fit the species to their natures. Beech, Hasel, and Holly affect gravel and gritty; and if mixed with loam, Oak, Ash, and Elm. In stiff ground plant Ash and Hornbeam; and in light feeding ground or loam, any sort whatsoever: In the lower and wetter lands, the Aquatics^s.

^s Of plants, each species affects a particular soil in preference to every other. In their culture, therefore, it is of the utmost importance to have a distinct knowledge of the *Loca Natalia*, that the nature of the soil in which they are cultivated may be made to approach, as near as possible, to that in which they spontaneously grow. This is the solid and proper foundation of Planting and Gardening:

Nec vero terræ ferre omnes omnia possunt.
 Fluminibus Salices, crassisque paludibus Alni
 Nascentur, steriles saxosis montibus Orni,
 Litora Myrteis lætissima: denique apertos
 Bacchus amat colles, Aquilonem et frigora Taxi.

GEORG. II.

The numerous species of plants which grow betwixt the North Pole and the Equator, when viewed in detail, appear to differ from each other only by insensible degrees; yet are the plants of the frozen zones, when viewed in cumulo, or in a body, totally different from those which are produced betwixt the tropics. Thus we often see whole families of plants, natives of the torrid zone, which are never to be found in any of the others. In the climate of plants, says Linnæus, are to be considered latitude, longitude, and the temperature or elevation of the soil. Vaillant was among the first who viewed the *Loca Natalia* of plants in this light; but his observations were confined to latitude alone.—Places situated under the same parallel of latitude, but in opposite hemispheres, produce plants that are totally different; even those in the same hemisphere are rarely alike.—Thus Rome, Pekin, and New-York in America, are situated almost in the same degree of north latitude, yet produce very different plants. The same may be said of the plants


Keep your newly-sown seeds continually fresh, and in the shade (as much as may be) till they peep.

All curious seeds and plants are diligently to be weeded, till they are strong enough to over-drop or suppress them: and you shall carefully hoe, half-dig, and stir up the earth about their roots during the first three years, especially in the vernal and autumnal equinoxes: This work should be done in a moist season for the first year, to prevent the dust from suffocating the tender buds; but afterwards in the more dry-weather.

Plants raised from seed should be thinned where they come up too thick; and none so fit to be transplanted into hedge-rows as those you thus draw, especially where ground is precious.

of Florida and Palestine, the Cape of Good Hope, and Chili in South America, places which exactly correspond in latitude; the two former situated in the northern hemisphere; the latter in the southern. What has been affirmed of latitude, may likewise be asserted of places that are situated upon the same meridian. Thus the North-Cape, Rome, Upsal, the Cape of Good Hope, agree in longitude, yet produce plants that are totally different. The aptitude or disposition of plants to grow in certain climates, and not in others, seems to depend not so much upon longitude and latitude, as upon the elevation of the soil, or difference of temperature in such climates. From this cause proceeds the difference which is generally found to obtain betwixt the plants of the torrid, and those of the temperate and frigid zones. For when in the torrid zone we find the mountains, which, by their elevation, have acquired a temperature similar to that of the temperate or frigid zones, we always discover on such mountains the same, or, at least, a part of the same plants. Thus the plants on the mountains of Lapland, of Switzerland, Greenland, Siberia, Wales, the Pyreneans, Olympus, Ararat, and Brazil, though placed at such immense distances from each other, are nearly the same. As at a certain depth, the temperature of water is found to be nearly the same in all climates, so the greatest part of Aquatic plants are common to the torrid, temperate, and frigid zones. Thus the Water-lily, *Althevanda*, Sun-dew, Arrow-head, Water-milfoil, and many other Aquatics, are equally natives of Europe and the Indies.

It is remarked by many writers, that the climate of modern Europe is much warmer than that of the antient; and as a proof of its being so, we need only compare the testimonies of the most authentic antient writers with our own observations and experience. The Abbé du Bos observes upon the climate of Italy, that it is warmer at present than in antient times. He says, "The annals of Rome tell us, that in the year 480, ab. U. C. " the winter was so severe, that it destroyed the trees. The Tyber froze at Rome, and " the ground was covered with snow forty-five days. When Juvenal describes a super-

BOOK III.  Suckers that sprout from the farthest part of the stem, or body of the mother-tree, are best, as easier plucked up without detriment to the roots and fibres, or violence to the mother: It were good therefore first to uncover the roots whence they spring, and to cut them close off, replanting them immediately; those which grow at more distance may be separated with some of the old root, if you find the sucker not well furnished.

To produce suckers, lay the roots bare, and slit some of them here and there discreetly, and then cover them.

Layers are to be bent down and couched in rich mould; and if you find them stubborn, you may slit a little in the bark and wood, but no deeper than to make it ply, without wounding the tender heart. Putting forth root is assisted by pricking the bark, slitting, or binding a pack-thread about the part you would have the root spring from.

The proper season is the early spring and mid-autumn; and in all dry seasons observe to keep the layers diligently watered.

Slips and cuttings (by which most trees may be propagated) should be separated at the burs, joints, or knobs: Strip them of their leaves before

“stitious woman, he represents her as breaking the ice of the Tyber, that she might perform her ablutions:

*Hybernium fracta glacie descendet in amnem,
Ter matutino Tyberi mergetur.*

“The Poet speaks of the freezing of the river as a common event. Many passages in Horace suppose the streets of Rome full of snow and ice. We should have had more certainty with regard to this point, had the antient Romans known the use of Thermometers. But their writers, without intending it, give us information sufficient to convince us, that the winters are now more temperate there than formerly. At present the Tyber no more freezes at Rome than the Nile at Cairo. The citizens of Rome esteem the winter very rigorous if the snow lies two days, and if one sees for eight and forty hours a few icicles hanging from a fountain that has a North exposition.” Pliny the Consul in his letter to Apollinaris, in which he describes his villa in Tuscany, says, that it produces Bay-trees in great perfection, but that sometimes, though not oftener than in the neighbourhood of Rome, they are killed by the sharpness of the seasons. Ovid describes the place of his banishment, Tomus, on the Euxine sea, as enjoying a most rigorous winter; but Tournefort, who visited the same country, says, that there is not a finer climate in the world. He remarks, that nothing but Ovid’s melancholy could have induced him to paint the country in such horrid colours. But I think the facts mentioned by the Poet are too circumstantial to admit of such an interpretation.

you bury them, leaving no side-branches. Some slit the end where it is cut off; at two years end is the soonest they will be fit to take up; layers much sooner. CHAP. V.

In Planting, omit not the placing of your trees towards their accustomed aspect; and if you have leisure, make the holes the autumn before; the wider the better: Three feet over and two deep is little enough if the ground be any thing stiff, often stirring and turning the mould, and mixing it with better as you may find cause. This done, dig or plough about them, and that as near their stems as you can come without hurting them, and therefore rather use the spade for the first two or three years; and preserve what you plant steady from the winds and annoyance of cattle, &c.

Remove the softest wood to the moistest grounds:

Divisæ arboribus patriæ———

GEORG. II.

Begin to plant Forest-trees when the leaves fall after Michaelmas; you may adventure when they are tarnished and grow yellow; it is lost time to commence later, and, for the most part of your trees, early Planters seldom repent; for sometimes a tedious bind of frost prevents the whole season. The baldness of a tree is a note of deceit; for some Oaks, Hornbeam, and most Beeches preserve their dead leaves till new ones push them off.

Set deeper in the lighter grounds than in the strong, but shallowest in clay: Five inches is sufficient for the driest, and one or two for the moist, provided you establish them against winds.

Plant forth in warm and moist seasons, the air tranquil and serene, the wind westerly; but never while it actually freezes or rains, nor in misty weather, for it moulds and infects the roots.

What you gather and draw out of woods, plant immediately, for their roots are very apt to be mortified, or hardened and withered by the winds and cold air.

Trees produced from seeds must have the tap-roots abated, (the Walnut-tree and some others excepted, and yet if planted merely for fruit, some affirm it may be adventured on with success) and the bruised parts cut away, but sparing the fibrous, for they are the principal feeders; and those who cleanse them too much are punished for the mistake.

BOOK III. In spring, rub off some of the collateral buds to check the exuberancy of sap in the branches, till the roots be well established.

Plant no more than you will fence, for that neglected, tree-culture comes to nothing; therefore all young-set trees should be defended from the winds and sun, especially the east and north, till their roots are fixed, that is, till you perceive them shoot; and the not exactly observing of this article, is the cause of the perishing of the most tender plantations; for it is the invasion of these two afsailants which does more mischief to our new set and lefs hardy trees, than the most severe and durable frosts of a whole winter. And here let me add this caution again, that, in planting of trees of stature for avenues or shades, you set them at such distance as they be not in reach of the mansion-house, in case of being blown down by the winds, for reasons sufficiently obvious. See Hist. of the Storm, Nov. 26, 1703^b.

The properest soil, and most natural, apply to distinct species: *Nec vero terræ ferre omnes omnia possunt*. Yet we find by experience that most of our forest-trees grow well enough in the coarsest lands provided there be a competent depth of mould; for albeit most of our wild plants covet to run just under the surface, yet, where there is not sufficient depth to cool them, and entertain the moisture and influences, they are neither lasting nor prosperous.

Wood well planted will grow in moorish, boggy, heathy, and the stoniest grounds; only the white and blue clay, which is commonly the best pasture, is the worst for wood; and such good timber as we find in any of these, Oaks excepted, is of an excessive age, requiring thrice the time to arrive at their stature.

If the season require it, all new plantations are to be plied with waterings, which is better poured into a circle at some distance from the roots, which should continually be bared of grafs; and if the water be rich, or impregnated, the shoots will soon discover it; for the liquor,

^b In the fourth Book of this Volume, Mr. Evelyn has given a short account of this dreadful Storm; and as it was one of the most sweeping Tempests that ever visited this Island, I have, in a note, given a more circumstantial account of it, from an annual Sermon preached by the Rev. Mr. Winter, to commemorate that awful day.

being percolated through a quantity of earth, will carry the nitrous virtue CHAP. V.
of the soil with it: By no means therefore water at the stem, because it washes the mould from the roots, comes too crude, and endangers their rotting.

But, for the cooling and refreshing tree roots, the congesting of rotten litter, sprinkled over with fine earth, is good; or place potsherds, flints, or pebbles near the foot of the stem; for so the Poet:

Aut lapidem bibulum, aut squallentes infode conchas:
Inter enim labentur aquæ, tenuisque subibit
Halitus.

GEORG. II.

Lime-stones, or squalid shells, that may the rain,
Vapours, and gliding moisture entertain.

But remember you remove them after a competent time, else the vermine, snails, and insects, which they produce and shelter, will gnaw and greatly injure the bark; and therefore to lay a coat of moist rotten litter with a little earth upon it, will preserve it moist in summer and warm in winter, enriching the showers and dews that strain through it.

Young plants will be strangled with corn, oats, pease, or hemp, or any rankly growing grain, if a competent circle and distance be not left, as of near a yard or so off the stem. This is a useful remark; but whether the setting or sowing of beans near trees make them thrive the more, as Theophrastus writes, (I suppose he means fruit-trees) I leave to experience.

Cut no trees (especially having an eminent pith in them, being young and tender too) when either heat or cold are in extremes, nor in very wet and snowy weather; and in this work it is profitable to discharge all trees of unthriving, broken, wind-shaken browse, and such as our law terms *Cablicia*, and to take them off to the quick,

———Ne pars sincera trahatur.

And for Evergreens, especially such as are tender, prune them not after planting till they do radicate; that is, by some little fresh shoot discover that they have taken root.

Cut not off the top of the leading twig or shoot (unless very crooked, and then at the next erect bud) when you transplant timber-trees, but

BOOK III, those of the collateral you may shorten, stripping up the rest close to the stem; and such as you do spare, let them not be the most opposite, but rather one above another, to preserve the part from swelling and hindering its taper growth: Be careful also to keep your trees from being top-heavy, by shortening the side-branches competently near the stem.—Young plants, nipt either by the frost or teeth of cattle, do commonly break on the sides, which impedes both growth and spiring: In this case, prune off some, and quicken the leading shoot with your knife at some distance beneath its infirmity: but if it be in a very unlikely condition at spring, cut off all close to the very ground, and hope for a new shoot, continually suppressing whatever else may accompany it, by cutting them away in summer.

Walnut, Ash, and pithy trees are safer pruned in summer and warm weather than in the spring, whatever the vulgar fancy.

I will conclude with the technical names, or dissimilar parts of trees, as I find them enumerated by the industrious and learned Dr. Merett: Scapus, Truncus, Cortex, Liber, Malicorium, Matrix, Medulla et Cor, Pecten, Circuli, Surculi, Rami, Sarmenta, Ramusculi, Spadix, Vimen, Virgultum et Cremium, Vitilia, Talea, Scobs, Termes, Turiones, Frondes, Cachrys et Nucamentum, Julus et Catulus, Comæ: To which add Alburnum, Capitulum, Cima, Echinus, Geniculum, Pericarpium, Petiolus: The Species, Frutex, Suffrutex, &c.; all which I leave to be put into good and proper English (as our learned Phytologist Mr. Ray has done) by those who shall once oblige our nation with a full and absolutely complete Dictionary, as yet a desiderate amongst us; however of late infinitely improved¹.

¹In the year 1731, Mr. Philip Miller published the first edition of his *Gardeners' Dictionary*. It has gone through nine editions, and is a work of considerable merit. 2d Edit. in 1733.—3d Edit. in 1738.—4th Edit. in 1740.—5th Edit. in 1743.—6th Edit. in 1752.—7th Edit. in 1759.—8th Edit. in 1768.—and 9th Edit. in 1798, with alterations and improvements, by Mr. Martin, Professor of Botany in the University of Cambridge.—In the year 1764, Dr. Berkenhout published his *Clavis Anglica Linguae Botanicae*; and in 1770, Mr. C. Milne favoured the *Botanical Student* with an excellent *Botanical Dictionary*, to which a Supplement was added in 1778.

C H A P. VI.

*Of the Laws and Statutes for the Preservation and Improvement of
WOODS and FORESTS.*

IT is not to be pased by, that the very first law we find which was ever promulged, was concerning Trees—and that laws themselves were first written upon them*, or tables composed of them; and after that establishment in Paradise, the next we meet withal are as ancient as Moses. You may find the statute at large in Deut. xx. 19, 20. which though they chiefly tended to fruit-trees, even in an enemy's country, yet you will find a case of necessity only alleged for the permission to destroy any other.

* The laws of Numa were first cut in Quernis Tabulis, before they were engraven in bras. See Dionys. Halicarnas. l. iii.

To sum up briefly the laws and civil constitutions of great antiquity, Servius informs us it was no less than capital, *alienas arbores incidere*; the *Lex Aquilia*, and those of the Twelve Tables mentioned by Paulus, Cujas, Julianus, and others of that robe, repeated divers more.

It was by those sacred constitutions provided, that none might so much as plant trees on the confines of his neighbour's ground, but he was to leave a space of at the least five feet, for the smallest tree, that they might not injure him with their shadow. *Si arbor in vicini agrum impenderit, eam subluato, &c.*; and if, for all this, any hung over farther, it was to be stripped up fifteen feet: And this law Balduinus, Olderdorpius, and Hoto-man recite out of Ulpian, lib. i. F. de Arb. Cædend. where we have the Prætor's interdict expressed, and the impendent wood adjudged to appertain to him whose field or fence was thereby damaged: Nay, the wise Solon prescribed ordinances for the very distances of trees, as the divine Plato did against stealing of fruit, and violating of plantations: And the Interdiction *de Glanale legenda* runs thus in Ulpian, *AIT PRÆTOR, GLANDEM, QUÆ EX ILLIUS AGRO IN TUUM CADAT, QUO MINUS ILLI TERTIO QUOQUE DIE LEGERE, AUFERRE LICEAT; VIM FIERI VETO.* And yet, though by the Prætor's permission he might come every third day to gather it up without trespass, his neighbour was to share of the mast which so fell into his ground;

BOOK III. and this chapter is well supplied by Pliny, lib. xvi. cap. v. and Cujas, upon the place, interprets *Glandem* to signify not the Acorns of the Oak alone, but all sorts of fruit whatsoever, as by usage of the Greeks, ἀγρὸς φρα imports the fruit of all kinds of forest-trees.

There were also laws concerning boundaries, to be found at large in other learned authors *De Re Agraria*, of which we give this short extract: Some admitted any sort of trees, others used peculiar kinds for the fencing of their grounds; others fenced with foreign trees, that the difference of the wood might serve as a mark: Some, by agreement, planted them in common upon the very borders; some, at their private charge, a little within the margents of their own fields, &c. Amongst the different sorts of trees, we find Pines and Cypress-trees placed for bounds, also Ash, Elm, and Poplar; which when near the limits, with any cultivated ground between, the intermediate spaces were filled with shrubs. In case the trees were in common, some preserved them untouched on both sides; others, the stem only, the lop, the tops, and branches (especially if they belonged to a particular person) to cut or spare at their pleasure, provided they planted others in their room. In trees *marked*, it was considered whether they were in *common*, in which case they were marked in the *middle*, or on each *side*; and if one side of the tree had leaves, the other was cut, to signify their belonging to those persons, on the border of whose grounds they were left entire: This for trees of eight feet asunder. Those at twenty feet distance, were marked with X or T, to notify a flexure or turning thereabout. Some permitted them to stand till they arrived to such a bulk and stature as to over-top the rest, distinguished also from those marked on both sides, whether they stood in woods, barren or uncultivated land, as being supposed in common: The same rule held if marked in the middle. If but one side was marked, the unmarked side was the boundary: If the mark was different on either side, (and none else to be seen) such trees were not to be accounted boundaries. Lastly, in champaign and open places, foreign trees were usually planted. If, as sometimes, briars and such shrubs grow on the ancient limits, it should be considered of what kind they are, and inquired how it happens that they are often found in the middle of the fields. There are more of those nice rules to be found among the lawyers, whilst, before any of these instances, the images of *Satyrs* bounded the confines, and

were counted as *Termini*^{*}, which none might remove, without being accounted as sacrilegious, and the person punished with death. These, and the *Hermæ*, were reputed protectors of such boundaries: CHAP. VI.

—————et te pater
Silvane, tutor finium! HOR.

In the mean time, no trees whatsoever might be planted near public aqueducts, lest the roots should insinuate into, and displace the stones; nor on the very margin of navigable rivers, lest the boats and other vessels; passing to and fro, should be hindered; therefore such impediments were called *rete*, *quia naves retinent*, says the Gloss; and because the falling of the leaves corrupted the water: So nor within such a distance of high ways, (which also our own laws prohibit) that they might dry the better, and less cumber the traveller. Trees that obstructed the foundation of houses were to be felled: Barthol. lib. i. doct. c. de Interdict. Ulp. in L. priore ff. de Arb. cædend. Trees spreading their roots in neighbour-ground to be in common: See Cujas and Paulus in L. Arb. ff. de Comuni dividend. where more of the *Alienation* of trees felled, and not standing but with the *Funds*, as also of the *Usu-fruit* of trees, and the difference betwixt *Arbores Grandes*, and *Cremiales* or *Ceduxæ*; of all which Ulpian, Baldus, Alciat, with the laws to govern the *Conlucatores* and

* The *Hermæ*, or what the Latins call *Termini*, were placed for boundaries of lands. They were sometimes worshipped as Gods, but the sacrifices offered to them were *unbloody*; and Plutarch gives the reason, "lest they should violate the tokens of peace and agreement by staining them with blood." The *Termini* were originally square statues of Mercury, and generally without legs or arms. The Athenians placed them in the vestibles of their houses and temples, and it was esteemed highly criminal to remove or deface them. —One night (says Thucydides) the heads of all the *Hermæ* in the city were cut off; Strict search was made after the perpetrators of this crime, in order to bring them to punishment: Alcibiades was suspected, —and obliged to fly into banishment. Other heads, besides that of Mercury, were placed upon square pillars, and constituted *Termini*. When it was a head of Minerva, called in Greek *Athena*, it was named a *Hermathena*. Those which had Apollo's head were named *Hermapollo*; and those *Hermæros* which had the head of Cupid from his being named Eros. Such as had the heads of Hercules, Anubis, Osyris, or Harpocrates, were called *Hermheracles*, *Hermamubis*, *Hermosyris*, and *Hermharpocrates*. These names frequently occur in the Latin classics. Exclusive of worship, it was strict policy both in the Greeks and Romans to consider their *Termini* as sacred; and if we look into the books of the Old Testament we shall find that vengeance was denounced against such as removed them. "Cursed is he that removeth his neighbour's land-mark."

BOOK III. Sublucatores, or Pruners: Vid. Pan. s. c. Sent. lib. v. Festus, &c. for we pass over what concerns Vines and Olive-trees, to be found in Cato de R. R. &c. Nor is it here that I design to enlarge, as those who have philologized on this occasion *de Sycophantis*, and other curious criticisms; but to pass now on, and confine myself to the prudent sanctions of our own Parliaments; for though, according to the old and best spirit of true English, we ought to be more powerfully led by royal example, than to have need of more cogent and violent laws; yet, that our Discourse may be as ample, and as little defective as we can render it, something, it is fit, should be spoken concerning such laws and ordinances as have been from time to time constituted amongst us for the encouragement and direction of such as do *well*, and for the animadversion and punishment of those who continue *refractory*.

But, before we descend to our municipal, and present laws and constitutions, let us inquire what was antiently meant by a Forest, waving those (I think) impertinent etymologies, *quia foris est*, Lombard Glos, &c. A Forest is properly an harbour for wild beasts, *quasi ferarum statio*, for which mighty tracts and portions of land have been afforded (as the term is) by the Kings and Monarchs of this nation, beyond any other in Europe, and guarded with such strict, rigorous, and severe laws, as did not extend to the prohibition of killing and destruction of deer and venison alone, but even to that of killing little silly birds; and that not only to the forfeiture and loss of goods, but of limb and life. Such, among others, was that of Richard I. upon incurring the loss of the offender's eyes, testicles, &c. to the insufferable hinderance of great improvements, whilst there might have been not only enough for royal diversion, but for the increase of timber and people, which are the true glory and safety of this nation. In the mean time, it is remarkable that William Rufus, (successor to the great Conqueror) chasing a stag under a spreading Oak, was, by the glance of an arrow levelled at the beast, deprived of his life. The Historian recounts it as God's visiting the sin of the father upon the children, for his demolishing so many churches and villages, and turning them into receptacles and dens of wild beasts; their having, besides this Prince, been two more who met with their death in New-Forest. There were in Yorkshire alone, in the time of Henry VIII. two hundred seventy and five woods, (besides parks and chases) most of them containing five hundred acres: See Mr. Camden's *Britannia*. As to what we call Wood-land, I know not how to distinguish forest from woods,

unless for its being applicable to all sorts in common; for heretofore (as Strabo tells us) the antient inhabitants of this island's security was their woods, instead of cities and towns, as still they are among the people of the uncultivated America: Nor doubtless was our superb and stately Metropolis any other; from whence some derive its name, turning Den only into Don; whilst, since our remembrance, the whole city was (till the late dreadful conflagration) a *wooden city*, almost entirely built of wood and timber.

Wood-land in Warwickshire (says the same learned Antiquary) was antiently called Arden, importing the same in British; from whence our own forest of Dean (Danica Silva) might probably derive its name, and Diana Nemorensis be found under the British Ardwen and Ardoina: But dismissing these conjectures, we now come to the subject of this chapter, as it more immediately concerns our common law, and some of other nations, which we shall deduce in this order.

From the time of Edward IV. were enacted many excellent laws for the planting, securing, cutting, and ordering of woods, coppices, and under-woods, as then they took cognizance of them, together with the several penalties upon the infringers, especially from the 17th of Hen. VIII. 25th, &c. confirmed by the 13th and 27th of Q. Eliz. cap. xxv, xix, &c. which are diligently to be consulted, revived, put in execution, and enlarged where any defect is apparent; as in particular the act of exempting timber of twenty-two years growth from tithe, for a longer period, to render it complete and more effectual to improvement; and that law repealed, by which Willows, Sallows, Oziers, &c. (which they term *Sub-bois*) are reputed but as weeds.

Several punishments have lately been ordained against our wood-stealers, destroyers of young trees, &c. By an antient law of some nation, I read, he forfeited his hand who beheaded a tree without permission of the owner; and I cannot say they are sharp ones, when I compare the severity of our laws against mare-stealers; nor am I by inclination the least cruel, but I do affirm, we might as well live without mares, as without masts and ships, which are our wooden, but no less profitable horses.

And here we cannot but perstringe those riotous assemblies of idle people, who, under pretence of going *a Maying*, as they term it, do oftentimes



cut down and carry away fine straight trees to set up before some alehouse, or revelling-place, where they keep their drunken Bacchanalia: For though this custom was introduced by the Emperor Anastasius to abolish the Gentile *Majuma* of the Romans at Ostia, which was to transfer a great Oaken-tree out of some forest into the town, and erect it before their Mistresses' door; yet I think it were better to be quite abolished amongst us, for many reasons, besides that of occasioning so much waste and spoil as we find is done to trees at that season, under this wanton pretence, by breaking, mangling, and tearing down of branches, and entire arms of trees, to adorn their wooden idol. The Imperial law against such disorders we have in L. ob. id. sl. ad legem Aquil. & in ff. l. xlvii. tit. vii. Arborum furtim cæsarum. See also Triphon. L. ig. de Bon. off. cont. tab. vel in ligna focaria. L. Ligni ff. de Lege 3, &c.

To these I might add the Jaws of our King Ina, of which the title is, *Be þu þaþete, Of Burning Trees.* The *Sanction* runs thus:

“ If any one set fire of a felled wood, he shall be punished, and besides pay three pounds; and for those who clandestinely cut wood, (of which the very sound of the ax shall be sufficient conviction,) for every tree he shall be mulcted thirty shillings. A tree so felled, under whose shadow thirty hogs can stand, the offender shall be mulcted three pounds,” &c.

I have heard, that in the great expedition of 1588, it was expressly enjoined the Spanish Commanders of that signal Armada, that if, when landed, they should not be able to subdue our nation, and make good their conquest, they should yet be sure not to leave a tree standing in the Forest of Dean. It was like the policy of the Philistines, when the poor Israelites went down to their enemies' *Smiths* to sharpen every man his tools; for, as they said, *lest the Hebrews make them swords or spears*; so these, *lest the English build them ships and men of war.* Whether this were so or not, certain it is, we cannot be too jealous for the preservation of our woods; and especially of those eminent, and, with care, inexhaustible magazines. In the Duke of Luxemburg's country, no farmer is permitted to fell a timber-tree, without making it appear he hath planted another. And we have already mentioned that inviolable custom about Frankfort, where the young farmer must produce a certificate of his having set a number of Walnut-trees, before he hath leave to marry. But of these, and the like,

V. Follar in Confit. Rey. de Offic. Tract. 11, 92, 93, &c. I dare not suggest the encouragement of a yet farther restraint, that even *Proprietors* themselves should not presume to make havock of some of their own woods to feed their prodigality, and heap fuel to their vices; but it is worthy of our observation, that (in that inimitable Oration, the second Philippic) Cicero does not so sharply reproach his great Antagonist for any other of his extravagancies, which yet he there enumerates, as for his wasteful disposal of certain wood-lands belonging to the Commonwealth, amongst his jovial Bravos and lewd Companions; *tua ista detrimenta sunt*; (meaning his debauches) *illa nostra*; speaking of the timber. And, doubtless, the spoil and wasting of this necessary material is no less than a public calamity. This John Duke of Lancaster knew well enough, when, to revenge the depredations made upon the English borders, it is said, he set four-and-twenty thousand axes at work at once, to destroy the woods in Scotland.

CHAP. VI.

But to the laws: It were to be wished that our tender and improvable woods should not admit of cattle by any means, till they were quite grown out of reach; the statutes which connive at it, in favour of custom, and for the satisfying of a few clamorous and rude *Commoners*, are too indulgent; since it is very evident, that less than a fourteen or fifteen years inclosure is in most places too soon; and our most material trees would be of infinite more worth and improvement, were the standards suffered to grow to timber, and not so frequently cut, at the next felling of the woods, as the general custom is. In the 22d Edw. IV. the liberty arrived but to seven years after a felling of a forest or purlieu; and but three years before, without special licence. This was very narrow; but let us then look on England as an over-grown country.

Wood in parks was afterwards to be four years fenced, upon felling; and yearling colts and calves might be put into inclosed woods after two: By the 13th Eliz. five years, and no other cattle till six, if the growth was under fourteen years; or until eight, if exceeding that age till the last felling. All which statutes being by the act of Hen. VIII. but temporal; this parliament of Elizabeth thought fit to make perpetual.

Then to prevent the destructive razing and converting of woods to pasture: No wood of two acres, and above two furlongs from the mansion-

BOOK III. house, should be indulged : And the prohibitions are good against Afsarts made in forests, &c. without licence: The penalties are indeed great, but how seldom inflicted? And what is now more easy than compounding for such a licence ?

In some parts of Germany, where a single tree is observed to be extraordinary fertile, a constant and plentiful mast-bearer, there are laws to prohibit their felling it without special leave : And it was well enacted amongst us, that even the owners of woods within chases should not cut down the timber without view of officers; this act being in affirmance of the common law, and not to be violated without Prescription : See the case cited by my Lord Coke in his Comment on Littleton. Tenure Burge, lib. ii. sect. 170. Or if not within chases, yet where a common person had liberty of chase, &c.; and this would be of much benefit, had the Regarders performed their duty, as it is at large described in the writ of the twelve articles, and that the surcharge of the forests had been honestly inspected with the due perambulations, and antient metes. Thus should the Justices of Eyre dispose of no wood without express commissiſion, and in convenient places^k.

Care is likewise by our laws to be taken that no unnecessary embezzlement be made by pretences of repair of paling, lodges, browse for deer, &c. wind-falls, root-falls, dead and sear trees, all which are subject to the inspection of the Wardens, Justices Itinerants, &c. and even trespasses done *de viridi* on boughs of trees, thickets, and the like, which (as has been showed) are very great impediments to their growth and prosperity,

^k A Justice in Eyre cannot grant licence to sell any timber, unless it be *sedente curia* or after a writ of *Ad quod damnum*; and it hath been resolved by all the judges, that though justices in Eyre, and the King's officers within his Forests, have charge of venison, and of vert, or green hue, for the maintenance of the King's game, and all manner of trees for covert, browse, and pannage; yet when timber of the Forest is sold, it must be cut and taken by power under the Great Seal, or the Exchequer Seal, by view of the foresters, that it may not be had in places inconvenient for the game: And the justices in Eyre, or any of the King's officers in the Forest, cannot sell or dispose of any wood within the Forest without commissiſion; so that the Exchequer and officers of the Forest have *divinum imperium*, the one for the profit of the King, the other for his pleasure. Also no officers of the Forest can claim Wind-falls, or Dotard trees, for their perquisites, because they were once parcel of the King's inheritance, but they ought to be sold by commissiſion for the King's best benefit. Read: on the Stat. vol. iii. p. 304, 305.

should be duly looked after and punished, and the great neglect of Swainmote-courts reformed, &c. See Consuet. & Afsis. Forest. Pannagium, or Pastura Pecorum & de Glandibus; Fleta; Manwood's Forest-laws; Coke pla. lib. viii. fol. 138, 366.

CHAP. VI.

Finally, that the exorbitance and increase of devouring iron-mills were looked into, as to their distance, and number near the seas, or navigable rivers,—and what if some of them were even removed into another world, the *Holy Land* of New-England—for they will else ruin Old-England. It were better to purchase all our iron out of America, than thus to exhaust our woods at home, although (I doubt not) they might be so ordered as to be rather a means of preserving them. There was a statute made by Queen Elizabeth to prohibit the converting of timber-trees to coal, or other fuel, for the use of iron-mills, if the tree were of one foot square, and growing within fourteen miles of the sea, or the greater rivers. It is pity some of those places in Kent, Sufsex, and Surrey were excepted in the proviso, for the reason exprest in a statute made 23 Elizabeth, by which even the employing of any under-wood, as well as great trees, was prohibited within twenty-two miles of London, and many other navigable rivers, creeks, and other lesfer distances from some parts of Sufsex-Downs, Cinque-Ports, Havens, &c.

One Simon Sturtivant had a patent from King James I. 1612, pretending to save 300,000l. a year, by melting iron ore, and other metals, with pit-coal, sea-coal, and brush-fuel: it is pity it did not succeed¹.

There are several acres of wood-land, of no mean circuit, near Rochester, in the County of Kent, extending as far as Bexley, and indeed for many miles about Shooter's hill, near the river Thames, which, were his Majesty owner of them, might in a few years be of an invaluable improvement and benefit, considering how apt they are to grow *forest*, and how opportune they lie for the use of the Royal Navy at Chatham.

But yet to prove what it is to manage woods discreetly: I read of one Mr. Christopher Darell, of Nudigate, a Surrey Gentleman, that had a

¹ In the neighbourhood of Sheffield, and other places, they now smelt iron ore with charred pit-coal, which answers equally well with charcoal, and comes much cheaper.

BOOK III. particular indulgence for the cutting of his woods at pleasure, though a great iron-master, because he so ordered his works that they were a means even of preserving his woods, notwithstanding those insatiable devourers, This may appear a paradox, but it is to be made out; and I have heard my own father (whose estate was none of the least wooded in England) affirm, that a forge, and some other mills, to which he furnished much fuel, were a means of maintaining and improving his woods; I suppose by increasing the industry of planting and care, as what he left standing of his own planting, inclosing, and cherishing, (lately in the possession of my most honoured brother George Evelyn, of Wotton, in the same county, and now in mine) did (before the late hurricane) sufficiently evince: A most laudable monument of his industry and rare example: for without such an example, and such an application, I am no advocate for iron-works, but a declared Denouncer. But nature has thought fit to produce this wasting Ore more plentifully in wood-land than any other ground, and to enrich our forests to their own destruction:

O semper bona Pauperies! & conditus altâ
 Thesaurus tellure nocens! O semper ovantes,
 Integræ, salvæque solo non divite Sylvæ!

COULET Pl. lib. vi.

O poverty! still safe; and therefore found
 Inseparably with mischiefs under ground!
 Woods tall and reverend, from all time appear.
 Inviolable, where no Mine is near.

For so our sweet Poet deplores the fate of the Forest of Dean.

Our own law makes it waste to cut down high trees (though they be not properly timber) standing for safe-guard and defence of a mansion-house, though it be done for necessary repairs; whilst yet many (and with reason) hold it unhealthful to suffer a dwelling to be choaked with trees, for want of free passage to the air. To remedy this, there needs only a competent distance to be left void. But, as a Noble Person* observes, people in these days are so disposed to quarrel with timber, as there shall need no advice to demolish trees about their houses upon this account: In the mean time, as to the incroachment of trees so near our dwellings, for the freer intercourse of air, the late dreadful *Silvifragi* storms have cleansed those places by a remedy worse than the disease, sufficient to deter us from

* Lord North.
 Oeconom.

planting not only too near our habitations, but from priding ourselves in our most stately avenues, the late boasts of our seats, as by sad experience myself and thousands more have found, that there is nothing stable in this world which *invisible spirits* cannot subvert and demolish, when God permits them to do *mischief*, and convince those who believe there are none because they do not see, though they feel their effects.

CHAP. VI.


As to the law of tithes, I find timber-trees pay none, but others do, both for body, branches, bark, fruit, root, and even the suckers growing out of them, and the tenth of the body sold or kept, and so of Willows, Sallows, and all other trees not apt for timber: Also of *Silva Cædua*, as coppices and underwoods, the tenth is paid whenever the proprietor receives his nine parts: But if any of these we have named unexempted, are cut only for mounds, fencing, or plough-boot within the parish in which they grow, or for the fuel of the owner, no tithes are due, though the Vicar have the tithe-wood, and the Parson that of the places so inclosed; nor are underwoods grubbed up by the roots tithable, unless for *this* and any of the former cases there be *prescription*. But for timber-trees, such as Oak, Ash, Elm, (which are accounted timber in all places after the first twenty years) also Beech, Hornbeam, Maple, Aspen, and even Hasel, (many of which are in some countries reputed timber) they are not to pay tithes, unless they are felled before the said age of twenty years from their first planting.

See L. Bishop
of Worcester
concerning
tithes of paro-
chial Clergy,
p. 268.

Some think, and pretend, that no tithe is due where there is no annual increase, as corn and other grain, hay, and fruit of trees, and some animals; and that therefore *Silva Cædua*, till it become timber, is exempted: But a Parliament at Sarum did make it tithable, in which are named even Willows, Alder, Beech, Maple, Hasel, &c.

In the Wild of Sufsex, tithe-wood is not paid, as for faggots; but in the Downs they pay for both, as I am told; at which I wonder, there being so little wood at all upon them, or likely to have ever been.—
Note here,

If the owner fell a fruit-tree, (of which the Parson has had tithe that year,) and convert the wood into fuel, the tithe shall cease, because he cannot receive the tithe of one thing twice in one year.

BOOK III.  Beech, in countries where it abounds, is not tithable, because in such places it is not accounted timber. 16th Jac. Co. B. Pinder's Case.

Cherry-trees, in Buckinghamshire, have been adjudged timber, and tithe-free. Pasch. 17th Jac. B. R.

If a tree be lopped under twenty years growth, and afterwards be permitted to grow past twenty years, and then be lopped again, no tithe is due for it, though at the first cutting it were not so.

If wood be cut for hedges, which is not tithable, and any be left of it unemployed, no tithe shall be paid for it.

If wood be cut for Hop-poles, (where the Parson or Vicar has tithe Hops,) in this case he shall not have tithe of Hop-poles.

If a great wood consist chiefly of underwood tithable, and some great trees of Beech, or the like, grow dispersedly amongst them, tithe is due, unless the custom be otherwise, of all, both greater and lesser, together: And in like manner, if a wood consist for the most part of timber-trees, with some small scatterings of underwood amongst them, no tithe shall be paid for the underwood or bushes. Trin. 19th Jac. B. R. Adjudged 16th Jac. in C. B. Leonard's Case.

No tithe is to be paid of Common, of Estovers, or the Wood burnt in one's house.—Now as to the manner of payment:

To give the parson the tenth acre of wood in a coppice, or the tenth cord, provided they are equal, is a good payment, and setting forth of tithe, especially if the custom confirm it.

The tithe of mast of Oak or Beech, if sold, must be answered by the tenth penny; if eaten by swine, the worth of it. And thus much we thought fit to add concerning Predial tithes. Who has a desire to be farther informed, may consult Charta de Foresta, with Manwood's Treatise of Forest Laws; Cromate on my Lord Coke's Reports, 11, 48, 49, 81, Plow. 470. Brownlow's Rep. 1 part 94. 2 part 150. D. and St. 169, &c. and that very useful, as well as compendious English

Historical Library, part iii. chap. iv. lately published by the worthy Archdeacon, now Bishop of Carlisle.—But let us see what others do. CHAP. VI.

The King of Spain has, near Bilboa, sixteen times as many acres of coppice-wood as are fit to be cut for coal in one year; so that when it is ready to be felled, an officer first marks such as are like to prove ship-timber, which are let stand, as so many *sacred* and *dedicate* trees; by which means the iron-works are plentifully supplied in the same place, without at all diminishing the stock of timber. Then in Biscay again, every proprietor plants three for one which he cuts down, and the law obliging them is most severely executed. See what we have already mentioned of the Duke of Lunenberg in this chapter, and that of the Walnut-tree. There indeed are few or no coppices, but all are Pollards; and the very lopping, I am assured, does furnish the iron-works with sufficient to support them.

What the practice is for the maintaining of these kinds of plantations in Germany and France, has already been observed to this illustrious Society, by the learned Dr. Merret, viz. that the Lords and (for the Crown-lands) the King's Commissioners divide the woods and forests into eighty partitions, every year felling one of the divisions, so as no wood is felled in less than fourscore years: And when any one partition is to be cut down, the Officer or Lord contracts with the buyer, that he shall, at the distance of every twenty feet, (which is somewhat near) leave a good, fair, sound, and fruitful Oak standing: Those of betwixt forty and fifty years, they reckon for the best, and then they are to fence these trees from all sorts of beasts and injuries for a competent time; which being done at the season, down fall the acorns which (with the autumnal rains beaten into the earth) take root, and in a short time furnish all the wood again, where they let them grow for four or five years, and then grub up some of them for fuel, or transplantation, and leave the most *probable* of them to continue for timber.

The French King permits none of his Oak woods, though belonging (some of them) to Monsieur, his Royal Brother, in *Appanage*, to be cut down, till his own Surveyors and Officers have first marked them out; nor are any felled beyond such a circuit: Then are they sufficiently fenced by him who buys; and no cattle whatsoever suffered to be put in till the very seedlings (which spring up of the acorns) are perfectly out of danger

BOOK III.



But these, and many other wholesome ordinances, especially as they concern the Forest of Dean, we have comprised in the late statute of the twentieth of his Majesty's Reign, which I find enacted five years after the first Edition of this Treatise; and these laws are worthy our perusal: As also the statute prescribing a scheme of proportions for the several scantlings of building timber, (besides what we have already touched, book iii. chap. iv.) which you have 19th Car. II. entitled, "An Act for the rebuilding of London;" to which I refer the Reader.

In the meantime, commissioners made purveyors for timber (though for the King's use) cannot, by that authority, take timber-trees growing upon any man's freehold, it being prohibited by *Magna Charta*, cap. xxi. *Nec nos nec Bullivi nostri, nec alii, capiemus Boscum alienum ad castra, vel ad alia agenda nostra, nisi per voluntatem illius cujus Boscus ille fuerit.*

We might here enlarge this title, by showing how different the forest-laws are from the common-laws of England, both as to their antiquity, and extreme severity against all offenders, (of what degree soever) till the oppression was somewhat qualified by the *Charta de Foresta*, and afterwards by yet more favourable* concessions; since, indeed, our Kings, after the rigour and example of the stern Northern Princes, rendered it intolerable: But much of this concerned the preserving *Royal Game*; when as to timber-trees, (like Germany) the whole island was almost but one vast forest and wood, so abounding, that what people might have had almost for carrying off the ground it grew on, is now grown so scarce in those very places, as that fuel is sold by weight: I think Mr. Camden mentions Oxfordshire, even so long since. And here I might mention that vast Caledonian forest, heretofore in Scotland, (whence the sea has its name, and the people Caledonians,) having now not so much as a single tree to show for it. Have we not then the greatest reason in the world to take all imaginable care for the preservation and improvement of this precious material?

* *Afises Forestæ, &c.*

† See *Groenzung de L. L. abrog. in Hollandia ad Tit. Arbor. furt. Caesar l. ii.* (One cruelly whipped at the Hague) See also *Carpzovius in Praxi Crim. part. ii. quest. 83. num. 2. seq. and several others: The German Laws concerning Forests are in abundance, and at large recited by Klotzius and Pellerus.*

We have said nothing of the laws against wood-stealers, (especially those who cut up to the very roots the most hopeful and thriving young Oaks, and sell bundles of them for walking-staves, &c.) severely punished in other countries †, but leave the rest to our learned in the laws, craving pardon for the errors I may have fallen into, by presuming to discourse of matters out of my Element and Profession.

C H A P. VII.


The Parænesis and Conclusion, containing some Encouragements and Proposals for the Planting and Improvement of his Majesty's Forests, and other Amenities for Shade and Ornament^m.

SINCE our forests are undoubtedly the greatest magazines of the wealth and glory of this nation, and our Oaks the truest oracles of its perpetuity and happiness, as being the only support of that navigation which makes us feared abroad, and flourish at home; it has been strangely wondered at by some good patriots, how it comes to pass, that many Gentlemen have frequently repaired, or gained a sudden fortune, with ploughing part of their parks, and setting out their fat grounds to Gardeners, &c. and very wild wood-land parcels (as may be instanced in several places) to dressers of Hop-yards, &c. while the Royal Portion lies folded up in a napkin, uncultivated and neglected, especially those great and ample forests; where, though ploughing and sowing have been forbidden, a Royal Command and Design may well dispense with it, and the breaking up of those intervals advance the growth of the trees to an incredible improvement.

It is therefore insisted on, that there is not a cheaper, easier, or more prompt expedient to advance ship-timber, than to solicit, that in all his Majesty's Forests, Woods, and Parks, the spreading Oak, &c. (which we have formerly described) be cherished, by ploughing and sowing Barley, Rye, &c. (with due supply of culture and soil between them) as far as may, without danger of the plough-share, be broken up. But this is only where these trees are arrived to some magnitude, and stand at competent distances, a hundred or fifty yards, (for their roots derive relief far beyond the reach of any boughs) as do the Walnut-trees in Burgundy, which stand in their best ploughed lands.

But, that we may particularize in his Majesty's Forests of Dean, Sherwood, Enfield-Chase, &c. and in some sort gratify the queries of the Ho-

^m This CHAPTER should constitute part of the Political Catechism of all Statesmen.
Volume II.

BOOK III.  nourable the Principal Officers and Commifioners of the Navy, I am advised by such as are every way judicious, and of long experience in those parts, that to inclose would be an excellent way: But it is to be considered, that the people, viz. Foresters and Bordurers, are not generally so civil and reasonable as might be wished; and therefore to design a solid improvement in such places, his Majesty must assert his power, with a firm and high resolution to reduce these men to their due obedience, and to a necessity of submitting to their own and the public utility, though they preserved their industry this way, at a very-tolerable rate, upon that condition; while some person of trust and integrity did regulate and supervise the mounds and fences, and destine some portions, frequently set apart, for the raising and propagating of wood, till the whole nation were furnished for posterity.

Which work, if his Majesty shall resolve to accomplish, he will leave such an everlasting obligation on his people, and raise such a monument to his fame, as the ages for a thousand years to come shall have cause to celebrate his precious memory, and his Royal Successors to emulate his virtue. For thus (besides the future expectations) it would in present be no deduction from his Majesty's treasure, but some increase, and fall in time to be a fair and worthy accession to it; while this kind of propriety would be the most likely expedient to civilize those wild and poor Bordurers, and to secure the vast and spreading heart of the forest, which, with all this indulgence, would be ample enough for a princely demesne: And if the difficulty be to find out who *knows* or *acknowledges* what are the Bordures, this article were worthy and becoming of as serious an inquisition as the legislative power of the whole nation can contrive.

The sum of all is, get the *Bordures* well tenanted, by long terms and easy rents, and this will invite and encourage takers; whilst the middle, most secure, and interior parts would be a Royal Portion. Let his Majesty therefore admit of any willing adventurers in this vast circle for such inclosures in the precinct; and rather of more, than of few, though an hundred or two should join together for any inclosure of five hundred acres, more or less; that multitudes being thus engaged, the consideration might procure and facilitate a full discovery of latter encroachments, and fortify the recovery by favourable rents, improvements, and reversions by

copyhold, or what other tenures and services his Majesty shall please to accept of^a. CHAP. VII.

^a As much improvement has been made upon Windsor Forest, under the auspices of our amiable Sovereign, I flatter myself that an extract from Mr. Kent's judicious account of the management of these forest lands, will be highly acceptable to the Public.

“ In the year 1791, the Great Park at Windsor, about 4000 acres, fell into his Majesty's possession. It might truly be called a rough jewel. The whole, as a natural object, was grand and beautiful, of a forest appearance; but the parts were crowded and indistinct. The soil was various, some parts clay and loam, and some sharp gravel or poor sand; a great part of the former was covered with rushes and molehills, and the latter with fern and moss.

“ About 1000 acres of the lightest part was separated from the rest at one extremity, and formed what is called the Norfolk Farm: about 400 acres more, at the other extremity, of a good loamy soil, were separated, and called the Flemish Farm, both being named from the nature of the husbandry meant to be adopted upon them.

“ The rest (about 2400 acres) remains still in Plantations and Park; and though so much reduced, yet, from the improvements which have been made upon it, is now capable of carrying more stock than the whole 4000 acres did before. All the unsound wet parts have been drained by the Essex mode, so as to be rendered firm, and productive of an improved herbage. The molehills have been levelled, chiefly by dragging, and the coarse and mossy parts fined by repeated harrowing and rolling; (being one of the first improvements upon Park Land of this description;) besides which, a variety of beauty has been laid open, by clearing the valleys and low parts, to give a bolder effect to the woody scenes upon the higher ground; and by making judicious openings, so as to break strait lines, and separate parts that were in some places too heavy and samely; so that the same extent of land has now not only a much larger appearance, but exhibits a much greater variety of ground. The truth of this, every impartial person who knew the place before his Majesty caused these improvements to be made, must allow. I have only to add, that though prejudice may have taken up an idea that there has been too great a sacrifice of timber in effecting these improvements, truth will deny it. There has not been a tree taken down, but what was either in decay, or removed either to give room for the growth of others, or to set them off to greater advantage in picturesque appearance.

“ I come now to the object in view, as before hinted, which is to state the motives which I am inclined to think induced his Majesty to adopt the farming system upon so large a scale, and next to show the result.—These I conceive were chiefly to create useful labour to the industrious poor in the neighbourhood, and for trying experiments in Agriculture, to excite imitation where success might encourage it.

“ The Norfolk Farm borders on that extensive waste called Bagshot-heath, hitherto considered too barren for cultivation, though large tracts of a similar quality have been long since rendered useful to the community in the south-west part of Norfolk. Arable land of this description is generally managed there under a five-course shift; first, wheat; second, turneps; third, barley with seeds, which continue laid two years. But as the

Now for the planting of woods in such places (which is the main design of this whole Treatise) the hills and rough grounds will do well; but they are the rich fat Vales and Flats which do best deserve the charge of walls; such as that spot affords; and the Hawthorn well plashed, single or double, is a better and more natural fence than unmortared walls, could our industry arrive to the making of such as we have described: Besides, they

“ seeds turn to very little account after the first year, his Majesty’s, which though a five-course shift likewise, of one hundred acres in a shift, is upon a much improved course of cropping; as thus—first, wheat or rye: second, the irregular shift; third, turneps; fourth barley or oats; fifth, clover.—The irregular shift, which is of great use on a light land farm, may perhaps want a little explanation. It is meant to be partly productive, and partly preparative. Forty acres of it are sown with vetches, to be fed off; forty are sown the latter end of August with rye, for early feed the next spring for the ewes and lambs; the remaining twenty acres are planted with potatoes, and the whole comes round for turneps the next year.

“ From the advantage of running sheep in the Park, this Farm has been brought surprisingly forward, considering the short time it has been cultivated; and a great part of it, which produced nothing but heath and moss, and would have been dear at five shillings an acre to rent, now produces crops worth more than the original fee-simple of the land.

“ Brevity checks me from going farther into a general description; but the following particulars may deserve notice.

“ The comparative advantages of the labour of Horses and Oxen have been for some time under the consideration of the Public. His Majesty has unquestionably tried the latter upon a larger scale than any other person, as he does not work less than one hundred and eighty oxen upon his different farms, parks, and gardens, and has found them to answer so well, that there is not now a horse kept.—Upon the two Farms, and the Great Park, two hundred are kept, including those coming on and going off. Forty are bought in every year, rising three years, and are kept as succession oxen in the Park; one hundred and twenty are under work; and forty every year are fatted off, rising seven years.

“ The working oxen are mostly divided into teams of six, and one of the number is every day rested, so that no ox works more than five days out of the seven.—This day of ease in every week, besides Sunday, is of great advantage to the animal, as he is found to do better with ordinary keep and moderate labour, than he would do with high keep and harder labour. In short, this is the first secret to learn concerning him; for an ox will not admit of being kept in condition like a horse, artificially, by proportionate food to proportionate labour.

“ These Oxen are never allowed any corn, as it would prevent their fitting so kindly afterwards. Their food in summer is only a few vetches, by way of a bait, and the run of coarse meadows, or what are called leasows, being rough woody pastures. In winter they have nothing but cut food, consisting of two thirds hay, and one third wheat-straw; and the quantity they eat in twenty-four hours is about twenty-four pounds of hay and

are lasting and profitable; and then one might allow sufficient bordure for a mound of any thicknefs, which may be the first charge, and well supported and rewarded by the culture of the land thus inclosed. CHAP. VII.

For example: Suppose a man would take in five hundred acres of good land, let the mounds be of the wildest ground, as fittest for wood: Two

“ and twelve of straw; and on the days of rest, they range as they like in the straw-yards; “ for it is to be observed, that they are not confined to hot stables, but have open “ sheds, under which they eat their cut provender, and are generally left to their choice “ to go in and out. Under this management, as four oxen generally plough an acre a day, “ and do other work in proportion, there can be no doubt but their advantage is very great “ over horses, and the result to the public highly beneficial.

“ The Oxen which are brought on in succesion, ran the first summer in the Park, and in “ the leasows and temporary straw-yards in the winter; by which temporary straw-yards, I “ would have it understood, that they are made in different places, so that the manure “ which they make may be as near to the spot where it is wanted as possible.

“ The forty oxen which go off are summered in the best pasture, and finished with tur- “ neps the ensuing winter.—The usual way has been to draw the turneps, and to give “ them either stalled or in cribs placed in the yard, with plenty of straw to browse and lie “ upon: but last winter an experiment was tried, which answered extremely well, and “ will be again repeated next winter: this was, penning the oxen by day upon the turnep- “ land, in the manner that sheep are penned, with this only difference, that the turneps “ were thrown up into cribs, instead of being left to be trodden into the ground; and in “ the nights they were driven into a yard, with a temporary shed well littered with rushes, “ fern, and leaves, and turneps and barley-straw given to them in cribs. They thrived “ very fast, and every one of them made at least eight loads of good muck in the night- “ yard, besides the benefit done in treading and dunging on the land in the day-time, “ which was very great, the soil being very light.—The result of the Ox system is, that “ charging the ox for his agistment the first year, for the value of the grafs and turneps “ the last year, and putting what he has in three intermediate years as an equivalent for “ his labour, after every allowance for risk, each Ox will pay at least twenty per cent. “ profit.—In what instance does a horse produce so much?

“ I do not allow that the Ox can be used on all soils; upon a very stony soil he cannot; “ nor can the horse in all places be wholly excluded from Husbandry; but every occupier “ of a large farm may at least use some Oxen to very great advantage. They are all “ worked at Windsor in collars, as their step is found to be much more free than when “ coupled together with yokes; and they are found to do their work with much greater “ ease in collars than in yokes, which ought every where to be exploded.

“ The different kinds of Oxen are in some measure suited to the soil.—Upon the Norfolk “ Farm, which is a light soil, the Devonshire sort are used; upon the Flemish Farm, where “ the soil is strong and heavy, the Herefordshire; and in the Park, where the business is “ carting, harrowing, and rolling, the Glamorganshire.—They are all excellent in their “ different stations.

“ It may not be improper to mention a very simple method which has been discovered, “ of first training them to the collar, which is nothing more than putting a broad strap round

BOOK III. hedges with their vallations and trenches, will be requisite in all the round, viz. one next to the inclosure, the other about the thicket, to fence it from cattle: This, between the two hedges, of whatsoever breadth, is fittest for plantations. In these hedges might be tried the plantation of stocks, in the intervals all manner of wood-seeds sown, after competent ploughings, as Acorns, Mast, Fir, Pine, Nuts, &c. the first year chasing

“ their necks, and fastening one end of a cord to it, and the other to a large log of wood, and letting the Ox draw it about as he feeds in his pasture, for three or four days, before he is put into harness, by which means he is very much brought forward in docility.

“ I have before observed, that twenty per cent. may be considered as the average profit of an Ox; stating them to be bought in at £.10, and allowing them to sell for £.25, taking off £.10 for the two years they are not worked: but the last year beans being of little value, they were kept longer than usual, by being stall-fed with bean-meal, which answered very well, as they were brought to an average of nearly £.30; and one of them, a Glamorganshire Ox, originally bought for £.8, and from his compact round make, always called the Little Ox, thrived to such a surprising degree, that he became too fat to be able to travel to Smithfield, and was therefore sold to Mr. Charlwood, a neighbouring butcher, for £.47.

“ Next to the advantage obtained from Oxen, as much benefit as possible has been endeavoured to be derived from sheep, by means of the fold.—Two ewe flocks are kept, of four hundred each: the soil being light and dry, admits of winter-folding (except when the weather is wet), upon the young clover;—a practice much to be recommended, as it is productive of a great crop of clover, and prepares the land the ensuing autumn for a crop of wheat, without any further assistance. Another excellent practice is folding upon light land, in dry weather, immediately upon the sowing of the wheat, which may be put forward, or kept back, a fortnight or three weeks, on that account; and it is not amiss to have the fold rather large, and to give the sheep a turn or two round the fold in a morning before they are let out, to tread and settle the land, which does a great deal of good, over and above their dung.

“ A third method of folding has been found to answer almost beyond description. This was first tried in the winter of 1793; but from an idea of the shepherd, that it injured the sheep, has been since disused: but as there is good reason to believe that there was no just ground for such an opinion, it is meant to be revived next winter.

“ A dry sheltered spot is selected, and sods of maiden earth, a foot deep, are laid over the space of a very large fold. It is then bedded thinly with rushes, leaves of trees, fern, moss, short straw, or stubble; and in hard or wet weather, the flock, instead of being penned upon the clover in the open fields, is put into this warmer fold, where the usual quantity of hay is given to them in racks; and every night they are so penned, the fold is fresh littered. When this has been continued, at intervals, during the winter, a layer of lime, chalk, rubble, or ashes, six inches thick, is spread over the whole surface—and when it is heated together, about the month of April, the whole is turned up, and mixed together, and makes the very best manure that can be used for turneps.

“ I have been particular in describing these methods of folding, as they are not common in any place, and in others entirely unknown, and to Gentlemen who have parks

away the birds, because of the Fir and Pine seeds, for reasons given; the second year loosening the ground, and thinning the supernumeraries, &c. This is the most frugal way; Or, by another method, the waste places of forests and woods (which by thorough experience is known and tried) might be perfectly cleansed; and then allowing two or three ploughings, well rooted stocks be set, cut, and trimmed as is requisite; and that the

CHAP. VII.

“and large plantations which afford abundance of leaves, this hint may be the more deserving attention.

“Upon the Norfolk Farm the land not having been yet marled or clayed, the clover is apt sometimes to fail, which is also the case elsewhere, upon the same sort of land. “When this happens, his Majesty does what every other person in a similar situation should do; instead of letting the ground remain unproductive, the next year it is sowed with vetches, which are nearly as valuable as the clover, and wheat always grows remarkably kind after them.

“As to implements, the Norfolk plough is chiefly what is used; and upon a light soil, it is certainly preferable to any other. It ploughs a cleaner furrow, by completely moving the whole body of earth, and inverts it much better than any other plough; and to establish its superiority over the common ploughs of the neighbourhood, I need only add, that from its construction it is nearly the draught of an ox easier. There is likewise a Norfolk harrow, very useful for harrowing what is called Brush-turneps, or any other turneps, preparatory to their being hoed.—I must be allowed, likewise, to mention the drill-roller, which consists of cast-iron rings, made at the Norwich Foundry, and slipt on upon a round piece of wood, as an axle-tree. This is one of the best things that ever has been introduced, for the preparation of the land for any sort of corn, where the soil will admit of its being used. By the corn being so well deposited, it takes better root, and at least one fourth of the quantity usually sown may be saved.

“The Flemish Farm, which I have before mentioned, was so named from an intention, at first, of carrying on a system of husbandry similar to that practised in Flanders, which consists of an alternate crop for man and beast; but the soil being strong and cohesive, upon trial, it has been found to answer best under a four-course shift, more like some parts of Gloucestershire; as thus—first year, wheat; second, cabbage or clover; third, oats; fourth beans.—The quantity of arable land on this Farm is one hundred and sixty acres, or forty acres in a shift. There are two things observed upon this Farm, which may be worth notice:—The first is the practice which has for these two years past been adopted, by taking off the tops of the beans just as the blossom is set; this not only improves the quality, but increases the quantity, and causes them to ripen sooner, which is a considerable advantage, by giving time to get the succeeding crop of wheat in perhaps a fortnight earlier. The other is, that of sowing clover early in the spring, among twenty acres or one half of the wheat, and bush-harrowing and rolling it in. This has produced a very fair crop of clover the next year; and the other half, after the wheat, is winter and spring fallowed, and planted with cabbage. There is a double advantage resulting from this; that one half of this shift, so managed, becomes a summer crop, and the other

BOOK III. timber-trees may be excellent, those afterwards coppiced, and the choicest stocks kept shreaded. If an inclosure be sowed, the seeds may be, as was directed, of all the species, not forgetting the best Pines, Fir, &c. Whiles the yearly removal of very incumbrances only will repay the workmen, who sell the Quick, or reserve it to store other inclosures, and soften the circumjacent grounds to the very great improvement of what remains.

“ half a winter crop; and by observing the next year to change the parts, by sowing the clover where the cabbage was before, the clover and cabbage do not come round upon the same ground but once in eight years.

“ Cabbage has been tried several years, but his Majesty’s husbandmen never got into the right management till this year; but now the crop is remarkably fine.

“ It will not be improper to mention, that the drum-headed cabbage is the best sort; that the seed should be sown in August, the plants first set out in November, and transplanted for good in July. The next thing to be noted is their application:—They are certainly inferior to turneps for fattening, but superior in the increase of milk, either of cows or ewes, and therefore they are particularly good where there is a dairy or a breeding flock of sheep: and I trust his Majesty will, the next yearning season, try an experiment, of which I have high expectation, which is to slice or quarter the cabbage, and feed the ewes with them upon such of the meadows as want manuring, which I flatter myself will be of inestimable service to the ewes and lambs, and be the means of increasing the next year’s crop of hay considerably.

“ The true light of viewing these improvements is to consider them as a sort of new creation to the public: for, as it is a fact not to be controverted, that the reduced number of acres in the Park, from their improved state, support as many deer and other cattle as the whole did before, the produce obtained from the Farms is all clear gain; and as the crop of wheat and rye from the 140 acres sown, upon the most moderate calculation, may be set at 3360 bushels, and allowing six bushels to a human mouth, this gives a yearly provision in bread for 560 people; to say nothing of the fattening off of forty oxen, the breed of 800 sheep, and the growth of at least 5000 bushels of oats and beans; all of which, it must be observed, goes in aid of the public market, as the work is done by oxen entirely.

“ As more experiments are in future made, I may perhaps trouble the Society with an account of them, as I am persuaded they cannot be registered any where else, to give them the credit, and to excite the imitation I flatter myself they may deserve: but for the present, I shall close my observations upon his Majesty’s Farms, with a description of his Mill, which I consider as the most benevolent thing that can be done for the Poor, and which I most earnestly recommend to all Gentlemen of landed property, who have like means of doing it. A small Over-shot Mill is erected, and worked by the waste water from the lake below the Lodge, where a sufficiency of corn, two thirds wheat and one third rye, is ground, dressed, and given to all the labourers, at sixteen-pence per stone of fourteen pounds, in quantities suitable to the size of their families, which is the first of all comforts to them, and a saving of at least twenty per cent. from what it would cost them to buy it from the mealmen or shopkeepers.”

And how if in such fencing-works we did sometimes imitate what Quintus Curtius, lib. vi. has recorded of the Mardorum Gens, near to the confines of Hyrcania, who did, by the close planting of trees alone upon the bordures, give so strange a check to the power of that great Conqueror Alexander. They were a barbarous people indeed, but in this worthy our imitation; and the work so handsomely and particularly described, that I shall not grieve to recite it: *Arbores dense sunt ex industria consite, quarum teneros adhuc ramos manu flectunt, quos intortos rursus inserunt terre: Inde, velut ex alia radice letiores videntur trunci: hos qua natura fert, adolescere non sinunt; quippe alium alii quasi nexu conserunt, qui ubi multa fronde vestiti sunt operiunt terram. Itaque occulti nexu ramorum velut laquei perpetua sepe iter claudunt.* “The trees,” saith he, “were planted so near and thick together of purpose, that when the boughs were young and flexible, bent and wreathed within one another, their tops were bowed into the earth, (*as we submerge our layers*) whence taking fresh roots, they shot up new stems, which not being permitted to grow as of themselves they would have done, they so knit and perplexed one within another, that when they were clad with leaves, they even covered the ground, and inclosed the whole country with a kind of living net, and impenetrable hedge.” And this is not unlike what I am told is frequently practised in several places of Devon; where the Oaks being planted very near the foot of those high mounds, by which they separate their lands, so root themselves into the bank, that when it fails and crumbles down, the fence continues still maintained by them with exceeding profit. Such works as these would become a Cato or a Varro indeed, one that were *Pater Patrie, non sibi soli natus*, born for posterity; but we are commonly of another mould:

—*Et fruges consumere nati.*

A fair advance for speedy growth and noble trees, especially for walks and avenues, may be assuredly expected from the grafting of young Oaks and Elms with the best of their kinds; and where the goodliest of these last are growing, the ground should be ploughed and finely raked in the season when the scales fall, that the showers and dews fastening the seed where the wind drives it, it may take root, and hasten, as it will, to a sudden tree; especially if seasonable shreading be applied, which has sometimes made them arrive to the height of twelve feet by the first three years; after which they grow amain. And if such were planted as near to one another as in the examples we have alleged, it is almost incredible

BOOK III. what a paling they would be to our most exposed plantations, mounting up their *wooden walls* to the clouds. And indeed the shelving and natural declivity of the ground more or less to our unkind aspects, and bleak winds, does best direct to the thickening of these protections; and the benefit of that soon appears, and recompenses our industry in the smoothness and integrity of the plantations so defended.

That great care be had of the seeds which we intend to sow, has been already advised; for it has been seen that woods of the same age, planted in the same soil, discover a visible difference in the timber and growth; and where this variety should happen, if not from the seed, will be hard to interpret; therefore let the place, soil, and growth of such trees, from whence you have your seeds, be diligently examined; and why not this, as well as our care of animals for breed and store?

As to the form, obey the natural site, and submit to the several disguises; but ever decline to inclose highways and common roads as much as possible. For the rest, be pleased to reflect on what we have already said to encourage the planting of the large spreading Oak above all that species; let the amplitude of the *distance* which they require, be resigned to the care of the Verderer, for grazing cattle, deer, &c. Trees planted in this manner form, as it were, a wild Quincunx which presents to the eye a great and masculine beauty.

But to advance the Royal Forests to this height of perfection, I should again urge the removal of some of our most mischievous placed Iron-mills; if that at least be true which some have affirmed, that we had better iron, and cheaper from foreigners, when those works were strangers amongst us. I am informed that the *New-English* (who are now become very numerous, and hindered in their advance and prospect of the continent by their surfeit of the woods, which we want) did, about twelve years since, begin to clear their highways by two Iron-mills. I am sure their *scal* has sufficiently wasted our stately *Woods* and *Steel* in the bowels of their *Mother Old England*: and it were now but expedient their *Brethren* should hasten thither to supply us with iron for the peace of our days, whilst his Majesty becomes the great Sovereign of the *Ocean*, and of *free Commerce*; *Nemo cum Vindex et Instaurator magnus*. This were the only way to render *both* our countries habitable indeed, and the fittest sa-

sacrifice for the Royal Oaks, and their Hamadryads, to whom *they* owe more than a slight submission: And he that should deeply consider the prodigious waste which these voracious iron and glass-works have formerly made but in one county alone, the county of Sussex, for one hundred and twenty miles in length, and thirty in breadth, (for so wide and spacious was the ancient *Andradswald*, of old one entire wood, but of which there remains now little or no sign) would be touched with no mean indignation. I named the Sussex glass-works; but what spoil and prodigious consumption the salt-works had made in Worcestershire, see the complaint of Mr. Camden, speaking of Feckenham-Forest in his days, now necessitated to use other coal; certainly the goodly rivers and forests of the other *World* would much better become these destructive works, our *Iron-works* and *Saw-mills*, than these exhausted countries, and we prove gainers by the timely removal: I have said this already, and I cannot too often inculcate it for the concerns of a nation, whose only protection (under God) are her *Wooden Walls*.

Another thing to be recommended (and which would prove no less than thirty, in some places forty, and generally twenty years advance) were a good, if well executed, act to save our standards and bordering trees from the ax of the neighbourhood: And who would not preserve timber, when within so few years the price is almost quadrupled? I assure you standards of twenty, thirty, or forty years growth, are of a long day for the concerns of a nation.

And though we have, in our general chapter of coppices, declared what by our laws and common usage is expected at every fell, (and which is indeed most requisite, till our store be otherwise supplied) yet might much even of that rigour be abated, by no unfrugal permissions to take down more of the standards for the benefit of the underwoods, (especially where, by over-dropping and shade, they interrupt the kindly dews, rains, and influences which nourish them) provided that there were a proportionable number of timber-trees duly and thoroughly planted and preserved in the hedge-rows and bordures of our grounds; in which case, even the total clearing of some coppices would be to their great advance, as by sad experience has been taught some good husbands, whose necessities sometimes forced them to violate their standards, and more grown trees, during the late Tyranny.

Nor will it be here unseasonable to advise, that where trees are manifestly perceived to decay, they be marked out for the ax, that so the younger may come on for a supply, especially where they are chiefly Elms, because their successors hasten to their height and perfection in a competent time; but beginning once to grow sick of age, or other infirmity, suddenly impair, and lose much of their value yearly; besides, that the increase of *this*, and other speedy timber, would spare the Oak for navigation and the sturdier uses.

How goodly a sight were it, if most of the demesnes of our Country Gentlemen were crowned and incircled with such stately rows of Limes, Firs, Elms, and other ample, shady, and venerable trees as adorn New-Hall in Essex, the seat of that Suffolk Knight near Yarmouth; our neighbouring pastures at Barnes; with what has been planted of later years by the illustrious Marquis of Worcester; the most accomplished Earl of Essex; and even in less fertile soils, though purer air, at Euston, by the Right Hon. the Earl of Arlington, Lord Chamberlain of his Majesty's Household; and at Cornbury, by the late Lord Chancellor, the Earl of Clarendon; and what is done nearer this imperial city by the Earl of Danby, late Lord High Treasurer of England, at Wimbleton; the Noble Earl of Rochester (succeeding him in that supreme Office) at New-Park; the Duke of Norfolk at Albery, now the Lord Guernsey's; Sir Robert Coke at Durdans, near Epsom, now my Lord Berkeley's; and at Beddington, an antient seat of the Carews, famous for the first Orange-trees planted in the naked earth one hundred years since, and still flourishing.

Besides what might have been seen, (as by me they were in perfection and with admiration) the Royal Seats of Oatland, Richmond, and above all Nonsuch, described by the judicious Camden, with deserved Eulogies.

All these, and more, in my own sweet county of Surrey, inferior to none for pleasure and salubrity of the air; to which we add the princely Sejours of the adjoining county, Eltham, and Greenwich for its park and prospect, not only emulous, but in many respects exceeding that of the famous Thracian Bosphorus from Constantinople: That palace, namely at Greenwich, now turned into a stately and capacious college (the incomparable work of that accomplished architect Sir Christopher Wrenn) of which I had the honour to lay the first foundation stone, as the First Treasurer of that royal structure, erected for the reception and encou-

agement of emerited and well-deserving seamen and mariners, for its glorious fabric and conveniences exceeding any in Europe dedicated to that excellent purpose. To this also belongs a Park, as there did to that of Eltham. Nearer the metropolis yet are those of St. James's, Hyde-Park, and that sweet Villa (as now built, planted, and embellished) of Kensington, deserving a particular description; and for all that can be desirable of magnificence, Hampton-Court, truly great, in a most beautiful Flat; the Palace, Gardens, Canal, Walks, Groves, and Parks; the sweet and silent Thames gliding her silver streams to the triumphal Winsonian Tempe, raising its stately head, and which alone has in view an hemisphere as far as eyes and telescopes can distinguish earth from heaven; thus from the Keape, the Terrace, Parks, and Forests, equalling, nay exceeding, any thing Europe can boast of.

Other there are sweet and delectable country seats and villas of the Nobles, rich and opulent citizens, (about our Augusta) built and environed with parks, paddocks, plantations, &c. adapted to country and rural seats, dispersed through the whole nation, conspicuous not only for the structure of their houses, built after the best rules of architecture, but for situation, gardens, canals, walks, avenues, parks, forests, ponds, prospect and vistas, groves, woods, and large plantations, and other the most charming and delightful recesses, natural and artificial: But to enumerate and describe what were extraordinary in these and the rest, would furnish volumes: For who has not either seen, admired, or heard of

Audley-End, Althorp, Aukland, Allington, Ampthill, Astwell, Aldermaston?

Bolsover, Badminton, Brockly, Burleigh on the Hill, and the other Burleigh, Bocton, Buckthurst, Buckland, Belvoir, Blechington, Bestwood, Broom-hall?

Castle-Rising, Castle-Ashby, Chatsworth, Charley, Cornberry, Cashio-berry, Cobham, Cowdrey, Caversham, Cranburn Park, Charlton, Copt-Hall, Claverton, famous for Sir W. Bafset's vineyard, producing forty hogsheads of wine yearly. Nor must I forget that of Deepden, in Surrey, planted by the Honourable Charles Howard, Lord of half the manor of Darking.

Drayton, Dorington-Park, Dean?

Eastwell, Euston, Ecleswold, Edscomb, Easton, Epping?

Falston, Flanckford?

BOOK III.

Graystock, Goodwood, Grooby, Grafton, Golden-Grove ?
 Holdenby, Haddon, Hornby, Hatfield, Haland, Hothfield, Hinton,
 Holm-Pierpont, Horstmonceaux ?
 Inchingfield ?
 Kirby, Knowsley ?
 Longleat, Latham, Lensal, Latimer, Lawnsbrough ?
 More-Park, Mulgrave, Marlborough ?
 Normanby, North-Hall, Norborough, Newnham ?
 St. Ostlo, Oxnead ?
 Petworth, Penshurst, Paston-Hall ?
 Querendon, Quickswood ?
 Ragland, Rutford, Ragbey, Ricot ?
 Sherborn, Sherley, Swallowfield, Shasford, Shaftsbury, Stansted, Scots-
 Hall, Sands of the Vine ?
 Theobalds, Thorn-kill, Thorny, Up-Park ?
 Wilton, Wrest, Woburn, Welbeck, Worksop, Woodstock, (which, as
 Camden tells us, was the first Park in England) as it is like to be one of
 the most magnificent and princely palaces and seats of that illustrious Hero,
 his Grace the Duke of Marlborough, to whose courage and conduct not
 the safety of the Empire alone, but of Europe, is due, whilst the actions
 at Blenheim and Schellenberg may challenge equal trophies with Mil-
 tiades and Caesar, at Marathon and Pharsalia ?—But to proceed, Wim-
 burn, Writtle-Park ?

And generally, all those seats which go under the names of Castles and
 Halls, as in Yorkshire, Essex, &c. were stored with noble parks full of
 timber, omitted here; which, but to have named, would over-swell the
 alphabet; without reckoning those of Ireland, which a few years since was
 an inexhaustible magazine of timber destroyed by the Cromwellian Rebels,
 not only in that Kingdom, but through all England: As to parks, there
 were more in this nation than in all Europe beside: And most of all that
 catalogue above-named, have yet their parks full of good timber-trees,
 industriously improved by the Owners, since the spoil of the late Usurpers
 and Sequestrators.

To these should I add the vast forests, (most of them belonging to the
 Crown) as that of Dean, New-Forest, Windsor, Ashdown, Leonard,

Sherwood^o, Epping, Pamber, Chute, &c. Forests for the most part without trees, and several of them together heretofore comprehended in that vast *Andradswald* already mentioned, of one county only. There were formerly twenty groves in Clarendon-Park near Salisbury, celebrated by

^o My ingenious friend, Major Rooke, has favoured me with the following account of the extensive forest of Sherwood, as it stood about fifty years before the publication of Mr. Evelyn's Sylva.

“The Forest is described, in a survey made in 1609, to be divided into three parts or districts, called the North Part, the South, and the Middle Part. The North Part contains the towns of Carburton, Gleadthorpe, Warsop with Nettleworth, Mansfield Wood-house, Clipstone, Rufford and Edwinstone, the hays of Eirkland and Billghay, and the towns of Budby, Thoresby, Paverelthorp or Palethorp, and Ollerton.

“The south part contains the towns of Nottingham, part of Wilford, Lenton with Radford, Sneinton, Colwick, Stoke, Carlton, Gedling, Burton with Bulcot, Gunthorp, Caythorp and Lowdham, Lambley, Arnold, Basford, Bulwell, Beskwood Park, Woodborough, Calverton and Saunterford Manor.

“The middle part contains the towns of Mansfield with Plesley Hill, Skegby, Sutton, Hucknal, Fullwood, part of Kirkby, Blidworth, Papplewick, Newstead, part of Linby, and part of Annesley.

“The whole quantity of ground in the Forest according to that survey is as follows:—

	A.	R.	P.
Inclosures, - - - -	41539	: 1	: 10
Woods, - - - -	9486	: 0	: 23
Wastes, - - - -	35080	: 2	: 6
	89406	: 0	: 0
Clipstone Park - - -	1583	: 1	: 35
Beskwood Park, - - -	3672	: 0	: 0
Bulwell Park, - - -	326	: 3	: 2
Nottingham Park, - - -	129	: 3	: 9
	95117	: 3	: 36 ^o

Many of the Plantations lately made upon this Forest, have names given them, with a view to commemorate the signal victories obtained by our gallant Admirals. My excellent friend, the Honourable Frederic Montague, has shown distinguished patriotism in this way. One of his Plantations is named the *Howe Plantation*. Another is called the *Spencer Plantation*, in honour of the noble Earl who now presides at the head of the Admiralty, and on whose judicious naval arrangements, too much praise cannot be bestowed. About a mile from these, on the right-hand side of the road, stands the *Nelson Plantation*, in honour of the splendid Victory obtained over the French Fleet at the mouth of the Nile by Lord Nelson. Contiguous to this is the *St. Vincent Plantation*, in commemoration of the signal Victory obtained by Earl St. Vincent over the Spanish Fleet. Adjoining is another Plantation in honour of Sir John Borlace Warren's gallant behaviour on the coast of Ireland, and is called the *Warrea Plantation*. On the right-hand side of the coach-road to Papplewick,

BOOK III. Masohertus, cited by Camden, that were every one of them a mile in compafs. In a word, to give an instance of what store of woods, and timber of prodigious size, there were growing in our little county of Surrey, (with sufficient grief and reluctance I speak it) my own Grandfather had

from Mansfield, is the *Duncan Plantation*, in honour of the Victory gained by Lord Viscount Duncan over the Dutch Fleet.—In these Plantations, pillars are erected with inscriptions.

Since this survey, many extensive inclosures have been made, and much waste land has been planted by the Duke of Portland and other Proprietors, to whose patriotism this nation is much indebted. The time will come when these Oaks will be venerated by posterity as Monuments of British valour, successfully exerted in every part of the habitable globe, in defence of the happiness and liberties of mankind. The illustrious Linnaeus styled our happy Island the “*Punctum Vitæ in Vitello Orbis.*” A compliment that Rome in the meridian of her glory never deserved.

Forests in England, many of which are without trees.

Cumberland, 2—Rothbury, in the middle of it; Lowes, on the west side. Cumberland, 5—Nicol, Knaredale, Ingewood, and Copeland, all desolate. Westmoreland, 6—Milburn, on the north; Whinfield, Martindale, and Thornwaite, on the west; Stanimore, and Mellerstang, on the east. Bishopric of Durham, 1—Langdale or Teesdale, on the banks of the Tees. Lancashire, 3—Lancaster, and Wiresdale, a little to the south; Simonswood, almost to Liverpool. Yorkshire, 10—Lime, Applegarth, Swalidale, and Wenesley Dale, on the north; Pickering, on the east; Knaresborough in the middle; Harewood, on the south; Galtrice, on the east, which extends almost to York; Hardwick, near Halifax; Hatfield Chase, the scite now only to be seen. Cheshire, 2—Delamere, and Macclesfield: there was formerly Wircall forest, which occupied the peninsula between the Mersey and the Dee. Nottinghamshire, 1—Sherwood. Shropshire, 4—Huckstow, Kinswood, Bridgenorth, and Clune. Staffordshire, 2—Needwood, and the extensive forest of Cankwood. Leicestershire, 2—Charnwood, to the south, and the forest of Leicester. Rutlandshire, 1—Lyfield. Hertfordshire, 4—Bringwood, Darfield, Hawood, and Acornbury. Worcestershire, 3—Wire, north-west, Malvern, and Feckingham. Warwickshire, 1—Arden. Northamptonshire, 4—Roekingham, Salecy, Yardley, and Whittlebury. Huntingdonshire, 1—Wabridge. Gloucestershire, 3—Dear, Micklewood, and Kingswood. Oxfordshire, 1—Wichwood. Buckinghamshire, 2—Bernwood, and Clitern. Essex, 2—Epping, and Hainhault. Wiltshire, 4—Peevisham, Blakmore, Bradon, and Savernach. Berkshire, 1—Windsor. Middlesex, 1—Enfield. Surrey and Kent, 1—Tunbridge. Sussex, 7—St. Leonard’s, Word, Ashdown, Walterdown, Dallington, Arundel, and Charlton. In Cornwall there does not appear to have been any. Devonshire, 2—Dartmore, and Exmore. Somersetshire, 2—Neroke, and Selwood. Dorsetshire, 3—Gillingham Cranburn; Cranburn Chase, east; Blackmore, west, commonly called the Forest of Whitehart: the whole island of Purbeck was once a forest. Hampshire, 5—Chute, on the north; Harewood, on the west; Holt, on the east; Waltham, on the south; Bere, near Titchfield, and the New Forest, on the south-west.—In all 86 Forests.

standing at Wotton, and about that estate, timber that now were worth 100,000 l. Since of what was left my father, (who was a great preserver of wood) there has been 30,000 l. worth of timber fallen by the ax, and the fury of the late hurricane and storm: Now no more Wotton, stripped and naked, and ashamed almost to own its name.

CHAP. VII.

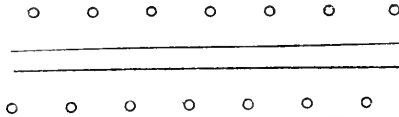
All which considered (for there are many other places and estates which have suffered the like calamity) should raise, methinks, a new spirit of industry in the Nobility and Gentry of the whole nation, like that with which Nehemiah inspired the Nobles as well as the People of the Captivity (than which nothing so much resembled that tedious slavery, and return from it, than did the Restoration of King Charles II.) *Let us arise up,* Nehem. c. ii. v. 18. *and says the brave man, and build: and so they strengthened their hands, for the people had a mind to the work.* And such an universal spirit and resolution to fall to planting, for the repairing of our wooden walls and castles, as well as of our estates, should truly animate us: *Let us arise then and plant,* and not give it over till we have repaired the havoc our barbarous enemies have made: Pardon then this zeal, O ye lovers of your country, if it have transported me! To you Princes, Dukes, Earls, Lords, Knights, and Gentlemen, Noble Patriots, (as most concerned) I speak, to encourage and animate a work so glorious, so necessary.

Of the noble Forest of Nuremburg and its privileges, such care has been taken by many Emperors, that the very models of the ploughs are still preserved, drawn by above an hundred horses, (it being two hundred years since this Royal Plantation was begun) wisely presaging what ravage might be made by the spoil which the wars have since caused in that goodly country; which being then an almost continual forest, is now so sadly wasted. Nor has this been the fate of Germany alone, but of all the most flourishing parts of Europe, through the execrable and unsatiable ambition of those who have been the occasion of the ruin, not only of these venerable shades, stately trees and avenues, (the graceful ornaments of the most princely seats) but of the miserable desolation of entire provinces, which their legions have left, with the inhuman murders of so many Christians, without distinction or just provocation! Mischiefs not to be repaired in many ages, the truculent and savage marks, among others, of a most *Christian King, Nomine non Re!* In the mean time, what provision this demolisher of woods in other countries makes to furnish and store his own

BOOK III.

dominions with so necessary a material, we have mentioned in this chapter, and how impolitic a waste there was of timber in France in John Bodin's time, see his Book de Repub. lib. vi. cap. i.

But leaving this sad and melancholy prospect, I return to the effects of peace, and it shall be to that plantation of Elms, carried out of England by Philip II. of Spain, to adorn his Royal Palace at Aranjuez, (of which I have already spoken, lib. i. cap. iv.) near Madrid in Spain: The palace is seated on the banks of the famous river Tagus, and the plantation on the north, where there is a piece of ground inclosed, formed into walks of six hundred and eighty yards long, and three hundred in breadth, in shape of a trapezium or parallelogram, about which the Tagus is artificially drawn to fence it. Next the river-side are more walks, not above twenty feet in breadth, for closer shade, planted on each side with double ranks of Elm, some of which are forty yards high, stript up to the top, and so near set as fifteen feet space: the second row is about six feet distant from the other; not planted exactly against its usual opposite, but the interval and through the space between, glides a narrow shallow channel of water to refresh the trees upon occasion; thus,



Which is the method used in many ridings of Elm-walks, some of which are a league in length, adorning this seat beyond any palace, some think, in the world. Many of these indeed are on the decay, prejudiced by their being planted so near one another; but for all that, it takes not much from the beauty of the Vista, which is certainly the most surprisingly agreeable; to which the ample fountain, and noble statues in the cross-walks, make so glorious an addition as would require a particular description.

And now do I not for all this so magnify it, as if not to be paralleled in our own country, where, I dare affirm, there are many that exceed it, both in form and planting, (which has there several defects) but as we said, for an exotic example, so admired and celebrated by that boasting nation, as if the universe could not show the like.

And what, in the mean time, can be more delightful than for noble persons to adorn their goodly mansions and demesnes with trees of venerable shade, and profitable timber? By all the rules and methods imaginable, to cut and dispose those ampler inclosures into lawns and ridings for exercise, health, and prospect, and for which I should here presume to furnish some farther directions, were it not already done to my hand by the often-cited Mr. Cooke, in that useful work of his; where, in the thirty-eighth chapter, he has laid down all that I conceive necessary, by measures exactly taken from the middle line of any front, following the centre-stake, if it be for a walk: He there determines the wideness of the walk, according to its length, as forty feet to one of half a mile; if more, fifty or sixty; and if you withal desire shade, that then you should make three walks, the two collaterals twenty feet broad, to a middle one of forty, twenty-five to fifty, so that the middle be as wide as both the other: He likewise shows how proper it is that walks should not terminate abruptly, but rather in some capacious or pretty figure, be it circle, oval, semi-circle, triangle, or square, especially in parks, or where they do not lead into other walks; and even in that case, that there may gracefully be a circle to receive them: There he shows how to pierce a walk through the thickest wood, either by stakes-set up where they may be seen to direct, or by candle and lanthorn in a calm night: He also gives the distances of the trees in relation to each other, according to the species, and shows how necessary it is to plant them nearer in those ovals, circles, and squares, for the better distinction of the figures, suppose to half the distance of that of the walks, and proportionable to the amplitude or smallness thereof. As for lawns, he advises that they should, if possible, be contrived on the south or east side of the seat or mansion, for avoiding the impetuousness of western winds; and that your best rooms may front those lawns and openings, and to screen from the occidental and afternoon's sun, which also hinders the prospect: A lawn on the north exposes the house to that piercing quarter, and therefore it should be well defended with the tallest trees: For the figure he commends the square, with three avenues breaking out at the three angles, or one at the angle opposite to the house: and these lawns may be bounded with walks, or a single row of Lime-trees at a competent distance: To which I add, the circle, with a star of walks radiating from it, likewise exceedingly pleasant; such as the Right Hon. the Earl of Winchelsea has cut out at his noble seat in Kent; and since, far exceed-

BOOK III. ing the most, at Long-Leats, the stately palace of Lord Viscount Weymouth; at Badminton, the Duke of Beaufort's princely seat in Gloucestershire; at Ackdowne-Park in Berks, a most delightful solitude, from the centre of a large wood belonging to the Lord Craven; and in Worcestershire at Westwood, the mansion of Sir John Packington; besides those mentioned by Dr. Plot in his Natural History of Staffordshire, with many others; most of which have been graphically plotted and designed (together with the seats, gardens, fountains, piscinas, plantations, avenues, vistas, and prospects about them) by Mr. Kniff, in near one hundred copperplates; a most laudable undertaking, and becoming the encouragement of those noble persons, who would do honour to themselves, their families, and the whole nation.

But these incomparable amenities and undertakings will best of all become the inspection and care of the noble Owners, Lieutenants, Rangers, and ingenious Gentlemen, when they delight themselves as much in the goodliness of their trees, as other men generally do in their dogs and horses, for races and hunting; neither of which recreations is comparable to that of planting, either for virtue or pleasure, were things justly considered according to their true estimation: Not that I am of so morose a humour, that I reprove any of these noble and manly diversions, seasonably used; but because I would court the industry of great and opulent persons to profitable and permanent delights: For, suppose that ambition were changed into a laudable emulation, who should best, and with most artifice, raise a plantation of trees, that should, by their direction and encouragement, have all the proper ornaments and perfections their nature is susceptible of; such as Ælian sums up, lib. iii. cap. xiv. *εὐγενεῖς, ἐκ κλάδων, καὶ ἡ κόρυς πολλή,* &c. kind and gentle limbs, plenty of large leaves, an ample and fair body, profound or spreading roots, strong against impetuous winds, (for so I affect to read it) extensive and venerable shade, and the like: Methinks this were as much a subject of glory as could be fancied of the kind; and comparable, I durst pronounce preferable, to any of their recreations; and how goodly an ornament to their demesnes and dwellings, let their own eyes be the judges.

One encouragement more I would reinforce from an history I have read of a certain frugal and most industrious Italian Nobleman, who, after his Lady was brought to bed of a daughter, (considering that wood and

timber was a revenue coming on whilst the owners were asleep) commanded his servants immediately to plant in his lands, which were ample, Oaks, Ashes, and other profitable and marketable trees, to the number of an hundred thousand; as undoubtedly calculating, that each of those trees might be worth twenty-pence, before his daughter became marriageable, which would amount to 100,000 Francs,) near ten thousand pounds sterling) and this he intended to be given with his daughter for a portion. This was good philosophy, and such as I am assured was frequently practised in Flanders, upon the very same account: Let us see it once take effect amongst our many slothful gentry, who have certainly as large demesnes, and yet are so deficient in that decent point of timely providing for their numerous children; and those who have none, let them the rather plant: Trees and Vegetables have perpetuated some names longer and better than a pedigree of a numerous offspring, as I have already showed; and it were a pledge of a noble mind, to oblige the future age by our particular industry, and by a long lasting train, with the living work of our own hands. But I now proceed to more general concerns in order to the Quæries; and first to the Proportion.

CHAP. VII.

It were just, and infinitely befitting the miserable needs of the whole nation, that every twenty acres of pasture made an allowance for half an acre of timber; the ground dug about Christmas, casting the grassy side downwards till June; then dug again, and about November stirred afresh, and sown with mast, or planted in a clump, well preserved and fenced for fourteen or fifteen years, unless that sheep might haply graze about four or five years: And where the young trees stand too thick, there to draw and transplant them into the hedge-rows, which would also prove excellent shelter for the cattle: This husbandry would more especially become Northamptonshire, Lincolnshire, Cornwall, and such other of our counties as are the most naked of timber, fuel, &c. and unprovided of covert; for it is rightly observed, that the most fruitful places least abound in wood, and do the most stand in need of it:

I.

Example by LEICESTERSHIRE;
 What soil can be better than that
 For any thing heart can desire?
 And yet doth it want ye see what;
 Mast, covert, close pasture, and wood,
 And other things needful, as good.



2.

More plenty of mutton and beef,
 Corn, butter, and cheese of the best,
 More wealth any where (to be brief)
 More people, more handsome, and prest,
 Where find ye (go search any coast)
 Than there where INCLOSURE is most ?

3.

More work for the labouring man,
 As well in the town as the field;
 Or therefore (devize, if ye can can)
 More profit what countries do yield ?
 More seldom where see ye the poor
 Go begging from door to door ?

4.

In WOOD-LAND the poor men that have
 Scarce fully two acres of land,
 More merrily live, and do save
 Than t'other with twenty in hand:
 Yet pay they as much for the two
 As t'other for twenty must do.
 If this same be true, as it is,
 Why gather they nothing by this ?

Thus honest Tufser, above an hundred years since, and the whole age has justified it; since it is evident, that by inclosure, and this diligent culture, the very worst land of England would yield tenfold more profit than that which is here celebrated for the best and richest spot of it.

Such as are ready to tell you their lands are so wet that their woods do not thrive in them, let them be converted to pasture, or bestow the same industry on them which good husbands do in meadows by *draining*; which instead of those narrow rills (gutters rather) might be reduced to a proportionable canal, cut even and straight, the earth taken out and spread upon the weeping and uliginous places; nor would the charge be so much as that of the yearly and perpetual renewing and cleansing of those numerous and irregular sluices; besides, there is a profit in storing the canal with fish.

It is a slothfulness to do otherwise, since it might be effected in few years, by continually, and by degrees making the middle cut large, where

it cannot be so conveniently done at once, and the pains would certainly be as fully recompensed in the growth of their timber as in that of their grafs: Where poor hungry woods grow, rich corn, and good cattle would be more plentifully bred; and it were beneficial to convert some woodland (where the proper virtue is exhausted) to pasture and tillage, provided that fresh land were improved also to wood in recompense, and to balance the other.

CHAT VII

Where we find such *uliginous* and starved places, (which sometimes obey no art or industry to drain, and of which our pale and fading corn is a sure indication) we are as it were courted to obey nature, and improve them by the propagation of Sallows, Willows, Alders, Abele, Black-Cherry, Sycamore, Aspen, Birch, and the like hasty and profitable growers, by ranging them, casting of ditches, trenches, &c. as before has been taught.

In the mean while, it is a thing to be deplored that some persons bestow so much in grubbing and dresing a few acres, which have been excellent wood, to convert them into wretched pasture, not worth a quarter of what the trees would have yielded, well ordered, and left standing; since it is certain, that barren land planted with wood will treble the expence in a short time. Of this, the Right Honourable the Lord Viscount Scudamore may give fair proof, who having felled (as I am credibly informed) a decayed wood, intended to set it to tenants; but upon second thoughts (and for that his Lordship saw it apt to cast wood) inclosed and preserved it. Before thirty years were expired it yielded him near 1000l. upon wood-falls, whereas the utmost rent of the whole piece of land yearly was not above 8l. 10s. The like I am able to confirm by instancing a Noble Person, who, a little before our unhappy wars, having sown three or four acres with acorns, the fourth year transplanted those which grew too thick, all about his Lordship. These trees are now * of that stature, and so likely to prove excellent timber, that they are already judged to be almost as much worth as the whole demesne; and yet they take off nothing from other profits, having been discreetly disposed of at the first designment. And supposing the longevity of trees should not extend to the periods we have, upon so good account, produced; yet, neither is their arrival to a very competent perfection so very discouraging: since I am credibly informed, that several persons have built of timber, and that of Oak, which were acorns within these forty years; and I find it cre-

* 1664.

BOOK 111. dibly reported, that even our famous Forest of Dean hath been utterly wasted no less than three several times within the space of nine hundred years. The Prince Elector, Frederick IV. in the year 1606, sowed a part of that most barren heath of *Lambertheim* with acorns after ploughing, as
 * 1664. I have been informed: It is now * likely to prove a most goodly forest, though all this while miserably neglected by reason of the wars. For the care of planting trees should indeed be recommended to Princes and great Persons, who have the fee of the estate; tenants upon the rack, by reason of the tedious expectation, and jealousy of having their rents enhanced, are, for the most part, averse to this husbandry; so that unless the Landlord will be at the whole charge of planting and fencing, (without which as good no planting) little is to be expected; and whatsoever is proposed to them above their usual course, is looked upon as the whim and fancy of speculative persons, which they turn into ridicule when they are applied to action; and this (says an ingenious and excellent husband, whose observations have afforded me no little treasure) might be the reason why the prime writers of all ages endeavoured to involve their discourses with allegories, and enigmatical terms, to protect them from the contempt and pollution of the vulgar, which has been of some ill consequence in husbandry; for that very few writers of worth have ventured upon so plain a subject, though doubtless to any considering person, the most delightful kind of Natural Philosophy, and that which employs the most useful part of the Mathematics.

The Right Honourable the late Lord Viscount Montague has planted many thousands of Oaks, which, I am told, he draws out of coppices, big enough to defend themselves; and that with such success as has exceedingly improved his possessions; and it is a worthy example. To conclude, I could have shown an avenue planted to a house standing in a barren park, the soil a cold clay; it consisted totally of Oaks, one hundred in number: The person who first set them, dying very lately, lived to see them spread their branches one hundred and twenty-three feet in compass, which, at the distance of twenty-four feet, mingling their shady trefses for above a thousand in length, formed themselves into one of the most venerable and stately arbor-walks that in my life I ever beheld: This was at Baynards in Surrey, and belonging lately to my most honoured brother (a most industrious planter of wood) Richard Evelyn, Esq.—since transplanted to a better world: The walk is fifty-six feet broad, one tree with another containing, by estimation, three quarters of a load of timber, and

in their tops three cords of fire-wood: Their bodies were not of the tallest, having been topped when they were young, to reduce them to an uniform height; yet was the timber most excellent for its scantling, and for their heads, few in England excelling them: Where some of their contemporaries were planted single in the park without cumber, they spread above fourscore feet in arms. All of them since cut down and destroyed by the person who continued to detain the just possession of that estate from those to whom of right and conscience it belonged. Since then it is disposed of, and I am glad it has fallen into the hands of the present possessor.

But I have some few instances to superadd, of no mean encouragement, before I dismiss my Reader, because they are so very pregnant and authentic. Sir Thomas Southwell, after he had sold and felled all the timber and underwood in a certain parcel of land lying in Carbrook, in the county of Norfolk, called by the name of *Latimer-Wood*, containing eighty acres, (now, as I understand, belonging to Sir Robert Clayton, Knight) granted a lease of the said ground, with other land, to one Thomas Wastney, the father, with liberty to grub and stub up all the wood and stub-shoots remaining, and to clear the said ground for pasture or tillage, as he should think to be most for his profit and advantage. Accordingly he puts out the same to labourers to stub and clear; but was, it seems, persuaded by one of them, to preserve some of the young stands or saplings then growing there, as that which might be of greater emolument to him before the expiration of the lease, than if he should quite extirpate them, and convert the said ground to tillage. These saplings were then so small, as when it happened that any of the labourers did break the haft of his mattock, he could hardly find one amongst them big enough to make another of for his present use: Nay, when the said labourers had made an end of clearing the ground of the old stub-shoots, upon which the timber and underwood did grow, (which is now fifty years since) there was not a tree left growing in it, that could be valued at above threepence, to be felled for any use or service. About the year 1650, the estate being then come (after the death of Sir Richard Crane, Knight) to William Crane, Esq. and the lease of the same to Thomas Wastney, the son, he offered five hundred of the best of the said young Oak saplings to one Daniel Hall a dealer in timber, for two shillings and sixpence the tree; which he refusing to give, the said Thomas Wastney making his application to Mr. Crane above-mentioned, (the owner of the estate) and desiring Daniel

BOOK III.

Hall to acquaint him what pity it was to cut down such young and thriving trees, Mr. Crane was persuaded to allow the said Thomas Wastney fourscore pounds to let them stand; since which time, the said Mr. Crane sold as many of those trees and saplings as came to about forty pounds, and left growing, and remaining on the ground, about thirteen hundred and eighty trees; which, in August 1675, being (upon the desire of Mr. Crane) valued by the said Daniel Hall, were estimated to be worth 700*l.* himself since offering for some of the said trees forty or fifty shillings a tree; five hundred of them being better worth than 500*l.* Now the said Latimer-Wood, were it cleared of the timber, would not be let for above four or five shillings per acre at the most. The particulars of this history I received under the hands and certificates of the above-mentioned Daniel Hall, who is the timber-merchant, and two of the stubbers or labourers, yet living, that were employed to clear the ground. I have likewise transmitted to me the following account from Mr. Sharp, under the hand of Robert Daye, Esq. one of his Majesty's Justices of the Peace for the county of Norfolk.

There were, in 1636, an hundred timber-trees of Oak, growing on some grounds belonging then to Thomas Daye, of Scopleton, in the county of Norfolk, Esq. which were that year sold to one Robert Bowgeon of Hingham, in the said county, for 100*l.* which price was believed to be equal, if not to surmount their intrinsic worth and value; but, after agreement made for them, a refusal happening, (which continued the trees standing till the year 1671) those very trees were sold to Thomas Ellys of Windham, timber-master, and one Henry Morley, carpenter, by Mr. Daye (son of the said Thomas Daye, Esq.) for 560*l.* And this comes to me attested under the hand of Mr. Daye himself, dated May 4, 1678 ^p.

From the same Mr. Sharp I receive this instance of an Ash planted by the hands of one Mr. Edm. Slater, in that county, which he sold for 40*s.* before his death; but this is frequent.

I am likewise assured that three acres of barren land, sown with acorns about sixty years since, are now become a very thriving wood: The im-

^p A few years ago, fifty Oak-trees growing in the park at Nostell, the seat of Sir Rowland Winn, Bart. were sold for 2500*l.*

provement of those few acres amounts to 300*l.* more than the rent of the land, and what it was before worth to be sold. Once more, and I have done.

CHAP. VII.

Upon the estate of George Pitt, Esq. of Stratfieldsea, in the county of Southampton, a survey of timber being taken in the year 1659, it came to 10,300*l.* besides near 10,000 samplers not valued, and growing up naturally: Since this, there hath been made by several sales 5600*l.* and there has been felled for repairs, building, and necessary uses, to the value (at least) of 1200*l.* so as the whole falls of timber amount to 6800*l.* The timber upon the same ground being again surveyed *anno* 1677, appeared to be worth above 21,000*l.* besides eight or nine thousand samplers and young trees to be left standing, and not reckoned in the survey: But what is yet to be observed, most of this timber above-mentioned, being Oak, grows in hedge-rows, and so as that the standing of it does very little prejudice to the plough or pasture.

It is likewise affirmed, that upon a living in the same place, of about 40*l.* rent *per ann.* there were (by an estimation taken in the year 1653) three hundred thirty-eight young timber-trees, valued at 59*l.* the saplings at 31*l.* 14*s.* And upon a later survey, taken the last year, 1677, the worth of the timber on that living is valued at above 800*l.* besides four or five hundred young thriving trees, which have, since the survey in 1653, grown naturally up, not reckoned in this account. With such, and the like instances, coming to me from persons and gentlemen of unquestionable credit, (dispersed through several other counties of this nation) I might furnish a just volume; and I have produced these examples because they are conspicuous, full of encouragement; worthy our imitation; and that from these, and sundry others which I might enumerate, we have made this observation, that almost any soil is proper for some profitable timber-trees or other, which is good for very little else.

Besides common Pasture which has long been fed, and is the very best, Meadow, that is up-land and rich, and such as we find to be naturally *Wood-scere* (as they term it) the bottoms of Downs, and like places well ploughed and sown, will bear lusty timber, being broken up and let lie till Midsummer, and then stirred again before sowing about November

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Mr. Cooke's directions are these: Prepare as for sowing of barley; about February scatter your seeds: If you plough your ground into great ridges, the thickness of the earth on the top will afford more depth and nourishment for the roots, and the furrows being filled up with leaves, when rotten, will lead the roots from one ridge to another: In dry ground, plough the ridges cros the descent, not to drain, but to keep the water on the ground; but in wet lands, contrary: This I hold to be an excellent note: He conceives the barley season to be of the latest to sow your seeds, but with oats it does well, so you sow them not too thick; but it is best of all to sow them by themselves, without any crop of grain at all.

A more expeditious way is to plant with sets, making holes or fosses, (which are best,) two feet wide and deep, and about a half a rod distant, viz. four in every rod square, two sets in each hole, sowing your keys and seeds among them the ensuing spring, and that continued as oft as you find *stampings* and *keys* to be had, even till your wood be perfectly furnished, only taking care that they lie not long too thick, because it will heat and burn the kernels; and therefore let them be put into the ground as soon as they are pressed, or else lay them thin, or parted with straw.

In case your land be poor, and wanting depth, or but indifferent, observing the posture of your ground, divide it into four yards distance at both extremes, by small stakes, making rows of them, by setting up some few between them, to direct and lay your work straight, ploughing one yard of each side of the stakes, if the ground be green sward, for the easier running of the roots: Having thus ploughed two yards, and left two unploughed through the whole piece, some short time before the planting season, so soon as the fall of the leaf begins, dig up the unploughed interstices, laying one half of the earth on the unploughed pieces, and the other half upon the rest; and as you do this, plant your prepared sets about a yard distant, with store of sallow or other cuttings with them, digging that ground which you laid on the ploughed part a good spade deep, which will make it near a foot thick to plant your sets in: Thus proceed from one unploughed ground to another, till all of it is planted: Two men on each side of the ridges will soon despatch the work, which should be finished by the latter end of January, which is the best time for the sowing your keys, nuts, and other seeds, unless the weather be frosty, in which case you may a little defer it; and when all is sowed, cover them a little

with the shovelings of some ditches, pond, or other stuff, as an assured good way to improve such grounds to considerable advantage.

For the planting of Walnuts, Chesnuts, Cyder-Apples, or any other Forest or Fruit Trees, in open fields, Mr. Cooke directs how the triangular form exceeds all the rest for beauty and advantage. I refer you to his 33d chapter.

An old and judicious planter of Woods prescribes us these directions for improving of sheep-walks, downs, heaths, &c. Suppose on every such walk, on which five hundred sheep might be kept, there were ploughed up twenty acres, (ploughed pretty deep, that the roots might take hold, and be able to resist the winds) this should be sowed with Mast of Oak, Beech, Chats of Ash, Mapple-keys, Sloes, Service-berries, Nuts, Bullace, Haws, and bruised Crabs, mingled and scattered about the sides and ends of the ground, near a yard in breadth. On the rest sow no Haws, but some few Crab-kernels; then begin at a side, and sow five yards broad, ploughing under the Mast, &c. very shallow; and then leave six yards in breadth, and sow and plough five yards more; and so from side to side, remembering to leave a yard and a half at the last side; let the rest of the head-lands lie till the remainder of the close be sown in March with Oats, &c. to preserve it from hurt of cattle, and poaching the ground: When the spring is of two years growth, draw part of it for Quicksets; and when the rest of the trees are of six years shoot, exhaust it of more, and leave not above forty of either side, each row five yards distant, and here and there a Crab-stock to graff on, and in the environing hedge (to be left thick) let the trees stand four yards asunder; which if forty-four were spared, will amount to above four thousand trees. At twenty years end, stock up two thousand of them; lop a thousand more every ten years, and reserve the remaining thousand for timber. Judge what this may be worth in a short time, besides the grafs, which will grow the first six or seven years, and the benefit of shelter for sheep in ill weather, when they cannot be folded; and the pasture which will be had under the trees, now at eleven yards interval, by reason of the stocking up those two thousand we mentioned, excepting the hedges; and if in any of these places any considerable waters fortune to lie in their bottoms, fowl would abundantly both breed and harbour there. These are admirable directions for park-lands, where shelter and food is scarce.

Even in the most craggy, uneven, cold, and exposed places, not fit for arable, as in Biscay, &c. and in our very peaks of Derbyshire, and other rocky places, Ashes grow about every village; and we find that Oak, Beech, Elm, and Ash will prosper in the most flinty soils. And it is truly from these indications, more than from any other whatsoever, that a broken and decaying Farmer is to be distinguished from a substantial Freeholder, the very trees speaking the condition of the Master. Let not then the Royal Patrimony bear a Bankrupt's reproach. But to descend yet lower:

Had every acre but three or four trees, and as many of fruit in it as would a little adorn the hedge-rows, the improvement would be of fair advantage in a few years; for it is a shame that Turnip-planters should demolish and undo hedge-rows near London, where the mounds and fences are stripped naked, to give sun to a few miserable roots, which would thrive altogether as well under them, being skilfully pruned and lopped: Our Gardeners will not believe me, but I know it to be true, though Pliny had not affirmed it. As for Elms, saith he, their shade is so gentle and benign, that it nourishes whatsoever grows under it; and (lib. xvii. cap. xxiii.) it is his opinion of all other trees, (very few excepted) provided their branches be pared away; which being discreetly done, improves the timber, as we have already showed.

Indeed, where Elms are planted either about very small crofts or avenues reserved for pasture, the roots are apt to spring up and annoy the grafs: But I speak of the larger field, and even in the former, that part of the root which spreads into the field, may (as I have shown) be hindered from infecting it, by cutting away those fibres which run into the field, without any impeachment to the growth of the trees, of which I have some whose roots are cut off very near the main stems at one side, thriving almost altogether as well as those which have their roots entire.

Now let us calculate a little at adventure, and much within what is both feasible and very possible, and we shall find, that four Fruit-trees in each acre throughout England, the product sold but at sixpence the bushel, (but where do we now buy them so cheap?) will be worth a million yearly. What then may we reasonably judge of Timber, admit but at the growth of fourpence per acre yearly, (which is the lowest that can be estimated) amounting to near half a million, if (as is supposed) there may be five or six and twenty millions of square acres in the kingdom,


(besides fens, highways, rivers, &c. not counted) and without reckoning in the mast or loppings; which whosoever shall calculate from the annual revenue that the *mast* only of Westphalia, (a small and wretched country in Germany) does yield to that Prince, will conclude to be no despicable improvement. CHAF. VII.

In this poor territory, every Farmer does by antient custom plant so many Oaks about his farm as may suffice to feed his swine. To effect this, they have been so careful, that when of late years the armies infested the poor country, (both Imperialists and Protestants) the single Bishopric of Munster was able to pay one hundred thousand crowns per mensem, (which amounts of our money to about 25,000l. sterling) besides the ordinary entertainment of their own Princes and private families. This being incredible to be practised in a country so extremely barren, I thought fit to mention, either to encourage or reproach us. General Melander was wont to say, the good husbandry of their ancestors had left them this stock *pro sacra anchora*; considering how the people were afterwards reduced to live even upon their trees, when the soldiers had devoured their hogs; redeeming themselves from great extremities, by the timber which they were at last compelled to cut down, and which, had it continued, would have proved the utter desolation of that whole country.

I have this instance from my most worthy and honourable Friend Sir William Cursius, late his Majesty's Resident in Germany, who received this particular from the mouth of Melander himself. In like manner, the Princes and Freedoms of *Hesse, Saxony, Thuringia*, and divers other places there, make vast incomes of their Forest-fruit (besides the timber) for swine only: So as in a certain wood in *Hessia* only, twenty thousand have been fatted, yielding the Prince 30,000 florins.

I say then, whosoever shall duly consider this, will find planting of wood to be no contemptible addition, besides the pasture much improved, the cooling of fat and heavy cattle, keeping them from injurious motions, disturbance, and running as they do in summer, to find shelter from the heat and vexation of flies.

But I have done, and it is now time to get out of the wood, and to recommend this, and all that we have proposed, to his Most Sacred Majesty, the Honourable Parliament, and to the Lord High Treasurer, prin-

BOOK III.  cipal Officers, and Commissioners of the Royal Navy, that where such improvements may be made, they be speedily and vigorously prosecuted; and where any defects appear, they may be duly reformed.

And what if, for this purpose, there were yet some additional Office constituted, which should have a more universal inspection, and the charge of all the Woods and Forests in his Majesty's Dominions? This might easily be performed by Deputies in every County; persons judicious and skillful in Husbandry, and who might be repaired to for advice and direction: And if such there are at present, (as indeed our laws seem to provide) that their power be sufficiently amplified where any thing appears deficient; and as their zeal might be excited by worthy encouragements, so might neglects be encountered by a vigilant and industrious check. It should belong to their province to see that such proportions of timber, &c. were planted and set out upon every hundred, or more of acres, as the Honourable Commissioners have suggested; or as might be thought convenient, the quality and nature of the places prudently considered. It should be their office also to take notice of the growth and decay of woods, and of their fitness for public uses and sale, and of all these to give advertisements, that all defect in their ill governing may be speedily remedied; and the superior Officers or Surveyor should be accountable to the Lord Treasurer, and to the principal Officers of his Majesty's Navy for the time being. And why might not such a regulation be worthy the establishing by some solemn and public Act of State, becoming our Glorious Prince, **SOVEREIGN OF THE SEAS!** and his prudent Senate, the present Parliament?

But to show how this Xilotropiæ Studium for the preservation of timber was honoured,

We find in Aristotle's *Politics*, the Constitution of Extra-urban Magistrates to be *Silvarum Custodes*; and such were the *Consulares Silve*, which the Great Cæsar himself (even in a time when Italy did abound in timber) insituted; and was one of the very first things which he did, at the settling of that vast Empire) after the Civil Wars had exceedingly wasted the country. Suetonius relates it in the Life of Julius; and Peter Cramus, in his fifth book *De Honestâ Disciplina*, cap. iii. gives this reason for it, *Ut materies, fâit he, non decisset, quâ videlicet, Navigia publica possent à præfecturis fabrum, confici.* True it is, that this Office was sometimes called

De collegiis Fabrorum, Centonariorum, et Dendrophlororum, Naviculariorum, ratiarum exercit. et Caudiciorum, plurimæ extant Inscriptiones apud Lipsium in lib. inscrip. antiq. quales Bergomensium Brixianorum Comensium, Lugdunensium, Araricorum et Rhodanicorum, eorumque corporum et Collegiorum patronis curatoribus. Vide etiam Hieron. Rubicum, l. i. Hist. Ravenat. Item de Dendrophoris Cod. Theodos. lib. i. et in eisdem verbis inscript: Morisot. Orb. Marit. lib. i. cap. xxiv.

Provincia minor; but for the most part annexed and joined to some of the greatest Consuls themselves; that facetious sarcasm of the Comedian (where Plautus names it *Provincia caudicaria*) referring only to some under officers, subservient to the other. And such a charge is at this day extant amongst the noble Venetians, who have near *Trivisi* (besides what they nourish in other places) a goodly forest of Oaks, preserved as a jewel, for the only use of the arsenal, called the *Montello*; and this is carefully supervised by a certain Officer whom they name *il Capitano*. The like have the Genoese for the care of the goodly forests of *Attone*, in the island of Corsica, full of goodly Oaks and other timber; which not only furnish that state with sufficient materials to build their own gallies and other vessels, but so many for sale to other nations, that since the late insult the French Monarch made upon their glorious city, he has haughtily forbid them to traffic any more with strangers, by supplying them as heretofore, to their great detriment and loss: This timber is of such grain and quality, as though felled in the new moon, it is not at all impaired.

We might, besides all these, instance many other prudent states; not to importune you with the express laws which Ancus Martius, the nephew of Numa, and other Princes long before Cæsar, did ordain for this very purpose; since, indeed, the care of so public and honourable an enterprize as is this of planting and improving of woods, is a right Noble and Royal Undertaking; as that of the Forest of Dean in particular, were it bravely managed, an Imperial Design; and I do pronounce it more worthy of a Prince, who truly consults his glory in the highest interest of his subjects, than that of gaining battles, or subduing a province.

And now after all this, and the directions and encouragements enumerated in this chapter, together with the most important concerns of these dominions, I list not to declare by *whose* negligence so little effects appear of these *improvements*, which might by this time have been made in the Royal Magazine, ever since the first edition of this Treatise^a; though the *Officers* then intrusted, and whose duty it was, be now no more. I cannot,

^a This takes in a period of forty years, viz. from the first appearance of the *Silva* in 1664, to the publication of the fourth edition in 1704.

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however, but call to mind how seemingly solicitous and earnest the Commissioners were I should digest and methodize the papers I laid before them on this subject, with a zeal becoming Public Spirits, (as under their hands I have to show,) whilst the putting it in practice to any laudable degree, was soon cast by as a project scarce worth the while. I again affirm, that had these advantages of forest culture been then vigorously encouraged and promoted, there had now been of those materials infinite store, even from the very acorn and seminary, a competent advance of the most useful timber for the building of ships, (as I think is sufficiently made out) since his late Majesty's Restoration. The want of timber, and the necessity of being supplied by foreign countries, if not prevented by better and more industrious instruments, may prove in a short time a greater mischief to the public than the late diminution of the coin. I wish I prove no prophet, whilst I cannot for my life but often think of what the learned *Melanthon* above an hundred years since was wont to say, (long before those barbarous wars had made these devastations in Germany) That the time was coming, when the want of *three* things would be the ruin of Europe, *Lignum, probam Monetam, probos Amicos; Timber, good Money, sincere Friends*. How far we see this prediction already verified, let others judge: And if what I have here touched with some resentment in behalf of the public and my country, in this rustic Discourse, using the freedom of a plain Forester, seems too rude, it is the Person I was commanded to put on, and my Plea is ready,

Δρῦς παρούσης, πᾶς ἀνὴρ ξυλεύεται.

Præsente Quercu, ligna quivis colligit.

For who could have spoken less upon so ample a subject? and therefore I hope my zeal for it in these Papers will excuse the prolixity of this digression, and all other the imperfections of my services:

Si canimus Silvas, Silvæ sunt consule dignæ.

S I L V A.

D E N D R O L O G I A.

BOOK THE FOURTH.

*An Historical Account of the SACREDNESS and USE of
STANDING GROVES.*

AND thus we have finished what we esteemed necessary for the direction of planting, and the culture of trees and woods in general; whether for the raising of new, or preservation of the more antient and venerable shades, crowning the brows of lofty hills, or furnishing and adorning the more fruitful and humble plains, groves, and forests, such as were never prophaned by the inhumanity of edge-tools: Woods, whose original are as unknown as the Arcadians; like the goodly Cedars of Libanus, Psalm civ. *Arbores Dei*, according to the Hebrew, for something doubtless which they noted in the genius of those venerable plants, besides their mere bulk and stature: And, verily, I cannot think to have well acquitted myself of this useful subject, till I shall have in some sort vindicated the honour of trees and woods, by showing my reader of what estimation they were of old for their divine, as well as civil uses; or at least refreshed both him and myself with what occurs of historical and instructive amongst the learned concerning them. And first, standing woods and forests were not only the original habitations of men, for defence and fortresses, but the first occasion of that speech, polity, and society which made them differ from beasts. This, the Architect Vitruvius* ingeniously describes, where he tells us, that the violent percussio

BOOK IV.

* Vitruv. l. ii.
cap. 1.

BOOK IV. them on fire, the flame did not so much surprise and affright the salvage foresters as the warmth, which (after a little gazing at the unusual accident) they found so comfortable: This (says he) invited them to approach it nearer, and, as it spent and consumed, by signs and barbarous tones (which in process of time were formed into significant words) they encouraged one another to supply it with fresh combustibles: By this accident the wild people, who before were afraid of one another, and dwelt asunder, began to find the benefit and sweetness of society, mutual assistance, and conversation; which they afterwards improved, by building houses with those trees, and dwelling nearer together. From these mean and imperfect beginnings they arrived in time to be authors of the most polished arts; they established laws, peopled nations, planted countries, and laid the foundation of all that order and magnificence which the succeeding ages have enjoyed. No more then let us admire the enormous moles and bridges of Caligula across to Baiæ; or that of Trajan over the Danube (stupendous work of stone and marble!) to the adverse shores; whilst our timber and our trees making us bridges to the furthest Indies and Antipodes, land us into new worlds. In a word, (and to speak a bold and noble truth) trees and woods have twice saved the whole world; first by the Ark, then by the Cross; making full amends for the evil fruit of the tree in Paradise, by that which was borne on the tree in Golgotha. But that we may give an account of the sacred and other uses of these venerable retirements, we will now proceed to describe what those places were.

Though *Silva* was the more general name, denoting a large tract of wood or trees, the *incidue* and *cadue*, yet there were several other titles attributed to greater or lesser assemblies of them; *Domus Silve* was a Summer-house; and such was Solomon's "Ὀμοι ἐρυμῆς, 1 Reg. vii. 2. When they planted them for pleasure and shade only, they had their *Nemora*; and as we our Parks, for the preservation of game and particularly venison, so had they their *Saltus*, and *Silva inertia*, secluded for the most part from the rest. But among authors we meet with nothing more frequent, and indeed more celebrated, than those arboreous amenities and plantations of woods, which they called *Luci*; and which, though sometimes restrained to certain peculiar places for devotion (which were never to be felled) yet were they also promiscuously both used, and taken for all that the wide forest comprehends, or can signify. To dismiss a number of critics, the name *Lucus* is derived by Quintilian and others,

who delight to play with words, (by antiphrasis) à *minime* *Lucendo*, because of its density^a, BOOK IV.

—————*nulli penetrabilis astro.*

whence Apuleius used *Luco sublucido*; and the Poets; *Sublustrī umbra*: Others (on the contrary) have taken it for light in the masculine, *umbra*, *non quia minime, sed quia maxime luceat*; by so many lamps suspended in them before the shrine; or because they kindled fires, by what accident unknown:

—————*seu Cæli fulmine misso;*
Sive quod inter se bellum Silvestre gerentes,
Hostibus intulerant ignem formidinis ergo. LUCRET. lib. v.

—————*Whether it were*
By lightning sent from Heaven, or else there
The salvage men in mutual wars and fight,
Had set the trees on fire, their foes affright.

^a The learned Mr. Bryant, in his Analysis of Antient Mythology, has something extremely curious upon the derivation of the word *LUCUS*. He says that the Sun, by the Amonians, was stiled *El-Uc*, which the Grecians changed into *Λυκος*, *Lucos*. He was also stiled *El-Uc-Or*, which was changed to *Λυκαργεος*: and *El-Uc-Aon*, rendered *Lycaon*, *Λυκαων*. As this personage was the same as *El-Uc*, *Λυκος*; it was fabled of him that he was turned into a wolf. The cause of this absurd notion arose from hence: every sacred animal in Egypt was distinguished by some title of the Deity. But the Greeks never considered whether the term was to be taken in its primary, or in its secondary acceptation; hence they referred the history to an animal, when it related to the God from whom the animal was denominated. *Λυκος*, *Lucos*, was, as I have shown, the name of the Sun; hence, wherever this term occurs in composition, there will be commonly found some reference to that Deity, or to his substitute Apollo. We read of *Λυκος Απολλωνιος υιος*: of *Lycorus*, a supposed son of Apollo: of *Lycomedes*, another son; of *Lycosura*, the first city which the sun beheld. The people of Delphi were of old called *Lycosians*; and the summit of Parnassus, *Lycocæa*. Near it was a town of the same name; and both were sacred to the God of Light. From *Lucos*, in this sense, came *lux*, *luceo*, *lucidus*, and Jupiter *Lucetius*, of the Latins: and *Λυκος*, *Λυκηια*, *Λυκηινω*, of the Greeks: also *Λυκαλια*, and *αμφιλυκος*, though differently expressed. Hence it was that many places, sacred to Apollo, were stiled *Leuce*, *Leuca*, *Λυκια*, *Leucas*, *Leucate*:

*Mox et Leucatae nimbosa cacumina montis,
Et formidatus nautis aperitur Apollo.*

VIRG.

Hence also inscriptions *DEO LEUCANLÆ*: which term seems to denote *SOL-FONS*, the Fountain of Day. The name *Lycophron*, *Λυκοφρων* which some would derive from *Λυκος*, a Wolf, signifies a person of an enlightened mind. Groves were held very sacred: hence *LUCUS*, which some would absurdly derive a *non lucendo*, was so named from the Deity there worshipped. *Vid. I. p. 79.*

Or whether the trees set themselves on fire :

Mutua dum inter se rami stirpesque teruntur.

When clashing boughs thwarting, each other fret.

For such accidents, and even the very heat of the sun alone, has kindled wonderful conflagrations ; or haply (and more probably) to consume their sacrifices, we will not much insist. The Poets, it seems, speaking of Juno, would give it quite another original, and tune it to their songs invoking Lucina, whilst the main and principal difference consisted not so much in the *Name*, as the *Use* and *Dedication*, which was for silent, awful, and more solemn Religion (*Silva, quasi sileus locus*;) to which purpose they were chiefly *manu consiti*, such as we have been treating of, entire, and never violated with the Ax: Fabius calls them *Sacros ex Vetustate*, venerable for their age; and certain it is, they had of very great antiquity been consecrated to holy uses, not only by superstitious persons to the Gentile Deities and Heroes, but to the true God by the Patriarchs themselves, who, *ab initio*, (as is presumed,) did frequently retire to such places to serve him, compose their meditations, and celebrate sacred mysteries, prayers, and oblations; following the tradition of the Gomerites, or descendants of Noah, who first peopled Galatia and other parts of the world after the universal deluge*.

From hence some presume that even the antient Druids had their origin: But that Abraham might imitate what the most religious of that age had practised before him, may not be unlikely; for we read he soon planted himself and family at the Quercetum of Mamre, Gen. xiii. where, as Eusebius, Eccles. Hist. l. i. c. 18. † gives us the account, he spread his pavilions, erected an altar, offered and performed all the priestly rites; and there, to the immortal glory of the Oak, or rather *Arboreous Temple*, he entertained God himself. Isidore, St. Hierom ‡, and Sozomen report confidently, that one of the most eminent of those trees remained till the reign of the great Constantine, (and the stump till St. Hierom) who founded a venerable chapel|| under it; and that both the Christians, Jews, and Arabs held a solemn anniversary or station there, and believed that from the very time of Noah it had been a consecrated place. Sure we are, it was about some such assembly of trees, that God was pleased first of all to appear to the Father of the Faithful, when he established the Covenant with him; and more expressly, when removing thence (upon confirming the League with Abimelech, Gen. xxi. and settling at Beersheba)

* See the learned Pezron Antiqu. fuse.

† Euseb. l. v. cap. 19. Demonstr. Eveng. ubi de Terebintho. Hieronymus, de locis Hebraicis, &c.

‡ Hierom in Epitaph Paul, vide et Eras. Schol. in Ep. ad Pammachium.

|| See the Emperor's Rescript to Bish. Macarius, for the demolition of the Idol worshipped there; and the building of a magnificent church. Euseb. de vit. Constant. l. iii. cap. 50.

he designed an exprefs place for God's Divine Service: For *there*, says the sacred text, *he planted a Grove, and called upon the name of the Lord.* Such another tuft we read of, (for we must not always restrain it to one single tree) when the Patriarch came to אֵלֹן מוֹרֶה, *Elon Moreh, ad Quercetum Moreh*: But whether that were the same under which the High-Priest repositied the famous Stone, after the exhortation mentioned, Joshua xxiv. 26, we do not contend; *under an Oak*, says the Scripture, and it grew near the Sanctuary, and probably might be that which his grandchild consecrated with the funeral of his beloved Rebecca, Gen. xxxv. For it is apparent, by the context, that *there* God appeared to him again: So Grotius, upon the words, "subter Quercum," says, *Illam ipsam cuius mentio*, Gen. xxxiv. 4. *in historia Jacobi et Jude*; and adds, *Is locus in honorem Jacobi diu pro Templo fuit*: "that the very spot was long after used for a Temple in honour of Jacob." This was the place which *Sozomen* calls *Terebinthum*, from certain trees growing there; these, says *Josephus, de Bell. Jud. l. v.* were as antient as the world itself. Some reported that this Oak sprung from a staff, which one of the Angels, who appeared to the Patriarch, fixed in the ground: So *Geor. Syncellus* in *Chronico. Mirum verò est* (says *Valesius* on this passage of *Eusebius*) *cum Quercus ibidem fuerit, sub qua Abraham Tabernaculum posuerit, (ut legitur in Gen. xviii.) cur locus ipse à Terebintho potius quam a Quercu nomen acceperit.* In the mean time, as to the prohibition, Deut. xvi. 21, whether this Patriarchal Devotion in Groves, and under Arboreous Shades, was approved by God, till there was a fixed altar, and his ceremonial worship confined to the tabernacle and temple, I think needs be no question*.

If we therefore now would tract the religious esteem of trees and woods yet farther in holy writ, we have that glorious vision of Moses in the fiery thicket; and it is not to abuse or violate the text, that *Moncaus* and others interpret it to have been an entire Grove, and not a single bush only which he saw as burning, yet unconsumed. *Puto ego* (says my Author) *rubi vocabulo non quidem rubum aliquem unicum et solitarium significari, verum rubetum totum, aut potius fruticetum, quomodo de Quercu Mambre pro Querceto toto docti intelligunt.* Now that they worshipped in that place soon after their coming out of Egypt, the following story shows. The feast of tabernacles had some resemblance of patriarchal devotion under trees †, though but in temporary groves and shades in manner of booths, yet celebrated with all the refreshings of the forest; and from thè

BOOK IV.

* D. Doughty
Analecta Sa-
cra. Excurs.
xiii.

† Lev. xxxiii.-
40.

BOOK IV. very infancy of the world, in which Adam was entertained in paradise, and Abraham (as we noted) received his divine guests, not in his tent, but under a tree, an Oak, (*triclinium angelicum*, the angel's dining-room) all intelligent persons have embraced the solace of shady arbours, and all devout persons found how naturally they dispose our spirits to religious contemplations. For this, as some conceive, they much affected to plant their trees in circles, and gave that capacious form to the first temples, observed not only of old, but even at this day by the Jews, as the most accommodate for their assemblies; or, as others, because that figure most resembled the universe and the heavens: *Templum à templando*, says a knowing critic; and another, *Templum est nescio quid immane, atque amplum*; such as Arnobius speaks of, that had no roof but heaven, till that sumptuous fabric of Solomon was confined to Jerusalem, and the goodliest Cedars and most costly woods were carried thither to form the columns and lay the rafters; and then, and not till then, was it so much as schism, that I can find, to retire to Groves for their devotion, or even to Bethel itself.

See Tirinus.
Our Mede.
Ainsworth.
Diatrib. on
Joh. xxiv. 26.
Valesius An-
not. in lib. 2.
Hist. Eccles.
Euseb. p. 28.

In such recesses were the antient Oratories and Proseuchæ, built theatre-wise, *sub dio*, at some distance from the cities, Acts xvi. and made use of even amongst the Gentiles as well as the people of God; (nor is it always the less authentic for having been the guise of nations;) hence that of Philo, speaking of one who πάσας Ἰουδαίων προσευχὰς ἐπεδρεθόμενος, &c. had felled all the trees about it; and such a place the Satyrist means where he asks, *In qua te quæro Proseucha?* because it was the rendezvous also where poor people used to frequent, to beg the alms of devout and charitable persons; so as it was esteemed *piacular* for any to cut down so much as a stick about them, unless it were to build them; when, with the Psalmist, men had honour according to their forwardness of repairing the houses of God in the land; upon which account it was lawful to lift up axes against the goodliest trees in the forest. But those zealous days are past:

At nunc desertis cessant sacraria lucis:
Aurum omnes victa jam pietate colunt.

PROPERT.

Now temples shut, and groves deserted lie:
All gold adore, and neglect piety.

In the mean time, that which came nearest to the *Scenopægia* of the

Jews, and other solemnities, was called by the Romans, *Umbrae*; as those in *Neptunilibus* are described by the Poet: BOOK IV.

Plebs venit, ac virides passim disjecta per herbas
 Potat, et accumbit cum pare quisque sua:
 Sub jove pars durat: pauci tentoria ponunt:
 Sunt, quibus è ramis frondea facta casa est. OVID. Fast. lib. iii.

All sorts together flock; and, on the ground
 Display'd, each fellow with his mate drinks round.
 Some sit in open air, some build their tents;
 And some themselves in branchy arbors fence.

Plutarch, speaking of the anniversary feast of Bacchus, plainly resembles it to that of the tabernacles, carrying about *Θύραξ Φωνικῶν*, branches of Palm, Citron, and other trees, as Josephus describes the Jewish Festival^b. The custom (for ought I know) is still kept up in many places of our country, and abroad, on May-Day, when the young men and maidens, like the Pagan *Ἐὐπροπορία*, go out into the woods and coppices, cut down and spoil young springers, to drefs up their May-booth, and dance about the *Pole*, as in pictures we see the wanton Israelites about the *Mollen Calf*. For thus, as we noted, those rites commanded by God came to be prophaned, and the retiredness of Groves and Shades for their opacousness, abused to abominable purposes, and works of darkness. But what good or indifferent thing has not been subject to perversion? It is said in the end of Isaiah, *Exprobratur Hebræis quod in Opisthonaïs idolorum horti essent in quorum medio februebantur*; but how this is applicable to Groves, does not appear so fully; though we find them interdicted, Deut. xvi. 21. Judg. vi. 25. 2 Chron. xxxi. 1. and forbidden to be planted near God's altar. And an impure Grove on mount Libanus, dedicated to Venus, was by an imperial edict of Constantine extirpated: But from the abuse of the thing to the non-use, the consequence is not always valid; and we may note as to this very particular, that where in divers places of holy writ the denunciation against

Vid. Seldenum de jure Nat. et Gent. Heb. lib. ii. cap. vi. Greg. Gyrallum de dñs gent. Syntag. 17.

^b There were feasts celebrated at Athens, at which they erected Tents and Pavilions, and adorned them. These were called *ἑστίαι*. Hence the month, which answers to our May, was called *ἑστίαιον*. This feast much resembled the Feast of Tabernacles among the Jews.

BOOK IV. Groves is so exprefs, it is frequently to be taken but *catachrestically*, from the *Wooden Image* or *Statue* called by that name, as our learned Selden makes out by sundry instances in his *Syntagma de Diis Syris*. Indeed the use of Groves upon account of devotion was so antient, and seemed so universal, that they consecrated not only real and natural Groves, but *Lucos pictos*, artificial *Boscage* and representations of them.

Vid. Sanctium, Fiscal. Grotium.

The sum of all is, Paradise itself was but a kind of Nemorous Temple, or Sacred Grove, planted by God himself, and given to man, *tanquam* * Gea. ii. 15. *primo sacerdoti*; the word is עֵבֶר *, which properly signifies to serve or administer *res divinas*; a place consecrated for sober discipline, and to contemplate those mysterious and sacramental trees, which they were not to touch with their hands; and in memory of them, I am inclined to believe, holy men (as we have showed in Abraham and others) might plant and cultivate Groves, where they traditionally invoked the Deity; and St. Hierom, Chrysostom, Cyprian, Augustin, and other Fathers of the church, greatly magnified these pious advantages; and Cajetan tells us, that from Isaac to Jacob, and their descendants, they followed Abraham in this custom. Solomon was a great Planter of Groves, and had an house of pleasure, or lodge, in one of them for recess. In such places were the monuments of their saints, and the bones of their heroes deposited. David celebrated the humanity of the men of Gilead for burying the bones of Saul and his sons under a tree at Jabesh. In such a place did the angel appear to Gideon; Judg. vi. And the Rabbins add a reason why they were reputed so venerable; because, being more remote from men and company, they were more apt to compose the soul, and fit it for divine actions^c.

^c It is natural for man to feel an awful and religious terror when plac'd in the centre of a thick wood; on which account, in all ages, such places have been chosen for the celebration of religious ceremonies. "Lucos, et in iis silentia ipsa adoramus." Seneca says, *Si tibi occurrit vetustis arboribus, et solitam altitudinem egressis frequens lucus, et conspectum Cæli densitate ramorum aliorum alios protegentium submovens: illa preceritas Sylvarum, et secretum loci et admiratio umbræ, in aperto tam densæ atque continuæ, sciẽm tibi numinis facit.* Epist. xli.

All pale with sacred horror, they survey'd
The solemn mountain and the reverend shade.
Some God, the Monarch said, some latent God
Dwells in that gloom, and haunts the frowning wood.

PITT'S VIRGIL.

Though, since the devil's intrusion into Paradise, even the most holy and devoted places were not free from his temptations and ugly stratagems, yet we find our blessed Saviour did frequently retire into the wildernesses, as Elijah and St. John the Baptist did before him, and divers other holy men, particularly the *Θεωρηταί*, whom Philo mentions, a certain religious sect, who addicting themselves to contemplation, chose the solitary recesses of Groves and Woods; as of old the Rechabites, Efsenes, primitive Monks, (and other institutions,) retired amongst the Thebaid deserts; and perhaps the air of such retired places may be assistant and influential for the inciting of penitential expressions and affections, especially where one may have the additional assistances of solitary grots, murmuring streams, and desolate prospects. I remember that under a tree was the place of that admirable St. Augustin's solemn conversion, after all his importunate reluctances. I have often thought of it, and it is a melting passage, as recorded by himself, *Con. l. viii. c. 8*; and he gives the reason; *Solitudo enim mihi ad negotium flendi aptior suggerebatur*. And that indeed such opportunities were successful for recollection, and to the very reformation of some ingenuous spirits, from secular engagements to excellent and mortifying purposes, we may find in that wonderful relation of Pontianus's two friends, great Courtiers of the time, as the same holy father relates it, previous to his own conversion. And here I cannot omit an observation of the learned Dr. Plot, in his (often-cited) *Nat. Hist. of Oxfordshire*, taking notice of two eminent religious houses, whose foundations were occasioned by trees; the first Osney-Abbey; the second, by reason of a certain tree, standing in the meadows, (where after was built the Abbey) to which a company of Pyses were wont to repair as oft as Editha, the wife of Robert D'Oyly, came to walk that way to solace herself; for the clamorous birds did so affect her, that, consulting with one Radulphus (Canon of St. Fridiswid) what it might signify, the subtle man advised her to build a Monastery where that tree stood, as if so directed by the Pyses in a miraculous manner; nor was it long ere the Lady procured her husband to do it, and to make Radulphus (her Confessor) first Prior of it.

Such another foundation was caused by a triple Elm having three trunks issuing from one root. Near such a tree as this was Sir Thomas White, Lord Mayor of London, warned by a dream to erect a College for the education of youth, which he did, namely, St. John's in Oxford, which,

BOOK IV. with the very tree, still flourishes in that University. But of these enough, and perhaps too much.

Cyrl Alex- We shall now, in the next place, endeavour to show how this innocent
an. in Hos. iv. veneration for Groves passed from the people of God to the Gentiles, and
13. Deut. xiv. by what degrees it degenerated into dangerous superstitions: for the
4. 2 Reg. xvi. devil was always God's ape, and did so ply his Groves, Altars, and Sacri-
4. fices, and almost all other rites belonging to his worship, that every green
tree was full of his abominations, and numerous places were devoted
to his impure service: *Hec fuerunt* (says Pliny, speaking of Groves)
Melchior A- *Numinum templa*, &c. "These were of old the temples of the gods;
damus Hist. "and (after that simple, but antient custom) men at this day consecrate
Ecl. cap. to his impure service: *Hec fuerunt* (says Pliny, speaking of Groves)
ccxxxiv. *Numinum templa*, &c. "These were of old the temples of the gods;
"and (after that simple, but antient custom) men at this day consecrate
"the fairest and goodliest trees to some deity or other; nor do we more
"adore our glittering shrines of gold and ivory than the Groves in which,
"with a profound and awful silence, we worship them." Quintilian,
speaking of the veneration paid an old umbrageous Oak, adds, *In quibus*
grandia, et antiqua robora jam non tantam habent speciem, quantum religio-
nem: For in truth the very tree itself was sometimes deified, and that
Celtic statue of Jupiter was no better than a prodigious tall Oak, whence,
it is said, the Chaldean Theologues derived their superstition towards it;
and the Persians, we read, used that tree in all their mysterious rites.
And, as for wood in general, they paid it that veneration for its main-
taining their deity, (represented by their perennial fire) that they would
not suffer any sort of wood to be used for coffins to inclose the dead in,
(but wrapt them in plates of iron) counting it a profanation. In short,
so much were people given up to this devilish and unnatural blindness,
as to offer human sacrifices, not to the *Tree-gods* only, but to the *Trees*
themselves as real *gods*.

Mariana in
2. Paralip.
xxviii. 4.

Omnis et humanis lustrata cruoribus arbor.

LUCAN.

Each tree besprinkled was with human gore.

Procopius tells us plainly, that the Slavii worshipped trees and whole forests of them: See Jo. Dubravius, lib. i. Hist. Bohem. And that formerly the Gandenses did the like, Surlus, the Legendary, reports in the life of St. Amadus; so did the Vandals, says Albert Crantz; and even those of Peru, as I learn from Acosta, lib. v. cap. xi. But one of the first idols which procured particular veneration in them, was the Sidonian

Astheroth, who took her name *à lucis*, as the Jupiter *ἑρδεδρος* amongst the Rhodians, the Nemorensis Diana or Arduenna, a celebrated Deity of this our island, for her patronage of wood and game ;

BOOK IV.

Diva potens memorum, terror silvestribus Apris :

as Gildas, an antient bard of ours, has it ; so soon had men, degenerated into this irrational and stupid devotion, that arch *fanatic* Satan, who began his pranks in a tree, debauching the contemplative use of Groves and other solitudes. Nor were the Heathens alone in this crime ; the Basilidians, and other Hereticks even amongst the Christians, did consecrate to the woods and the trees their serpent-footed and barbarous ΑΒΡΑΞΑΣ, as it is yet to be seen in some of their mysterious Talismans and Periaptas which they carried about^d.

But the Roman madnefs (like that which the Prophet derides in the Jews, was well prestringed by Sedulius and others, for imploring these-stocks to be propitious to them, as we learn in Cato de R. R. Nor was it long after (when they were generally consecrated to Faunus) that they boldly set up his oracles and responses in these nemorous places : Hence the Heathen Chapels had the name of *Fana*, and from their wild and extravagant religion, the professors of it were called *Fanaticks* ; a name well becoming some of the late *Enthusiasts* amongst us, who when their *quaking* fits possess them, resemble the giddy motion of *trces*, whose heads are agitated with *every wind of doctrine*.

Here we may not omit what learned men have observed concerning the custom of Prophets, and persons inspired of old, to sleep upon the boughs and branches of trees : I do not mean on the tops of them, (as the salvages somewhere do in the Indies, for fear of wild-beasts in the night-time) but on mattresses and beds made of their leaves, *ad consulen-*

^dThe Basilidians embraced a Religion which was half Christian and half Pagan : It sprung up in the second century. Innumerable gems are preserved in the cabinets of the curious, which were considered by this sect as amulets against misfortunes and diseases. These were called Abraxas, from their having this word usually engraved upon them. The inscriptions and figures are a compound of Pagan and Christian Hieroglyphicks. S. Irinaus, S. Epiphanius, and S. Jerom, have left us no more than bare specimens of this sort of heretical impiety ; whereas the monuments left us by the hereticks themselves, teach us many things that otherwise would have been buried in oblivion.

BOOK IV. *dum*, to ask advice of God. Naturalists tell us, that the *Laurus* and *Agnus Castus* were trees which greatly composed the fancy, and did facilitate true visions; and that the first was specifically efficacious *πρὸς τὸ ἰδναισασμυς*, (as my Author expresses it) to inspire a poetical fury: Such a tradition there goes of *Rebekah* the wife of *Isaac*, in imitation of her father-in-law: The instance is recited out of an ancient Ecclesiastical History by *Abulensis*. From hence the *Delphic Tripod*, the *Dodonæan Oracle* in *Epirus*, and others of that nature, had their original: At this decubation upon boughs the *Satyr* seems to hint, where he introduces the *Gypsies*:

See S. Fulgent. Mythol. cap. xiii. et Munsterum in Comment.

See Hier. in Trad. Heb. 3 Reg. c. iv.

Arcanam Judæa tremens mendicat in aurem,
Interpres legum Solyinarum, et magna Sacerdos
Arboris, ac summi fida internuncia cæli.

JUV. Sat. vi.

————— With fear
A cheating Jewish whispers in her ear,
And begs an alms: An High-Priest's daughter she,
Vers'd in their Talmud and Divinity;
And prophesies beneath a shady tree.

For indeed the *Delphic Oracle* (as *Diodorus*, lib. xvi. tells us) was first made à *Lauri ramis*, of the branches of *Laurel* transferred from *Thefsaly*, bended and arched over in form of a bower or summer-house; a very simple fabrick you may be sure: And *Cardan*, I remember, in his book de *Fato*, insists very much on dreams had by sleeping upon the boughs and leaves of trees, for portents and presages; and that the use of some of them do dispose men to visions.

* Vide Animum Viterb. lib. xvii. fol. 158.

† Cic de Leg. lib. ii.

‡ See Aristophanes Schol. ad Pluti Verba, καὶ ταῦτα πρὸς τὸ μίσηται, &c.

— ὅτι ἐπὶ τῶν κοίτων, καὶ ἄλλων ἰδωδῶν πανταχῶς ἐν τοῖς ἑσπέραις προσκαθήμενοι τὰ ἀκαθάρτα, To which add, Apul. Miles. VI. Videt dona speciosa, et facinas auro iteratas, et ramis arborum postibusque suffixas.

From hence then began *Temples* to be erected * and sought to in such places; nay, we find † sanction for it among the laws of the *Twelve Tables*; and as there was hardly a *Grove* without its temple, so almost every temple had a *Grove* belonging to it, where they placed idols, altars, and lights, endowed with fair revenues, which the devotion of superstitious persons continually augmented: Such were those ‡ *arbore obumbratrics*, mentioned by *Tertullian*, Apol. cap. ix. on which they suspended their *Ἄραθῆματα* and devoted things: And I remember to have seen something very like this in *Italy*, and other parts; namely, where the images of the *Blesed Virgin*, and other saints, have been enshrined in hollow and umbrageous trees, frequented with much veneration;

which puts me in mind of what that great traveller Pietro della Valla relates, where, speaking of an extraordinary Cypress, yet extant, near the tomb of Cyrus, to which at this day many pilgrimages are made, he mentions a gummy transudation which it yields, that the Turks affirm to turn every Friday into drops of blood: The tree is hollow within, adorned with many lamps, and fitted for an Oratory; and indeed some would derive the name *Lucus*, a Grove, as more particularly to signify such enormous and cavernous trees, *quod ibi lumina accenderentur religionis causa*: But our Author adds, The *Ethiops* do still repute all great trees to be *divine*, and the habitation of *souls* departed. Perhaps such a hollow tree was that Asylum of our Poet's Hero, when he fled from his burning Troy:

—————juxtaque antiqua Cupressus
Religione Patrum multos servata per annos.

EN. II.

—————an antient Cypress near,
Kept by religious parents many a year.

For that they were places of protection, and privileged like churches and altars, appears out of Livy, and other good authority. Thus where they introduce Romulus encouraging his new colony,

—————ut saxo Lucum circumdedit alto,
Quilibet huc, inquit, confuge, tutus eris.

So soon as e'er the Grove he had immur'd,
Haste hither, says he, here you are secur'd.

Such a Sanctuary was the *Aricina*, and Suburban *Diana*, called the *Nemorale Templum*, and divers more which we shall reckon up anon. Lucian in his *Dea Syria*, speaks of these temples and dedications in their Groves among the Egyptians: *Lucus in urbe fuit*, &c. and what follows? *Hic Templum*—and since they could not translate the Grove with the idol, they * carved out something like it, which the superstitious people bought, carried home, and made use of, representing those venerable places, in which they had the images of some feigned Deity (suppose it Tellus, Baal, or Priapus;) and such was the Jupiter Ἰσίδιος of the Rhodians, Bacchus of the Boetians, אשתרת the Sidonian Ashteroth: and the women mentioned 2 Reg. xxiii. 7, who are said to weave hangings and curtains for the Grove, were no other than makers of Tentories to spread from tree to tree, for the more opportune and secret perpetration of those

* *Luci dicuntur, non modo collectio arborum, &c. sed etiam scenographice sive delineationes lucorum in tabella*: See the Annotation on Isa. xvii. collated with 2 Reg. xviii. 4. Crit. Sac. for they brought the Grove out of the temple, and burnt it: which clearly shows it was the picture or image of the Grove, and not the trees themselves.

BOOK IV impure rites and mysteries, which (without these coverings) even the opacousness of the places were not obscure enough to conceal^e.

* Can. lib. i.
cap. 42. Selden
Jani Angl.
fac. cap. 2.

The famous Druids, or Saronides *, whom the learned Bochart, from Diodorus, proves to be the same, derived their Oak-theology, namely, from that spreading and gloomy-shading tree, probably the Grove at Mambre, Gen. xiii. 2. How their mysteries were celebrated in their woods and forests, is at large to be found in Cæsar, Pliny, Strabo, Diodorus, Mela, Apuleius, Ammianus, Lucan, Aventinus, and innumerable other writers, where you will see that they chose the Woods and the Groves, not only for all their religious exercises, but their courts of justice, as the whole institution and discipline is recorded by Cæsar, lib. vi. and as he, it seems, found it in our country of Britain, from whence it was afterwards translated into Gallia; for he attributes the first rise of it to this once happy island of Groves and Oaks; and affirms, that the antient Gauls travelled hither for their initiation^f. To this Tacitus assents, 14 Annal. and our most learned critics vindicate it, both from the Greeks and French impertinently challenging it: But the very name itself, which is purely Celtic, does best decide the controversy: For though Δρῦς be *Quercus*, yet Vossius skilfully proves that the Druids were altogether strangers to the Greeks; but what comes yet nearer to us, *Dru*, *fides*, (as one observes) begetting our now antiquated *Trou* or *True*, makes our title the stronger: Add to this, that amongst the Germans it signified no less than God himself; and we find *Drutin*, or *Trudin*, to import *Divine*, or *Faithful*, in the *Othfridian Gospel*, both of them *Sacerdotal* expressions. But that in this island of ours, men should be so extremely devoted to

^e For proofs of the lewdness and obscenity of many of the religious rites of the Heathen, vid. Herodot. Euterp. cap. lxiv. Diodor. Sicul. lib. iv. Valer. Maxim. lib. ii. cap. vi. Juvenal, Sat. ix. ver. 24. and what Eusebius saith of a Grove on mount Libanus, dedicated to Venus, in his Life of Constantine, lib. ii. cap. lv. Compare 1 Kings xiv. 23.

^f Cæsar and Tacitus differ as to the origin of the Druids, the former saying, that the Druidical religion originated in Britain, and the latter, that it was introduced by the Celtic Gauls, when they peopled this island; of this latter fact, there can be no doubt. It is certain, however, that the British Druids preserved their religion in greater purity than the Gauls, insomuch that young men were frequently sent from Gaul into Britain, to be instructed in the mysteries of the Druidical religion. The true derivation of Druid, is from the Celtic word *Deru*, an Oak.

trees, and especially to the Oak, the strength and defence of all our enjoyments, invironed as we are by the seas, and martial neighbours, is less to be wondered ;

BOOK IV.

Non igitur Dryadæ nostrates pectore vano
 Nec sine consulto coluerunt Numine Quercum ;
 Non illam Albionis jam tum celebravit honore
 Stulta superstîtio, venturive insecia sæcli
 Angliaci ingentes puto pravidiſcè triumphos
 Roboris, imperiumque maris, quod maximus olim
 CAROLIDES vastâ Victor dititione teneret.

COULET, lib. vi. Pl.

Our British Druids, not with vain intent,
 Or without Providence, did the Oak frequent ;
 That Albion did that Tree so much advance,
 Nor superstition was, nor ignorance.
 Those Priests divining even then, bespoke
 The mighty triumphs of the Royal Oak :
 When the sea's empire with like boundless fame,
 Victorious CHARLES, the son of CHARLES, shall claim.

as we may find the prediction gloriously followed by our ingenious Poet, where his Dryad consigns that sacred Depositum to this Monarch of the Forest, the Oak, than which nothing can be more sublime and rapturous ; whilst we must never forget that wonderful Providence which saved this forlorn and persecuted Prince, after his defeat at Worcester, under the shelter of this auspicious and hospitable tree ; when

—————All the countries fill'd
 With enemies' troops, in every house and Grove
 His sacred head is at a value held,
 They seek, and near, now very near they move.
 What should they do? They from the danger take
 Rash, hasty counsel; yet, from heav'n inspir'd,
 A spacious Oak he did his Palace make,
 And safely in its hollow womb retir'd.
 The loyal Tree its willing boughs inclin'd,
 Well to receive the climbing Royal Guest,
 (In Trees more pity than in Men we find)
 And its thick leaves into an arbour prefs'd.
 A rugged Seat of Wood became a Throne,
 Th' obsequious Boughs his Canopy of State :
 With bowing Tops the Tree its King did own,
 And silently ador'd him as he sate.

BOOK IV.

But to return to the superstitions we were speaking of. They were utterly abolished under the reign of Claudius, as appears by Suetonius; and yet, by Tacitus, they continued here in Britain till Nero; and in Gaul till Vitellius, as is found by St. Gregory writing to Q. Brunehaut, about the prohibiting the Sacrifices and Worship which they paid to Trees; which, Sir James Ware allirms, continued in Ireland till Christianity came in.

From these Silvan Philosophers and Divines (not to speak much of the Indian Brachmans, or antient Gymnosophists) it is believed that the great Pythagoras might institute his silent Monastery; and we read that Plato entertained his Auditors amongst his Walks of Trees, which were afterward defaced by the inhumanity of Sylla, when, as Appian tells us, he cut down those venerable shades to build forts against the Pyræus. Another we find he had, planted near Anicerides with his own hands, wherein grew that celebrated Platanus, under which he introduces his master Socrates discoursing with Phædrus de Pulchro. Such another place was the Athenian Cephisia, as A. Gellius describes it. We have already mentioned the stately Xysta, with their shades, in book ii. c. iii. Democritus also taught in a Grove, as we find in that of Hippocrates to Damagetus, where there was a particular tree designed *ad otium literarum*: and I remember Tertullian calls these places *Studia opaca*. Under such shades and walks was at first the famous ACADEMIA, so venerable, as it was esteemed by the old Philosophers prophane so much as to laugh in it. See Laertius, Ælian, &c. I could here tell you of Palæmon, Timon, Apollonius, Theophrastus, and many more that erected their schools in such Colleges of Trees, but I spare my reader; I shall only note, that it is reported of Thucydides that he compiled his noble History in the Scaplan Groves, as Pflny writes; and in that matchless piece of Cicero *de Oratore*, we shall find the Interlocutors to be often under the Platanus in his Tusculan Villa, where, invited by the freshness and sweetness of the place, *Admonuit* (says one of them) *me hæc tua Platanus que non minus ad opacandum hunc locum patulis est diffusa ramis, quam illa, cujus umbram secutus est Socrates, que mihi videtur non tam ipsa aquila, que describitur, quàm Platonis oratione crevisse, &c.* as the Orator brings it in, in the person of one of that meeting.

* See this most elegantly described in a Greek Epistle of Budeus to his brother.

I confess Quintilian seems much to question whether such places do not rather perturb and distract from an Orator's * recollection and the

depths of contemplation: *Non tamen* (says he) *protinus audiendi, qui credunt, aptissima in hoc nemora silvasque; quod illa celi libertas, locorumque amenitas, sublimem animum, et beatiorum spiritum parent: Mihi certè jucundus hic magis, quam studiorum hortator, videtur esse secessus: Namque illa ipsa, que delectant, necesse est avocent ab intentione operis destinati: He proceeds—Quare Silvarum amœnitas, et præterlabentia flumina, et inspirantes ramis arborum auræ, volucrumque cantus, et ipsa latè circumspiciendi libertas, ad se trahunt; ut mihi remittere potius voluptas ista videatur cogitationem, quam intendere.* But this is only his singular suffrage, which, as conscious of his error, we soon hear him retract, when he is by and by as loud in their praises, as the places in the world the best fitted for the diviner rhetoric of Poetry. But let us admit another* to cast in his symbol for Groves: *Nemora* (says he) *et luci, et secretum ipsum, tantam mihi afferunt voluptatem, ut inter præcipuos carminum fructus numerem, quod nec in strepitu, nec sedente ante ostium litigatore, nec inter sordes et lacrymas reorum componuntur: Sed secedit animus in loca pura, atque innocentia, fruiturque sedibus sacris.*

* Tacitus.

Whether this were the effect of the incomparable younger Pliny's Epistle to this noble Historian, I know not; but to show him, by his own example, how study and forest-sport may consist together, he tells him how little the noise of the *Chasers* and bawling *Dogs* disturbed him, when at any time he indulged himself in that healthful diversion: So far was he from being idle, and losing time, that besides his *Javelin* and *Hunting Pole*, he never omitted to carry his *Style* and *Table-Book* with him, that upon any intermission, whilst he now and then sat by the toil and nets, he might be ready to note down any noble thought, which might otherwise escape him: The very motions (says he) and agitation of the body in the wood and solitude, *magna cogitationis incitamenta sunt: I know, my friend, (continues he) you will smile at it; however take my counsel; be sure never to carry your Bottle and Bisque into the field, without your Style and Tablet: you will find as well Minerva as Diana in the woods and mountains.*

Plin. Ep. vi.
lib. 1. Cornes
lio Tacito.

And indeed the Poets thought of no other heaven upon earth, or elsewhere; for when Anchises was setting forth the felicity of the

BOOK IV. other life to his son, the most lively description he could make of it was to tell him,

—————Lucis habitamus opacis.

—————We dwell in shady Groves.

And when Æneas had travelled far to find those happy abodes,

Devenere locos letos, et amœna vireta
Fortunatorum nemorum, sedesque beatas.

They came to Groves, of happy souls the rest,
To Evergreens, the dwellings of the blest.

Such a prospect has Virgil given us of his Elysium; and therefore wise and great persons had always these sweet opportunities of recess, their *Domos Silve*, as we read, Reg. vii. 2, which were thence called Houses of Royal Refreshment; or, as the Septuagint, *Οίκους δρυμῶν*, not much unlike the Lodges in divers of our Noblemen's Parks and Forest-walks; which minds me of his choice in another Poem:

—————Pallas quas condidit arces,
Ipsa colat: nobis placeant ante omnia Sylvæ.

ECLOG. II.

In lofty towers let Pallas take her rest,
Whilst shady Groves 'bove all things please us best.

And for the same reason Mecænas

Maluit umbrosam Quercum—————

—————Chose the broad Oak—————

And as Horace bespeaks them,

—————Me gelidum nemus,
Nympharumque leves cum Satyris Chori
Secernant populo—————

Me the cool woods above the rest advance,
Where the rough Satyrs with the light Nymphs dance

And Virgil again,

Nostra nec erubuit Sylvas habitare Thalia.

Our sweet Thalia loves, nor does she scorn
To hunt umbrageous Groves—————

Or as thus exprest by Petrarch,

Silva placet Muis, urbs est inimica Poetis.

—————The Muse herself enjoys
Best in the woods; Verse flies the city noise.

So true is that of yet as noble a Poet of our own;

As well might Corn as Verse in cities grow:
In vain the thankless glebe we plough and sow:
Against th' unnatural soil in vain we strive:
'Tis not a ground in which these plants will thrive.

COWLEY.

When it seems they will bear nothing but Nettles and Thorns of Satire, and, as Juvenal says, by *Indignation* too; and therefore almost all the Poets, except those who were not able to eat bread without the bounty of great men, that is, without what they could get by flattering them, (which was Homer and Pindar's case) have not only withdrawn themselves from the vices and vanities of the great world, into the innocent felicities of Gardens and Groves, and Retiredness, but have also commended and adorned nothing so much in their never-dying Poems. Here then is the true Parnafus, Castalia, and the Muses; and at every call in a Grove of venerable Oaks, methinks I hear the answer of an hundred old Druids, and the Bards of our inspired ancestors.

In a word, so charmed were Poets with those natural shades, especially that of the Platanus, that they honoured temples with the names of Groves*, though they had not a tree about them. Nay, sometimes one stately tree alone was so revered: And of such a one there is mention in a fragment of an inscription in a garden at Rome, where there was a temple built under a spreading Beech-tree, sacred to Jupiter, under the name of *Fagutalis*.

* "Αση να-
λῆτες τὰ ἱερὰ
πάντα, καὶ ἢ
ἴδω ἐς πῦρ
ἴα) κοσμοσιν.
Strab. lib. ix.

Innumerable are the testimonies I might produce in behalf of Groves and Woods out of the Poets, Virgil, Grattius, Ovid, Horace, Claudian, Statius, Silius, and others of later times, especially the divine Petrarch, (for *scriptorum chorus omnis amat nemus*) were I minded to swell this charming subject beyond the limits of a chapter. I think only to take notice, that theatrical representations, such as were those of the Ionian, called Andria, the scenes of pastorals, and the like innocent rural entertainments, were of old adorned and trimmed up *de ramis et frontibus, cum*

BOOK IV. *racemis et corymbis*, and frequently represented in Groves, as the learned Scaliger shows. Here the most beloved and coy mistress of Apollo rooted; and, in the walks and shades of trees*, the noblest raptures have been conceived, and poets have composed verses which have animated men to heroic and glorious actions: Here Orators (as we showed) have made their panegyrics, Historians grave relations, and the profound Philosophers have loved here to pass their lives in repose and contemplation.

* See Wower, de Umbra, cap. xxvi. Bisciola Horæ subces. cap. 9.

Nor were the Groves thus frequented by the great Scholars and the great Wits only, but by the greatest Statesmen and Politicians also. Thence that of Cicero speaking of Plato, with Clinias and Megillus, who were used to discourse *de Rerumpublicarum institutis, et optimis legibus*, in the Groves of Cypress, and other umbrageous recesses. It was under a vast Oak, growing in the park of St. Vincent, near Paris, that St. Louis was used to hear complaints, determine causes, and do justice to such as resorted thither: And we read of a solemn treaty of peace held under a flourishing Elm between Gisors and Treves, which was afterwards felled by the French King Philip in a rage against King Henry II. for not agreeing to it. Nay, they have sometimes been known to crown their Kings under a goodly Tree, or in some venerable Grove, where they had their stations and conventions; for so they chose Abimelech: See Tostatus upon Judg. ix. 6. I read (in Chronicon Jo. Bromton) that Augustin the Monk (sent hither from the Pope) held a kind of council under a certain Oak in the West of England, and that concerning the great question, namely the right celebration of Easter, and the state of the Anglican Church, &c. where also it is reported he did a great miracle. In the mean-time I meet with but one instance where this goodly tree has been (in our country) abused to cover impious designs, as was that of the arch-rebel Kett, who, in the reign of Edward VI. (becoming leader to that fanatic insurrection in Norfolk) made an Oak (under the specious name of * Reformation) the court, council-house, and place of convention, whence he sent forth his traitorous edicts: The history and event of which, to the destruction of the rebel and his followers, together with the sermon (call it speech, or what you please) which our then young Matthew Parker (afterward the venerable and learned Archbishop of Canterbury) boldly pronounced on it, to reduce them to obedience, is most elegantly described in Latin, and in a style little inferior to the antients, by our countryman Alexander Nevill, in his *KETTUS: Sive de furoribus Norfolkensium KETIO Duce*. But to return: The Athenians were wont to

* *Quercus Reformationis.*

consult of their gravest matters and public concerns in Groves. Famous for these assemblies were the Ceraunian, and at Rome the Lucus Petilinus, the Farentinus, and others, in which there was held that renowned Parliament after the defeat of the Gauls by M. Popilius; for it was supposed that in places so sacred they would faithfully and religiously observe what was concluded amongst them:

In such green palaces the first kings reign'd,
Slept in their shades, and angels entertain'd:
With such old counsellors they did advise,
And by frequenting sacred Groves grew wise.
Free from th' impediments of light and noise,
Man thus retir'd, his nobler thoughts employs.

WALLER.

As our excellent poet has described it. And, amongst other weighty matters, they treated of matches for their children, and the young people made love in the cooler shades, and engraved their mistresses names upon the bark, *Tituli arcis literis insculpti*, as Pliny speaks of that ancient Vatican Hlex; and Euripides, in Hippolyto, shows us how they made the incision whisper their soft complaints, like that of Aristænetus, *Τῶν δὲ ἰδίῃ δὲ δίδραξα*, &c. and wish that it had but a soul and voice to tell Cydippe, the fair Cydippe, how she was beloved: And doubtless this character was antienter than that on paper. Let us hear the amorous Poet leaving his young couple thus courting each other:

Lib. xvi. cap. 41.

Incisæ servant à te mea nomina Fagi:
Et legor Oenone falce notata tuâ.
Et quantum trunci, tantum mea nomina crescunt:

Crescite, et in titulos surgite recta meos.

OVID. Ep.

Each Beech my name yet bears, carv'd out by thee,
Paris and his Oenone fill each tree;
And as they grew the letters larger spread;
Grow still a living witness of my wrongs when dead.

Which doubtless he learnt of Maro, describing the unfortunate Gallus:

—————Tenerisque meos incidere amores
Arboribus: Crescent ille, crescentis amores.

ECLOG. X.

There on the tender bark to carve my love;
And as they grow so may my hopes improve.

And these pretty monuments of courtship, I find, were much used on the

BOOK IV. Cherry-tree, (the wild one I suppose) which has a very smooth rind, as the witty Calphurnius :

Dic age: nam Cerasi tua cortice verba notabo,
Et decisa feram rutilanti carmina libro.

Repeat, thy words on Cherry bark I'll take,
And that red skin my table-book will make.

Let us add the sweet Propertius :

Ah quoties teneras resonant mea verba sub umbras,
Scribitur et vestris Cynthia Corticibus. Lib. i. Eleg. xviii.

Theocrit. Epithal. Helena. Idyll. 15. And so deep were the incisions made, as that of Helena * on the Platan, (*ως παλιὰ τις αναγιάν*) that one might run and read them. And thus forsaken lovers appeal to Pines, Beeches, and other trees of the forest. But we have dwelt too long on these trifles, omitting also what we might relate of feasting, banqueting, and other splendid entertainments under trees, nay, sometimes in the very bodies of them. We will now change the scene, as the Egyptians did the mirth of their guests, when they served in a scull to make them more serious : For thus,

Amongst other uses of Groves, I read that some nations were wont to hang, not malefactors only, but their departed friends, and those whom they most esteemed, upon trees, as so much nearer to heaven, and dedicated to God, believing it far more honourable than to be buried in the earth. And that some affected to repose rather in these woody places, Propertius seems to speak :

Di faciant, mea ne terrâ locet ossa frequenti
Quâ facit absiduo tramite vulgus iter.
Post mortem tumuli sic infamantur amantum,
Me tegat arboreâ devia terra comâ.

The gods forbid my bones in the high road
Should lie, by every wand'ring vulgar tread.
Thus buried lovers are to scorn expos'd:
My tomb in some by-arthor be inclos'd.

The same is affirmed of other septentrional people by Chr. Cilicæ de Bello Dithmarsico, lib. i. It was upon the trunk of a knotty and sturdy Oak the ancient heroes were wont to hang the arms and weapons taken

from the enemy, as trophies; as appears in the yet remaining stump of Marius at Rome, and the reverses of several medals. Famous for this was the pregnant Oleaster which grew in the Forum of Megara, on which the heroes of old left their shields and bucklers, and other warlike harness, till in process of time it had covered them with successive coats of bark and timber, as it was afterwards found when Pericles sacked the city, which the Oracle predicted should be impregnable, till a tree should bring forth armour*. We have already mentioned Rebekah, and read of Kings themselves that honoured such places with their sepulchres: What else should be the meaning of 1 Chron. x. 12. when the valiant men of Jabesh interred the bones of Saul and Jonathan under the Oak? Famous was the Hymethian Cæmetry where Diaphon lay. Ariadne's tomb was in the Amathusian Grove in Crete, now Candy; for they believed that the spirits and ghosts of men delighted to expatiate and appear in such solemn places, as the learned Grotius notes from Theophylact, speaking of the Dæmons, upon Matth. xvii. 18; for which cause Plato gave permission, that trees should be planted over graves, to obumbrate and refresh them. The most antient *Conditoria* and burying places were in such nemorous solitudes. The Hypogeum in Machpelah, purchased by the patriarch Abraham of the sons of Heth, Gen. xxiii. for Sarah, his own dormitory, and family sepulchre, was conveyed to him with particular mention of all the Trees and Groves about it; and this is the very first precedent I ever read of conveying a purchase by a formal deed.

BOOK IV.

* Diod. Sic.
lib. xii.

Our blessed Saviour, as we shall show, chose the garden sometimes for his Oratory—and dying, for the place of his Sepulchre; and we do avouch for many weighty causes, that there are no places more fit to bury our dead in than our gardens and groves, or airy fields, *sub dio*, where our beds may be decked and carpeted with verdant and fragrant flowers, trees, and perennial plants, the most natural and instructive hieroglyphics of our expected resurrection and immortality; besides what they might conduce to the meditation of the living, and the taking off our cogitations from dwelling too intently upon more vain and sensual objects; that custom of burying in churches, and near about them, (especially in great and populous cities) being a novel presumption, indecent, sordid, and very prejudicial to health; for which I am sorry it is become so customary. Graves and sepulchres were, of old, made and erected by the sides of the most frequented highways, which being many of them mag-

BOOK IV.

nificent Structures and Mausoleums, adorned with statues and inscriptions, (planted about with Cypress and other Evergreens, and kept in repair,) were not only graceful, but a noble and useful entertainment to the travellers, putting them in mind of the virtues and glorious actions of the persons buried; of which, I think, my Lord Verulam has somewhere spoken. However, there was certainly no permission for any to be buried within the walls of Rome, almost from the very foundation of it; for so was the Sanction, XII. Tab. *IN URBE NE SEPELITO NEVE URITO*, “neither to bury or burn the dead in the city.” And when long after they began to violate that law, Antoninus Pius, and the Emperor succeeding, did again prohibit it. All we meet of antient to the contrary, is the Tomb of Cestius, the Epulos, which is a thick clumsy pyramid yet standing, *nec in Urbe, nec in Orbe*, as it were, but half *in*, and half *without* the wall. If then it were counted a thing so profane to bury in the cities, much less would they have permitted it in their temples: nor was it in use among Christians, who, in the primitive ages, had no particular Cœmeteria; but when (not long after) it was indulged, it was to Martyrs only *ad limina*, and in the porches, even to the deposita of the Apostles† themselves. Princes indeed, and other illustrious persons, founders of churches, &c. had sometimes their Dormitories near the Basilicæ and Cathedrals, a little before St. Augustin’s time, as appears by his book *de cura pro mortuis*, and the concession was not easily obtained. Constantine, son to the Great Constantine himself, did not, without leave, inhumè his Royal Father in the church-porch of that august fabrick, though built by that famous Emperor: And yet after this, other great persons placed their sepulchres no nearer than towards the church-walls, whilst, in the body of the church, they presumed no farther for a long time after, as may be proved from the Capitula of Charlemagne; nor hardly in the city, till the time of Gregory the Great: and when connived at, it was complem’d of. We find it forbidden (as to churches) by the Emperors Gratian, Valentinian, and Theodosius; and so in the Code, where the sanction runs thus: *Nemo Apostolorum vel Martyrum solum humanis corporibus existimet esse concessum*, † &c. And now, after all this, would it not raise our indignation to see so many exterior’s, luxurious, profane, and very mean persons, without merit, not only allowing, but permitted to lay their carcases, not in the nave and body of the church only, but in the very chancel, next the communal table, ruffling up the pavements, removing the seats, &c. for some little gratification of those who should have more respect to decency at least, if for no other!

* See that passage of the famous Civilian Baldwin, ed. Reg. XII. Tab.

Chrys. Hom. xxvi. Epist. ad Corinth.

† Greger, Lucii de Pom. Christ. cap. 8. Cœpior. de Bona Sepul.

The fields, the mountains, the highway-sides, and gardens, were thought honourable enough for those funeral purposes: Abraham and the Patriarchs (as we have showed) had their Caves and Cryptæ in the fields, set about with trees: The kings of Judah had their sepulchres in their palaces, and not in the sanctuary and temple: And our most blessed Saviour's Sepulchre was in a garden: which indeed seems to me to be the most proper and eligible, as we have already showed; nor even to this day do the Greeks and Eastern Christians bury in churches, as is well known. A remarkable instance apposite to this, we have of a worthy person of our own country, Mr. Burton, great grandfather of the learned Author who writ the Commentary on Antoninus's Itinerary; which, for its laudable singularity, I present my reader the description of.

*In Agro Salopiensi, Longnore, ad Sabrinam Fl. ad piscinas in horto juxta
ades Patruelis mei Francisci Burtoni, Proavi mei Epitaphium*.*

1558.

Quod scelus? an Christi nomen temerare quod ausus,
Huic velitum sacro condere membra solo?
Di melius—sincera fides, nec tramite veri
Devia, causa: illo tempore, grande nefas.
Urbibus insultat nostris dum turbida ROMA;
Rasaque gens facris dat sua jura locis;
Nec sacri ritus, nec honores funeris, intra
Mœnia, Christicolis, heu male sancta! piis.
At referens Dominum inculptæ munere vitæ,
Ad Domini Exemplar funera nactus erat.
Ille ut odorifero tumulatus marmore in horto,
Ossa etiam redolens hortus et hujus habet;
Hic ubi et expectat, felix! solantia verba;
“Euge age! Mercedem jam, Bone Serve, cape.”

* His great grandson has thus recorded his death, which was very remarkable: “Having been under the persecution for his religion in the days of Queen Mary, and obliged to live very retired, in order to escape from her fury, sitting one day in his upper parlour at Longnor, he heard a general ring of all the bells in Shrewsbury; his right-divining soul strait told him that it was for the death of Queen Mary; he inquired, and having learned that it was certainly so, through the excess of the joy which he conceived, instantly expired.” The Epitaph was written by Sir Andrew Corbet, A. D. 1614, in English, whence Mr. Burton, the Commentator on Antoninus, turned it into the Latin exhibited by Mr. Evelyn.

BOOK IV.

Thus, with the incomparable Sannazarius, *Non mihi fornicibus Pariis.*—
Sculptures and Titles, preferable to the proudest *Mausoleums*, I should choose.

The late elegant and accomplished Sir W. Temple, though he laid not his whole body in his garden, deposited the better part of it, his heart, there; and if my executors will gratify me in what I have desired, I wish my corpse may be interred as I have bespoke them; not at all out of singularity, or for want of a Dormitory, (of which there is an ample one annexed to the parish-church,) but for other reasons, not here necessary to trouble the reader with, what I have said in general being sufficient: However, let them order it as they think fit, so it be not in the church or chancel.

Plato, as we noted, permitted trees to be planted over sepulchres, to obumbrate the departed; but with better reason we adorn their groves with flowers and redolent plants, just emblems of the life of man, which has been compared in Holy Scripture to those fading beauties, whose roots being buried in dishonour, rise again in glory. Of such hortulan instances, Gruter gives us this inscription:

V. F.
T. VETTIUS. T. L.
HERMES
SEPLASARIUS
MATER. GENUIF. MATER. RECEPIT
III. HORTI. ITA. UTI. OPT. MAXIMI. Q. SUNT
CINERIBUS. SERVIA. NT. MEIS
NAM. CURA. FORES. SUBSTITUAM
QUI. VESCAN. TUR
EX. HORVM. HORTORUM. REDITU
NATALI. MEO
ET. PRAEBEANT. ROSAM. IN. PERPETUUM
HOS. NEQUE. DIVIDI
NEQUE. ALIENARI. VOLO

This sweet flower, born on a branch full set with Thorns, and accompanied with the Lily, are natural hieroglyphics of our fugitive, umbratile,

anxious, and transitory life, which making so fair a show for a time, is not yet without its thorns and crosses. BOOK IV.

Of this kind, and the like antiquity, we could multiply instances; nor is the custom yet altogether extinct in my own native county of Surrey, and near my dwelling, where the maidens yearly plant and deck the graves of their defunct sweethearts with Rose-bushes; of which I have given account in the learned Mr. Gibson's edition of Camden^b; and for the rest, see Mr. Sumner of Garden-Burial, and the learned Dr. Cave's Primitive Christianity.

And now let not what I have said concerning the pious Dr. Hammond's Paraphrase in the Text, of Hortulan Burial, be thought foreign to my subject, since it takes in the custom of it in the Groves, and shady

^b "At Ockley, in Surrey, there is a certain custom, observed time out of mind, of planting Rose-trees upon the Graves, especially by the young men and maids who have lost their lovers, so that this churchyard is now full of them. It is the more remarkable, because we may observe it to have been antiently used both among the Greeks and Romans, who were so very religious in it, that we find it often annexed as a codicil to their wills, as appears by an old inscription at Ravenna, and another at Milan, by which they ordered roses to be yearly strewed and planted upon their graves. Hence that of Propertius, Lib. i. El. 2. implying the usage of burying amidst roses, *Et tenera poneret ofsa Rosâ*; and old Anacreon, speaking of it, says, that it does *νεποις ἀποθνή* "protect the dead." Camd. Brit. Vol. 1. p. 236.

It is the universal practice in South Wales to strew Roses and all kinds of flowers over the graves of their departed friends. Shakespear has put the following lines into the mouth of a young Prince, who had been educated, under the care of a supposed shepherd, in that part of the island:

—————With fairest flowers,
Whilst summer lasts, and I live here, *Fidèle*,
I'll sweeten thy sad grave. Thou shalt not lack
The flow'r that's like thy face, pale Primrose; nor
The azur'd Hare-bell, like thy veins; no, nor
The leaf of Eglantine; which not to slander,
Out-sweeten'd not thy breath.

CYMBELINE.

Morestellus cites an Epitaph where Publica Cornelia Annia declares, that she would not survive her husband to live in desolate widowhood, but had therefore voluntarily shut herself up in his sepulchre, to remain with him, with whom she had lived twenty years in peace and happiness; and then orders her freed-men and freed-women to come every year to their sepulchre, to sacrifice there to Pluto and Proserpine, to adorn the sepulchre with Roses, and to feast there upon the remainder of the sacrifice.

and solemn places, as I have already showed: And thus, like the Yew, planted in our country churchyards, the Cypresses, growing so like a shroud as does that sepulchral tree, and other perennial greens, emblems of immortality, and a flourishing state to come, were not less proper to shade our natural bed, would our climate suffer it.

Let us return then to Groves, and for diversion add a short recital of the most famous Groves which we find celebrated in histories; since those, besides many already mentioned, were such as, being consecrated both to gods and men, bore their names. Amongst these are reckoned such as were sacred to Minerva, Isis, Latona, Cybele, Osiris, Æsculapius, Diana, and especially the Aricinian, in which there was a goodly temple erected, placed in the midst of an island, with a vast lake about it, a mount and a grotto adorned with statues, and irrigated with plentiful streams: And this was that renowned recess of Numa, where he so frequently conversed with his *Ægeria*, as did Minos in the cave of Jupiter; and by whose pretended inspirations they gained the deceived people, and made them receive what laws they pleased to impose upon them. To these we may join the Groves of Vulcan, Venus, and the little youth Cupid; of Mars, Bellona, Bacchus, Silvanus, and that of the Muses near Helicon, dedicated by the same Numa, their great patron; and hence had they their name *Camænæ*¹. In this was the noble statue of Eupheme, nurse to those Poetical Ladies: and so the Feranian, and even *Mons Parnassus*, were thick shaded with trees. Nor may we omit the more impure *Lupercal Groves*, sacred, or profaned rather, yet most famous for their affording shelter and foster to Romulus and his brother Remus

That of Vulcan was usually guarded by dogs, like the town of St. Malo in Bretagne: The Pineæ Silva appertained to the mother of the gods, as we find in Virgil. Venus had several Groves in Egypt, and in the Indian

¹The learned and ingenious Mr. Bryant is the only person who has given us a satisfactory derivation of the word *Camænæ*. He says, the Camænæ of Latium, who were supposed to have shown the sacred Fountain to the Vestals, were probably the original Priestesses, whose business it was to fetch water for Lustrations from that Stream. For Cam-Ain (in the Amonian language) is the Fountain of the Sun: and the Camænæ were named from their attendance upon that Deity. The Hymns in the temples of this god were sung by these women: Hence the Camænæ were made Presidents of Music. *Analisis*, Vol. I.

island, where once stood those famous statues cut by Praxiteles; another also in Pontus, where, if you believe it, hung up the Golden Fleece, meed of the bold adventurer. Nor was the watery king Neptune without his Groves: the Helicean in Greece was his. So Ceres, and Proserpine, Pluto, Vesta, Castor and Pollux, had such shady places consecrated to them. Add to these the Lebadian, Arsinoan, Paphian, Senonian, and such as were in general dedicated to all the gods, for

BOOK IV.


—————Habitarent Di quoque Silvas.

—————Gods have dwell in Groves.

To the memory of famous men and heroes were consecrated the Achillean, Aglauran, and those to Bellerophon, Hector, and Alexander; to others also who disdained not to derive their names from trees and forests, as Silvius the Posthumous of Æneas, and divers of the Albanian Princes and great persons; Stolon, Laura, Daphnis, &c. And a certain custom there was for the parents to plant a tree at the birth of an heir or son, presaging by the growth and thriving of the tree the prosperity of the child: Thus we read in the life of Virgil, how far his natalitial Poplar had outstripped the rest of its contemporaries. And the reason doubtless of all this was the general repute of the sanctity of those places; for no sooner does the Poet speak of a Grove, but immediately some consecration follows, 'as believing that out of those shady profundities some deity must needs emerge:

Quo possis viso dicere Numen inest.

So as Tacitus (speaking of the Germans) says, *Lucos et Nemora consecrant, Deorumque nominibus appellant secretum illud, quod solum reverentia vident*: To the same purpose, Pliny, lib. xii. cap. 1. tells us, *Arbores juere Numinum templa*, in which (says he) they did not so much revere the golden and ivory statues, as the goodly trees and awful silence: and the consecration of these nemorous places, together with the express rites thereof, we find in Quintus Curtius, and in what Paulus Diaconus relates of the Longobards, who not being capable of philosophising on the physical cause, which they deemed supernatural, and plainly divine, were allured, as it is likely, by the gloominess of the shade, procreancy and

BOOK IV. altitude of the stem, floridness of the leaves, and other accidents; so as
 to use the words of Prudentius,

Quos penes omne sacrum est, quicquid formido tremendum
 Suaserit horrificos quos prodigialia cogunt
 Credere monstra Deos————

Lib. i. *Cont. Sym.*

Here all religion paid; whose dark recess
 A sacred awe does on their minds impress,
 To their wild gods————

And this deification of their trees, amongst other things, besides their age and perennial veridity, says Diodorus, might spring from the manifold use which they afforded, and which haply had been taught them by the gods, or rather by some godlike persons, whom for their worth, and the public benefit, they esteemed so; and it might be a motive to this reverence, that divers of them were voiced to have been metamorphosed from men into trees, and again out of trees into men, as the Arcadians gloried in their birth, when

Gensque virum, truncis, et rupto Robore nati.
 Out of the teeming bark of Oaks men burst:

Which perhaps they fancied, by seeing men creep sometimes out of their cavities, in which they often lodged and secured themselves^k.

Quippe aliter tunc orbe novo caeloque recenti
 Vivebant homines, qui rupto Robore nati.

JUVEN. lib. ii.

For in the earth's nonage under heav'n's new frame,
 They stricter liv'd, who from Oaks' rupture came.

^k It is highly probable that the inhabitants of all uncivilized woody countries take up their habitations in the trunks of trees. Captain Cook, in his description of New Holland, says, “many of their largest trees were converted into comfortable habitations. These had their trunks hollowed out by fire, to the height of six or seven feet; and that they take up their abode in them sometimes, was evident from the hearths, made of clay, to contain the fire in the middle, leaving room for four or five persons to sit round it. At the same time these places of shelter are durable; for they take care to leave one side of the tree sound, which is sufficient to keep it growing as luxuriantly as those which remain untouched.”

Or as the sweet Papinius again :

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————— Nemorum vos stirpe rigenti
Fama satos, cum prima pedum vestigia tellus
Admirata tulit, nondum arva, domusque ferebant
Cruda puerperia, ac populos umbrosa creavit
Fraxinus, et fætâ viridis puer excidit Orno :
Hi lucis stupuisse vices, noctisque feruntur
Nubila, et occiduum longe Titana secuti
Desperasse diem——

Fame goes, that ye brake forth from the hard rind,
When the new earth with the first feet was sign'd ;
Fields yet nor houses doleful pangs reliev'd,
But shady Ash the num'rous births receiv'd,
And the green babe dropp'd from the pregnant Elm,
Whom strange amazement first did overwhelm
At break of day, and when the gloomy night
Ravish'd the sun from their pursuing sight,
They gave the day for lost——

Almost like that which Rinaldo saw in the enchanted forest :

Quercia gli appar, che per se stessa incisa
Aprè feconda il cavo ventre, è figlia ;
E n'esce fuor vestita in strana guisa
Ninfâ d'età cresciuta——

CANTO 13.

A lab'ring Oak a sudden cleft disclos'd,
And from its bark a living birth expos'd ;
Where (passing all belief) in strange array,
A lovely damsel ifs'd to the day.

And that every great tree included a certain tutelar genius or nymph, living and dying with it, the Poets are full ; a special instance we have in that prodigious Oak which fell by the fatal stroke of Erisichthon ; but the Hamadryads, it seems, were immortal, and had power to remove and change their wooden habitations.

In the mean while, as the fall of a very aged Oak, giving a crack like thunder, has often been heard at many miles distance, (constrained though I often am to fell them with reluctance,) I do not at any time remember to have heard the groans of those nymphs (grieving to be dispossesed of

BOOK IV.


their antient habitations) without some emotion and pity. Now to show that many such disasters as that which befel Erisichthon have happened to the owners of places where goodly trees have been felled, I cannot forget *one*, who giving the first stroke of the ax with his own hand, and doubtless pursuing it with more, killed his own *Father* by the fall of the tree, not without giving the uncautious *Knight* (for so he was) sufficient warning to avoid it. And here I must not pass by the *Groaning-Board* which they kept for a while in Southwark, drawing abundance of people to see the wonder; such another plant had been formerly, it seems, exposed as a miracle at *Caumont*, near *Thoulouse*, in France; and the like sometimes happens in woods and forests, through the inclusion of the air within the cavities of the timber; and something of this kind perhaps was hertofore the occasion of the fabulous *Dodonean Oracle*. But however this were, methinks I still hear, sure I am that I still feel, the dismal groans of our forests, when that late dreadful hurricane (happening on the 26th of November, 1703) subverted so many thousands of goodly Oaks, prostrating the trees, laying them in ghastly postures, like whole regiments fallen in battle by the sword of the conqueror, and crushing all that grew beneath them. Such was the prospect of many miles in several places, resembling that of mount Taurus, so naturally described by the Poet, speaking of the fall of the Minotaurs slain by Theseus:

—————*Illa procul radicibus exturbata*
Prona cadit, late quæcumvis obvia frangens.

The losses and dreadful stories of this ruin were indeed great, but how much greater the universal devastation through the kingdom! The public accounts reckon no less than 3000 brave Oaks in one part only of the Forest of Dean blown down; in New-Forest in Hampshire, about 4000; and in about 450 Parks and Groves, from 200 large trees to 1000 of excellent timber, without counting fruit and orchard trees *sans* number; and proportionably the same through all the considerable woods of the nation.

Sir Edward Harley had 1300 blown down; myself above 2000; several of which, torn up by their fall, raised mounds of earth near twenty feet high, with great stones intangled among the roots and rubbish; and this almost within sight of my dwelling, (now no longer * Wotton,) sufficient to mortify and change my too great affection and application to this work,

* Wood-Town.

which, as I contentedly submit to, so I thank God for what are yet left standing: *Nepotibus umbram*¹. BOOK IV. 

Lactantius reports of a people who worshipped the *Wind*, as some at this day among the Indians do the *Devil*, that he may do them no harm.

¹ This dreadful tempest is most pathetically described by the Rev. Mr. Winter, in an annual sermon, instituted by Mr. Taylor, for the commemoration of that awful visitation. The Preacher says, "It was in the year 1703, that this great tempest visited Europe, and spent its main force on the British islands. A strong west wind set in about the middle of November. Instead of subsiding, every day, and almost every hour, increased its force. On Wednesday the 24th, it blew furiously and did some damage. Its violence was still augmented so much, that on Friday the 26th, it became awfully tremendous, and the most dreadful consequences were with reason apprehended. It was not however till Saturday the 27th, about six in the morning, that it arose to its greatest height. Those who have written any account of this calamity, agree in their testimony, that it exceeded any storm that had happened in the memory of man, or that could be found in any history. The violence of the wind, the length of its continuance, the prodigious extent to which it spread, and the innumerable calamities produced by it, rendered it one of the most awful events in the history of the world, of which we have any knowledge, the general deluge excepted. Blessed be God that such judgments are indeed "his strange work," and that the wind is not often excited to such dreadful fury. In this city and its neighbourhood, more than 800 houses were laid in ruins, in most of which the inhabitants were personal sufferers, and some lost their lives. About 2000 stacks of chimnies were blown down in and about London. The lead which covered the roofs of 100 churches was rolled up, and hurled in prodigious quantities to great distances. The devastation spread also through the country; stacks of hay and corn innumerable, were thrown down and damaged. Multitudes of cattle were lost. In one level in Gloucestershire, on the banks of the Severn, 15000 sheep were drowned. A certain person set himself the task of numbering the trees that were torn up by the roots; but when he had proceeded through but a part of the county of Kent, he counted 250,000, when he relinquished the undertaking. But the greatest calamities were, as might be expected, on the water. In the river Thames, at least 500 wherries, 300 ship boats, and 200 lighters and barges were entirely lost, besides a much greater number that received considerable damage. The ships destroyed by this tempest were computed at 300. Of the Royal Navy, 12 ships were sunk with most of their crews. The Eddystone light-house, near Plymouth, was precipitated into the surrounding ocean, and in it perished Mr. Winstanley, its ingenious architect. Having been frequently told, that the edifice was too slight to withstand the fury of the wind and waves, he was accustomed to reply contemptuously, that he only wished to be in it when a storm should happen. Unfortunately, may we not say, as a warning against presumptuous confidence, his desire was gratified. Signals of distress were made, but in so tremendous a sea, no vessel could live, or would venture to put off for their relief."

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What this prince of the air did to *Job* and his religious family, for the trial of his patience, by God's permission, the Scripture tells us: And for what cause he still suffers that malicious spirit to exert his fury in these lower regions, the same God only knows; though certainly for our chastisement; and therefore reformation, submission, and patience, will become our best security.

Scaliger the Father affirms, he could never convince his learned antagonist Erasmus, but that trees feel the first stroke of the ax, and discover a certain resentment; and indeed they seem to hold the edge of the fatal tool, till a wider gap be made: And so exceedingly apprehensive they are of their destruction, that, as *Sorowster* says, if a man come with a sharp bill, intending to fell a *barren tree*, and a friend importunately deprecate the angry person, and prevail with him to spare it, the tree will infallibly bear plentifully the next year. Such is the superstitious sanctity and folly of some credulous people.

We might here indeed produce the wonderful strange apparitions of spirits interceding for the standing and life of trees, when the ax has been ready for execution, as you may see in the hymn of Callimachus to Apollo, Pausanias, and the famous story of Paræbius, related by Apollonius in 2. *Argonaut.* with the fearful catastrophe of such as causelessly and wantonly violated those goodly plantations, (from which fables arose that of the Dodonean and Vocal Forests, frequent in heathen writers;) but none so elegantly as in that tale by the witty Ovid, describing the fact of the wicked Erisichthon:

As fame reports, his hand an ax sustain'd,
Which Ceres' consecrated Grove prophan'd;
Which durst the venerable gloom invade,
And violate with light the awful shade.
An antient Oak in the dark centre stood,
The Covert's glory, and itself a Wood:
Garlands embrac'd its shaft, and from the boughs
Hung tablets, monuments of prosperous vows.
In the cool dusk its unpiere'd verdure spread,
The Dryads oft their hallow'd dances led;
And oft, when round their gaging arms they cast,
Full fifteen ells it measur'd in the waist:
Its height all under standards did surpass,
As they aspir'd above the humbler grafs.



These motives, which would gentler minds restrain,
 Could not make Triope's bold son abstain;
 He sternly charg'd his slaves with strict decree,
 To fell with gashing steel the sacred tree.
 But whilst they, ling'ring, his commands delay'd,
 He snatch'd an ax, and thus blaspheming said:
 Was this no Oak, nor Ceres' favourite care,
 But Ceres' self, this arm, unaw'd, should dare
 Its leafy honours in the dust to spread,
 And level with the earth its airy head.
 He spoke, and as he pois'd a slanting stroke,
 Sighs heav'd, and tremblings shook the frighted Oak:
 Its leaves look'd sickly, pale its acorns grew,
 And its long branches sweat a chilly dew.
 But when his impious hand a wound bestow'd,
 Blood from the mangled bark in currents flow'd.
 When a devoted bull of mighty size,
 A sinning nation's grand atonement, dies;
 With such a plenty from the spouting veins,
 A crimson stream the turfy altar stains.
 The wonder all amaz'd; yet one more bold,
 The fact dissuading, strove his ax to hold:
 Eut the Thesalian, obstinately bent,
 Too proud to change, too harden'd to repent,
 On his kind monitor, his eyes, which burn'd
 With rage, and with his eyes his weapon turn'd;
 Take the reward, says he, of pious dread:
 Then with a blow lopp'd off his parted head.
 No longer check'd, the wretch his crime pursu'd,
 Doubled his strokes, and sacrilege renew'd;
 When from the groaning trunk a voice was heard,
 A Dryad I, by Ceres' love preferr'd,
 Within the circle of this clasping rind
 Coëval grew, and now in ruin join'd;
 But instant vengeance shall thy sin pursue,
 And death is cheer'd with this prophetic view.

At last the Oak with cords enforc'd to bow,
 Strain'd from the top, and sap'd with wounds below,
 The humbler Wood, partaker of its fate,
 Crush'd with its fall, and shiver'd with its weight.

DRYDEN.

But a sad revenge follows it, as the Poet will tell you: And one might fill a just volume with the Histories of Groves that were violated by wicked men who came to fatal periods, especially those upon which the

BOOK IV. Mistleto grew, than which nothing was reputed more sacred, for amongst such Oaks the Druids usually dwelt,

—————Nemora alta remotis
Incolitis Lucis—————

LUCAN.

and with whose leaves they adorned and celebrated their religious rites. “The Druids,” says Pliny, lib. xvi. cap. xlv. “for so they call their Divines, esteem nothing more venerable than Mistleto, and the Oak upon which it grows.” Indeed they did nothing of importance without some leaves or branches of this tree, and they esteemed its very *excescence* as sent from heaven. The Mistleto was not to be gathered, but cut by the Priest with a golden ax, praying for a blessing upon the Divine Gift; after this two white bulls were offered up as a sacrifice. But for this consult (besides Pliny) *Mela*, *Lactantius*, *Eusebius de preparat. Evangel.* and the *Aulularia* of *Pseudo-Plautus*, *Camden*, and others; whilst as to that *excescence*, I relate the disasters which happened to two men who, not long since, felled a goodly tree, called the *Vicar's Oak*, standing at *Norwood*, (not far from *Croydon*) partly belonging to the Archbishop, and was limit to four parishes which met in a point; on this Oak grew an extraordinary branch of Mistleto, which in the time of the *sacrilegious usurpers* they were wont to cut and sell to an apothecary of London; and though warned of the misfortunes observed to befall those who injured this *plant*, proceeded not only to cut it quite off, without leaving a sprig remaining, but to demolish and fell the Oak itself also. The first soon after lost his eye, and the other broke his leg, as if the *Hamadryads* had revenged the indignity.

It is reported that the *Minturnensian Grove* was esteemed so venerable, that a stranger might not be admitted into it; and the great Xerxes himself, when he passed through *Achaia*, would not touch a Grove which was dedicated to Jupiter, commanding his army to do it no violence; and the honours he did to one single (but a goodly) *Platanus*, we have already mentioned. The like to this we find when the Persians were put to flight by *Pausanias*; though they might have saved their lives by it, as appears in the story. The same reverence made *Hercules* not so much as taste the waters of the *Ægerian Groves*, after he slew *Cacus*, though extremely thirsty.

—At talibus alma sacerdos
 Puniceo canas stamine vincta comas :
 Parce oculis, hospes, Lucoque abscede verendo,
 Cede agedum, et tuta limina linque fuga.
 Interdicta viris metuenda lege piatur,
 Quæ se summota vindicat ara casa.
 Di tibi dent alios fontes—

BOOK IV.



PROPERT. l. iv.

—The priestess said,
 (A purple fillet bound her hoary head)
 Stranger, pry not, but quit this shady seat :
 Avant, and whiles thou safely may'st, retreat.
 To men forbid, and by hard sanction bound :
 Far better other springs were by thee found.

Nor indeed was it lawful to hunt in such places, unless it were to kill for sacrifice, as we read in Arrianus ; whence it is reported by Strabo, that in the Ætolian Groves, sacred to Diana, the beasts were so tame, that the very wolves and stags fed together like lambs, and would follow a man licking his hands, and fawning on him. Such a Grove was the *Crotonian*, in which Livy writes, there was a spacious field stored with all sorts of game. There were many forests consecrated to *Jupiter*, *Juno*, and *Apollo* ; especially the famous *Epidaphne*, near the *Syrian Antioch*, which was most incomparably pleasant, and adorned with fountains and rare statues.

* There was to be seen the *Laurel* which had been his chaste *Mistress*, and in the centre of it his *Temple*, an *Asylum* : Here it was that *Cosroes* and *Julian* did sacrifice upon several occasions, as *Eusebius* relates, but could not with all their impious arts obtain an answer, because the holy *Babylas* had been interred near that Oracle ; for which it was reputed so venerable, that there remained an express Title in the Code, *de Cupressis ex Luco Daphnes non excidendis vel venundandis*, “ that none should either fell or sell any of the trees about it ; ” which may serve for another instance of their burying in such places. The truth is, so exceedingly superstitious they were, and tender, that there was almost no meddling with these devoted trees ; and even before they did but *conlucare* or prune one of them, they were first to sacrifice, lest they might offend in something ignorantly : But to *cut down* was *capital*, and never to be done away with any offering whatsoever ; and therefore *conlucare* in authors is not (as some pretend) *succidere*, but to *prune* the branches only ; and yet even this gentle tourse of superfluities was reputed a kind of contamination, unless in the case of *Lightning*, when *Cælo tacta*, a whole tree might quite be felled,

* See this delicious place elegantly described by S. Chrysostom, lib. de S. Babyl. tom. vi. p. 671. Sozom lib. vi. cap. xix. Niceph. lib. x. cap. xxviii.

Salmas. Exercit. Plin.

as marked by Heaven for the fire: But of this sufficient. We could indeed fill many sheets with the catastrophe of such as maliciously destroyed Groves, to feed either their revenge or avarice; see Plutarch in Pericles, and the saying of Pompeius. Cicero sharply reproves C. Gabinius for his prodigious spoil in Greece; and it was of late days held a piece of inhumanity in Charles the French King, when he entered the Grisons, after he had slain their leader, to cut down their woods; a punishment never inflicted by sober Princes, but to prevent Idolatry in the old Law; and to show the heinousness of disloyalty and treason by latter sanctions; in which case, and for terror, even a traitor's woods have become Anathema, as were easy to instance out of histories.

But what shall we say then of our late prodigious *Spoilers*, whose furious devastation of so many goodly woods and forests have bequeathed an *infamy* on their names and memories, not quickly to be forgotten! I mean our unhappy *Usurpers* and injurious *Sequestrators*; not here to mention the deplorable necessities of a gallant and loyal *Gentry*, who, for their *Compositions*, were many of them compelled to add yet to this *Waste*, by an inhuman and unparalleled *Tyranny* over them, to preserve the poor remainder of their *Fortunes*, and to find them *Bread*.

Nor was it here they desisted; for after the fate of that once beautiful Grove under Greenwich castle, (of late supplied by his present Majesty) even the royal walk of Elms in St. James's park

“That living gallery of aged trees,”

was once proposed to the late Council of State (as they called it) to be cut down and sold; that, with the rest of his Majesty's houses already demolished, and marked out for destruction, his trees might likewise undergo the same destiny, and no footsteps of *monarchy* remain unviolated.

It is from hence you may calculate what were the *designs* of those excellent *Reformers*, and the care these great *Statesmen* took for the preservation of their *country*, when, being *parties* in the *booty* themselves, they gave way to so dishonourable and impolitic a *waste* of that *material*, which being left entire, or husbanded with discretion, had proved the best support and defence of it. But this (say they) was the effect of *war*, and in the height of our *contentions*. No, it was a *late* and *cold* deliberation,

and long after all had been subdued to them; nor could the most implacable of *enemies* have expressed a resolution more barbarous. For, as our own incomparable Poet describes it, BOOK IV.

'Twas not enough alone to take the spoils
Of God's and the king's houses; these unjust
And impious men destroy the stately piles;
Of ev'ry ruin there's a wicked lust.

In every place the groaning carts are fill'd
With beams and stones; so busy and so loud
Are the proud victors, as they meant to build;
But they to ruin and destruction crowd.

Timber, which had been buried many years
Under such royal towers, they invade:
'Tis sure that hand the living never spares,
Which is so wicked to disturb the dead.

Then all the woods the barbarous victors seize,
(The noble nursery of the fleet and town,
The hopes of war and ornaments of peace)
Which once religion did as sacred own.

Now public use, and great convenience claims
The woods from private hands inviolate;
Which greedy men, to left devouring flames,
Do for sweet lucre freely dedicate.

No age they spare, the tender Elm and Beech,
Infants of thirty years they overthrow;
Nor could old age itself their pity reach,
No reverence to hoary barks they know.

The unhappy birds, an ever-singing choir,
Are driven from their antient shady seats,
And a new grief does Philomel inspire
With mournful notes, which she all night repeats.

Let them the woods and forests burn and waste,
There will be trees to hang the slaves at last;
And God, who such infernal men disclaims,
Will root 'em out, and throw 'em into flames:

In which he has showed himself as well a *Prophet* as a *Poet*.

BOOK IV.

We have spoken of the great Xerxes, that, passing conqueror through *Achaia*, he would not suffer his army to violate so much as a tree of his adversaries; and have sufficiently observed from the antients, that the Gods did never permit them to escape unpunished who were injurious to *Groves*. What became of Agamemnon's host after his spoil of the woods at *Aulis*? Histories tell us Cleomenes died mad: The *Temesian Genius* became proverbial; and the destructive fact that the enraged Cæsar perpetrated on the *Mafsilian* trees, went not long unrevenged, thus related by the poet, and an illustrious record of all we have hitherto produced, to assert their veneration.

Lucum Æsculapio dicatum
succiderat Turullius; manifestis
Numinis illius viribus, cum in
Lucum quem violaverat, ille attractus
est, effecitque Deus ut ibi potissimum
occideretur. Vide Valer. Max. lib. i.
cap. i. n. 19.

Lucus erat longo nunquam violatus ab ævo, &c.

LUCAN, lib. iii.

Not far away for ages past had stood
An old inviolated sacred wood;
Whose gloomy boughs, thick interwoven, made
A chilly, cheerless, everlasting shade:
There, nor the rustic gods, nor satyrs sport,
Nor fawns and sylvans with the nymphs resort:
But barb'rous priests some dreadful pow'r adore,
And lustrate ev'ry tree with human gore.
If mysteries in times of old receiv'd,
And pious antientry be yet believ'd,
There nor the feather'd songster builds her nest,
Nor lonely dens conceal the savage beast:
There no tempestuous winds presume to fly,
Ev'n lightnings glance aloof, and shoot obliquely by.
No wanton breezes tofs the dancing leaves,
But shiv'ring horror in the branches heaves.
Black springs with pitchy streams divide the ground,
And bubbling tumble with a sullen sound.
Old images of forms mishapen stand,
Rude and unknowing of the artist's hand;
With hoary filth begrim'd, each ghastly head
Strikes the astonish'd gazer's soul with dread.
No gods, who long in common shapes appear'd,
Where'er with such religious awe rever'd:
But zealous crowds in ignorance adore,
And still the less they know, they fear the more.
Oft (as fame tells) the earth in sounds of woe
Is heard to groan from hollow depths below:
'The baleful Yew, tho' dead, has oft been seen
To rise from earth, and spring with dusky green:
With sparkling flames the trees unburning shine,
And round their boles prodigious serpents twine.

The pious worshippers approach not near,
 But shun their gods, and kneel with distant fear :
 The priest himself, when, or the day, or night,
 Rolling have reach'd their full meridian height,
 Refrains the gloomy paths with wary feet,
 Dreading the dæmon of the grove to meet;
 Who, terrible to fight, at that fix'd hour,
 Still treads the round about his dreary bow'r.

This wood, near neighb'ring to the encompass'd town,
 Untouch'd by former wars remain'd alone ;
 And since the country round it naked stands,
 From hence the Latian Chief supplies demands.
 But lo ! the bolder hands that should have struck,
 With some unusual horror trembling shook ;
 With silent dread and reverence they survey'd
 The gloom majestic of the sacred shade :
 None dares with impious steel the bark to rend,
 Lest on himself the destin'd stroke descend.
 Cæsar perceiv'd the spreading fear to grow,
 Then, eager, caught an ax, and aim'd a blow.
 Deep sunk within a violated Oak
 The wounding edge, and thus the warrior spoke :
 Now let no doubting hand the task decline ;
 Cut you the wood, and let the guilt be mine.

And so it was, as he carried (it is thought) the *maledictions* of the incensed Gauls to his funeral pile :

————— Quis enim læsos impune putaret
 Eſſe Deos? —————

————— For who,
 The Gods thus injur'd, unreveng'd does go ?

But, lest this be charged with superstition, because the instances are heathen ; it was a more noble and remarkable, as well as recent example, when, at the siege of Breda, the late famous General Spinola commanded his army not to violate a tree of a certain wood belonging to the Prince of Orange there, though a reputed traitor, and in open defiance with his master. In sum, we read, that when Mithridates but deliberated about the cutting down of some stately trees which grew near Patara, a city of Lycia, though necessitated to it for the building of warlike engines with them, being terrified in a vision, he desisted from his purpose. It were to be wished that these, or the like examples, might have

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wrought some effects upon the sacrilegious *purchasers* and disloyal *invaders* in this iron age amongst us, who, to gratify an impious and unworthy avarice, have lately made so prodigious a spoil of those goodly forests, woods, and trees, which, being once the treasure and ornament of this nation, were doubtless reserved by our more prudent ancestors for the repairs of our floating castles, the safeguard and boast of this renowned island, when necessity, or some imminent peril should threaten it, or call for their assistance, and not transmitted to be devoured by these improvident wretches, who, to their eternal reproach, did, together with the Royal Patrimony, swallow likewise God's own inheritance.

Que tibi factorum penas instare tuorum Vaticinor—

Vide Met. l. 8. Apollon. l. 2. Argonaut. Prostermit Quercum funestam quam sibi Nympha Pignorisque suis fecit—

* At Wotton, in Surry.

But their sons and grand children we have lived to see as hastily disgorge them again, and with them all the rest of their holy purchases, which otherwise they might securely have enjoyed. But this, *in terrorem* only, and for caution to posterity, whiles we leave the guilty, and those who have done the mischiefs, to their proper Scorpions, and to their Erichthonian fate, or to that of the inexorable Paræbius, the vengeance of the Dryads; and to their tutelar better genius, if any yet remain who love the solid honour and ornament of their country: For, wood-born* as I am, what could I say less in behalf of those sacred shades, which both grace our habitations, and protect our nation!

One thing more I think not impertinent to hint, before I take my leave of this Book, concerning the use of Standing Groves: That in some places of the world they have no other water to drink than what their trees afford them; not only of their proper juice, (as we have noted) but from their attraction of the evening moisture, which impends in the shape of a cloud over them: Such a tuft of trees is in the island of Ferro; of which consult the learned Isaac Vossius upon Pomponius Mela, and Magnenus de Manna: The same likewise happeneth in the Indies: so that if their woods were once destroyed, they might perish for want of rains; upon which account Barbadoes grows every year more torrid, and has not near the rain it formerly enjoyed when it was better furnished with trees; and so in Jamaica, at Gunaboa, the rains are observed to diminish as their plantations extend: The like I could tell you of some parts of England not far from hence.

And now, lastly, to encourage those to plant that have opportunity, and

those who innocently and with reluctance are forced to cut down, and endeavour to supply the waste with their utmost industry: It is observed, that such planters are often blessed with health and old age, according to that of the prophet Isaiah, lx. 22. "The days of a tree are the days of my people." Of their extraordinary longevity we have given abundant instances in this Discourse; and it seems to be so universally remarked, that as Paulus Venetus (that great traveller) reports, the Tartarian Astrologers affirm, nothing contributes more to men's long lives, than the planting of many trees. *ILÆC SCRIPSI OCTOGENARIUS*, and shall, if God protract my years, and continue my health, be continually planting, till it shall please him to *transplant* me into those glorious regions above, the celestial paradise, planted with Perennial Groves and Trees, bearing immortal fruit; for such is the Tree of Life, which they who do his commandments have right to, Apoc. xxii. 2, 14, 20. *Ναὶ ἔρχεται τὰ χυμῶτα ἀμύρῃ καὶ ἔρχεται, Κύριε Ἰησοῦ Ἀμύρ.*

Thus my reader sees, and I acknowledge, how easy it is to be lost in the wood, and that I have hardly power to take off my pen whilst I am on this delightful subject; for what more august, more charming and useful, than the culture and preservation of such goodly plantations

That shade to our Grand-children give.

VIRGIL.

What affords so sweet and so agreeable refreshment to our industrious Woodman,

When he his wearied limbs has laid
Under a florid Platan's shade,

CLAUDIAN;

or some other goodly-spreading tree, such as we told you stopt the legions of a proud conqueror, and that the wise Socrates sware by?

But whilst we condemn this excess in them, Christians and true Philosophers may be instructed to make use of their enjoyments to better purposes, by contemplating the miracles of their production and structure^m. And what mortal is there so perfect an Atomist, who will under-

^m When the enlarged philosopher takes a survey of the structure of the heavens, his mind is impressed with an awful idea of the power and majesty of the Deity, and he bends

BOOK IV. take to detect the thousandth part, or point, of so exile a grain, as that insensible rudiment, or rather halituous spirit, which brings forth the lofty Fir-tree, and the spreading Oak? That trees of so enormous an height and magnitude, as we find some Elms, Planes, and Cypresses; that others hard as iron, and solid as marble, (for such the Indies furnish) should be swaddled and involved within so small a dimension, (if a point may be said to have any) and in so weak and feeble a substance, without the least luxation, confusion, or disorder of parts! That when they are buried in the moist womb of the earth, which so easily dissolves and corrupts substances so much harder, yet this, which is at first but a kind of tender mucilage, or rather rottenness, should be able in time to displace and rend asunder whole rocks of stone, and sometimes to cleave them beyond the force of iron wedges, so as even to remove mountains! That our tree, like man, (whose inverted symbol he is) being sown in corruption, rises in glory, and by little and little ascending into an hard erect stem of comely dimensions, becometh a solid tower, as it were! And that this, which but lately a single ant would easily have borne to his little cavern, should now become capable of resisting the fury, and braving the rage of the most impetuous storms, *magni mehercule artificis est, clausisse totum in tam exiguo* (to use Seneca's expression) *et horror est consideranti.*

Epist. 55.

For is it not plainly astonishing, how these minute atoms, rather than visible eggs, should contain the fœtus exquisitely formed, (even while yet wrapped in their secundines, like infants in the animal womb) till growing too big for their dark confinements, they break forth, and after

in silent reverence: But the man who views him through the medium of his lesfer works, forms to himself a closer, and more pleasing connection:


The men

Whom nature's works can charm, with God himself
Hold converse———

AKENSIDE.

A mind brought to such a state of harmony, has only to embrace REVELATION with zeal and fervency, in order to render the Christian character complete. Some there are who look upon this conjunction as unnecessary. My answer to them shall be in the words of Seneca:

Quocunque te flexeris, ibi Deum videbis occurrentem tibi.

a while more distinctly display every limb and member completely perfect, with all their apparel, tire, and trim of beautiful and flourishing vegetables, endowed with all the qualities of the species? BOOK IV. 

Contemplate we again what it is which begins the motion, and kindles the flame of these *Automata*, causing them first to radiate in the earth, and then to display their top in the air, so different poles (as I may call them) in such different mediums. What it is which imparts this elastic, peristaltic, and other motions, so very like to the sensible and perfectest animal. How they elect, and then introsume their proper food, and give suck as it were, to the yet tender infant, till it have strength and force to prey on, and digest the more solid juices of the earth; for then, and not till then, do the roots begin to harden^a. Consider how they assimilate, separate, and distribute these several supplies; how they concoct, transmute, augment, produce and nourish without separation of excrements, (at least to us visible) and how without violation of virginity they generate their like.

For their preservation, nature has invested the whole tribe and nation (as we may say) of vegetables, with garments suitable to their naked and exposed bodies, temper, and climate: Thus some are clad with a coarser, and resist all extremes of weather; others with more tender and delicate skins and scarfs, as it were, and thinner raiment. *Quid foliorum describam diversitates?* What shall we say of the mysterious forms, variety, and variegation of the leaves and flowers, contrived with such art, yet without art; some round, others long, oval, multangular, indented, crisped, rough, smooth and polished, soft and flexible at every tremulous blast, as if it would drop in a moment, and yet so obstinately adhering, as to be able to contest against the fiercest winds that prostrate mighty structures!—There it abides till God bids it fall: For so the wise Disposer of things has placed it, not only for ornament, but use and protection both of body and fruit; from the excessive heat of summer, and

^a In the corn tribe, the flour of the grain is converted into a milky juice, which nourishes the infant germ till its roots become sufficiently strong to extract nourishment from the earth. At this early period, there is a manifest analogy between the animal and vegetable worlds, and if no other proof could be brought of the existence and wisdom of a Supreme Being, this alone would, in my opinion, be conclusive. See this beautiful subject treated of at large in vol. 1. p. 33.

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colds of the sharpest winters, and their immediate impressions; as we find it in all such places and trees, as, like the blessed and good man, have always fruit upon them, ripe, or preparing to mature; such as the Pine, Fir, Arbutus, Orange, and most of those which the Indies and more southern tracts plentifully abound in where nature provides this continual shelter, and clothes them with perennial garments.

Let us examine with what care the seeds, (in which the whole and complete tree, though invisible to our dull sense, is yet perfectly and entirely wrapped up) exposed, as they seem to be, to all those accidents of weather, storms, and rapacious birds, are yet preserved from avolation, diminution, and detriment, within their spiny, armed, and compacted receptacles; where they sleep as in their causes, till their prisons let them gently fall into the embraces of the earth, now made pregnant with the season^o, and ready for another burden: for at the time of year she fails not to bring them forth. With what delight have I beheld this tender and innumerable offspring repullulating at the feet of an aged tree! from whence the suckers are drawn, transplanted and educated by human industry, and, forgetting the ferity of their nature, become civilized to all his employments.

Can we look on the prodigious quantity of liquor, which one poor wounded Birch will produce in a few hours, and not be astonished? Is it not wonderful that some trees should, in a short space of time, weep more than they weigh? And that so dry, so feeble, and wretched a branch, as that which bears the grape, should yield a juice that cheers the heart of man? That the Pine, Fir, Larch, and other resinous trees, planted in such rude and uncultivated places, amongst rocks and dry pumices, should transude into turpentine, and pearl out into gums and precious balms?

In a word, so astonishing and wonderful is the organism, parts, and functions of plants and trees, that some have, as we said, attributed animal life to them, and conceived that they were living creatures; for so did Anaxagoras, Empedocles, and even Plato himself.

* Virgil beautifully marks this season:

Vere tument terra, et genitalia semina poscunt.

GEORG. 2.

I am sure plants and trees afford more matter for medicine, and the use of man, than either animals or minerals; are more familiar at hand and safe; and within this late age being wonderfully improved, increased, and searched into, they seem, by the Divine Wisdom, an inexhaustible subject for our disquisition and admiration.

BOOK IV.

Vide Petri Magnol. Bot. Monspel.

There are ten thousand considerations more, besides that of their medicinal and sanative properties, and the mechanical uses mentioned in this Treatise, which a cohtemplative person may derive from the groves and woods; all of them the subject of wonder. And though he had only the Palm^p (which Strabo affirms is fit for three hundred and sixty uses) or the Coco, (which yields wine, bread, milk, oil, sugar, vinegar,

Vide Mons. Dodart's Hist. de l'Academ. des Sciences,

^pFor the enumeration of the virtues of the Palm-tree, Mr. Evelyn was indebted to a Portuguese missionary of the name of Jeronymo, whose manuscript was translated into English by Sir Peter Wyche, at the request of the Royal Society in 1668. The account being extremely curious, I here transcribe it.

“Of all the trees created by Almighty God for the ornament of the earth and service of man, the Palm-tree is the most useful and profitable to human society; though for this end the Author of Nature created all plants, all which, with all their virtues, are at man's devotion, yet none serves so munificently, and for so many uses as the Palm-tree. For, from her deepest roots, which take first possession of the earth in vegetation, to the highest leaf of her adorned head, with the variety, propriety, and excellency of her fruit; in fine, with all her virtue, is man substantially served, and paid his due tribute. What I shall say in this tract will fully unfold the truth.

“The Palm-tree is advanced by one peculiar excellency, by which, without any second, she hath the advantage of all. Other trees, well satisfied in paying man once a year their tribute, rest from their labour; the Palm-tree takes no repose, but every month in the year presents new fruit. A beautiful cluster of thirty, forty, sometimes more, Cocoes, or Nuts, monthly appearing; and though not above seven, twelve at the most, come to be ripe, and attain the last perfection, (there not being strength and nourishment for so many) yet is it questionless, that the Palm-tree by her fruitfulness was by God peculiarly created for the advantage of mankind: If vigour to perform her natural propensity be wanting, yet is her generous inclination apparent. The most favourable climate or soil, and which with greatest propriety and in most abundance produceth this famous tree, (which strangers, divine and human writings, and the natives, call the Palm-tree) is Asia, particularly that part of it called India, containing the kingdoms and provinces, which lie betwixt, and are bounded by the two famous rivers Indus and Ganges, both so well known in history. The land nearest the sea-side produceth the fairest; the air from the sea, being very favourable and benign to them. Though strangers give the same name of Palm-tree to divers sorts of this tree, all cannot challenge it, neither enjoy the excellencies proper to

thread, cloth, cups, dishes, spoons, and other vessels and utensils; baskets, mats, umbrellas, paper, brooms, ropes, sails, and almost all that

the Palm-tree called *Coco*: The natives distinguish them by particular names, and reckon up eight sorts, all different in their trunks, leaves, fruit, profit, and appearance, yet enjoy the general name of Palm-trees, having I know not what likeness, by which they lay claim to it, besides the proper name of each species.

“The chiefest and most famous, and which best retains the property of the Palm-tree, is that which bears *Coco*; of these some are wild, some cultivated, some, but few, called *Barcas*, which amongst them signify excellent; and when they knavishly put off any thing for excellent, they say it is *Barca*. The *Nut Barca* is savoury, wholesome, not to be surfeited on, though eaten in never so great a quantity; but as all trees are not *Barcas*, so not all the nuts; and the same tree bears *Barcas* and others: The natives distinguish and very much value them. The *Nut Barca*, when crude and unripe, is called *Lanha Taugi* (i. e.) excellent and sweet; is refreshing, wholesome, of great use in fevers. If the roots of this tree touch the sea, or any brackish water, the bearing is very much improved. Of the other seven sorts, some are esteemed wild, from their fruit, soil, and the little manuring they require. The tree called *Cajura*, is the peculiar one which bears *Dates*; though in India this tree yields none, but affords a certain liquor which they distil, and of it make wine. Another sort named *Trefulum*, from her fruit of the same name, *Arequira*, of whose leaves are made great umbrellas, large enough to shelter one or two men from the rigour of the sun or rain, without which none could travel: There are lefs, for the same use, like our umbrellas, which also keep off the rain. This tree yields no fruit. There is another tree (the name not much in use,) which by the leaf, trunk, and make, is of the race of Palm-trees; the fruit is called *de Raposa*, (i. e.) the *Foxes* fruit; eaten, of no good taste, such a crab as never ripens, and if brought to maturity would prove a wild *Date*, being so in the form, colour, bunch, or cluster. The tree called *Berlim*, bears no fruit, only used for adorning churches; the boughs of so fit a size and proportion for this use, as if solely created by God Almighty for his service, not of less esteem and value, because serviceable to divine worship; this dedication supplies the defect of fruit for the service of man, and may reasonably rank the tree above the fruitful. The last the earth produceth, called *Macomeira*, is without doubt a species of the Palm-tree; her fruit in clusters of thirty or more, every one as big as an ordinary apple; when ripe, of a date-colour, and very grateful, the rind as hard as tow, oftener sucked than eaten; if swallowed, of very hard digestion; in scent, exceeding the *Camoca**; the stone, called *Coquinho*, very hard, though green, is sovereign against many diseases.

“These are the Palm-trees the earth produceth, which challenge a right in that name. The sea affords one, which, though at the bottom of the deep, and so undiscovered, the fruit called *Coco*, and surnamed *Maltiva*, (because the sea about those islands affords that plant in greatest abundance) gives us the information. The *Maldives* are a ridge of great and small islands, reaching near two hundred leagues, are counted from North to South distant from the shore, thirty or forty leagues; the natives affirm them to be eleven thou-

* Esteemed the best apple in Portugal.

belongs to the rigging of ships; in short, this single tree furnishing a great part of the world with all that even a voluptuous man can need,

BOOK IV.

sand. He was at leisure, and of no small curiosity who counted them. But not to inquire too strictly and minutely into their number, the ocean about these islands most abounds with these nuts, which are rare; the sea casts them upon the shore, or they float upon the water, yet have I seen them from the coast of Melinde to the Cape of Guardafay, for above two hundred leagues: they are little less than a man's head, grow two together, joined one to the other, not all along, but near two-thirds, the colour of the rind, (which is hard, though thin) black. The Europeans make of it bodies of birds, e. g. of a Peacock, adding to it feet, neck, head, and wings, and that perfection of parts the bird designed requires. The pulp, or kernel of this fruit is very firm, as in those that grow at land; of very great esteem with the natives. I have seen it sold for its weight in silver, being esteemed a singular remedy against all diseases, particularly against poison, pounded in a mortar (made for that purpose) with a little water, till it grows white, and so drank.— In India they make frequent use of this remedy, having it in abundance. So much of the Palm-tree and the Nut Maldiva*. I am now to discourse of the inestimable profit of the other sorts.

“ Palm-trees, of what species soever, have neither a thick trunk, nor boughs like other trees. As they grow in height, their boughs come out at the top, and open to make room for others; as the old ones fall, they leave an impression in the tree where they were. If any have two trunks, the thing is very peculiar, and shown as notorious: I have only seen one or two such, in all the time and places I was in India: One of them near the coast of Melinde, whence I embarked for the island Pate, to see a thing so remarkable. The tree called Macomeira (from the fruit named Macoma) is the only one, that grown to the height of a man, divides herself into two trunks, each of which at the same distance is divided into other two, so grows on, each trunk producing two, till she arrives to that height, the natives allow proportionable to the species. The tree called Trafalum grows the tallest, and for height, were the thickness proportionable, (loftiness is more considerable in this, than any other of the sorts) and the nature of the wood solid, and strong, might make a mast for a great vessel, but it wants sufficient substance, neither are those trees which yield Cocoes proper for that use; in little vessels they serve, as will be immediately related. That the most favourable situation for the growth and fertility of these trees is the ground nearest the sea, has been said before: and if the roots reach the mud of salt-water, they thrive best with that watering. Experience hath found, that those Palm-trees which grow nearest houses inhabited, are the most fruitful; therefore the natives, if possible, contrive to dwell in the Palm orchards, having there their goods and estates, (as will presently be said) their pleasure and recreation: These are the real estates in India, as vineyards and oliveyards in Europe: amongst these is arable land, which they sow, and

* The Sea Cocca-nut which has long been considered as a marine production, and been so extremely scarce and valuable, is now discovered to be the fruit of a Palm with flabelliform leaves, which grows abundantly on the small islands to the eastward of Madagascar, called in our charts Mahi, &c. and by the French, *Les Isles de Sechelles*. A. H.

BOOK IV. or almost desire) it were sufficient to employ his meditations and his hands, as long as he were to live, though his years were as many as the

have a crop of rice, wheat, and other grain; I have seen fair and beautiful Palm-trees in the inland, remote from the sea, always in plains, never upon hills, where they come to no maturity, either because in low grounds they shelter one the other, or that on the hills the winds shake them too violently, to the no little detriment of their fruit; being tall and tender with all their boughs and fruit on the top, they are obnoxious to the wind, the whole weight being at the head, the body high, tender, and fragile: They may be fitly compared to the mast of a ship with round top and top-mast, without the help of shrouds to support it. These trees are planted, by sowing the Cocos or Nuts in a bed, and covering them with earth: a little time will put forth a shoot, the ordinary product of seed; arrived at some growth, they are transplanted into a place designed for that purpose; there ranked in fit distance, order, and proportion, they remain till arrived to perfection, and being planted in a line, make a fair show in the field, so pleasant to the natives, that no garden in Europe is with more care manured, or of greater, if of equal satisfaction. This hath been experienced by presenting them with our rarities, who neglect them, and sigh after the Palm-trees of their own country; though there is not a more melancholy and unpleasant sight to Europeans, than to be in a Palm-orchard, where nothing is to be seen but trunks of trees set in order, which appear withered without any foliage; all the greenness being above the sight, there is little enjoyed: beheld at a distance, no prospect is more grateful. Being young plants, their mortal enemies are the cattle, which rife their beauty, and with their teeth do them no little damage; that begets a necessity to encompass them with fences. These plants are manured at small expense; ordinarily they require not much watering; grown to some bigness, they lay ashes to their roots, all sorts of shell-fish, particularly little fish, called by the natives Cuta, putrefied at the foot of the tree, are of admirable effect; but all trees cannot be so indulged; this is supplied by mud taken out of salt marshes, by which their fruitfulness is very much advanced. They bear fruit at five years if planted in soft artificial beds, so taking root sooner and with greater ease; at seven, if the earth be firm and hard, spreading their roots leisurely and with more difficulty. I only know one spot of ground in the island of Ceylon so fruitful and proper for these trees, that in two years they come to their growth, get strength, and are laden with fruit. The fruit of this tree, (whatsoever the species is) comes forth thus: From the stem of the Palm, shoots out a twig, made like a man's arm, not unlike a Moorish scimitar, which the natives call Poyo. This opens and puts forth a cluster of thirty, fifty, eighty, sometimes an hundred Coquinhos or nuts, about the bigness of an hazle-nut; should all come to perfection the quantity were stupendous, but the parent wanting sap and nourishment for so many young ones, the greatest part fall off and come to nothing; few remain of the first appearing multitude, twelve or fourteen in every cluster may come to maturity, according to the goodness of the ground, or the soiling employed: Nature supplies the lost ones, by putting forth immediately another cluster before the first is ripe or cleared of the flower; the same happens to the latter fruit, and so to more, every month a bunch appearing, and all the trees having four or five clusters of different ages, some in the blossom, others newly cleared of the flower, as big as ordinary nuts, others larger, some come to perfection.

most aged Oak: So as *Fr. Hernandez, Garcilaso de la Vega*, and other travellers* speaking of the Coko, Aloes, and Wild Pine of

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* Vide Raii.
H. Pl. l. xxi.
cap. vii.

The Palm tree resembles an indulgent mother, environed with greater and smaller children, at the same time feeding these and bearing others, a rarity not experienced in other trees.

“The emolument of the fruit Coko is very extraordinary, for divers ways it proves good meat; while the kernel is yet in water, and full of liquor, the nut green, and not come to maturity, the natives drink it as an exquisite regallo, being sweet and recreative, affording a good cup of wholesome water called Lanha; arrived to a greater consistence, like that of cream, they eat it with spoons, then called Cocanha: come to the last perfection, it is eaten, is savoury and well tasted: but being extremely hot and of hard digestion, much of it is unwholesome, the nut Barca excepted, which is savoury and harmless. The thin rind which covers the kernel, black and good in medicine. This nut grated and put into the hollow joints of canes called Bambus is boiled, and of it is made Cuscus†. The gratings steeped in water and squeezed, the milk they yield, makes a kind of broth, frequent amongst them, called Cerul, which is very delicious: The nut Coko is eaten other different ways, which deservedly advance the esteem of this provision. The two rinds taken off, the kernel divided into two parts, and exposed to dry in the sun, when dried is called Copra; of this great quantities go for the inland country, and where no Olive-trees grow; oil made of which is toothsome, wholesome, and good for wounds and sores. This Copra eaten with Igra, (a sort of coarse Muscovadoes sugar, made of the sweet of the Palm-tree, as shall immediately be related) is a great dainty with the Indians. And that no part of the Coko may seem not valuable, and declaring the obligation human life hath to the Palm-tree, the outmost rind, called Cayro, not unlike tow, well macerated and drawn into threads, affords all sorts of fine thread, and ropes big enough for the greatest vessels and ships, which are in great esteem for good and secure cables; they will endure stretching, and rot not in salt water; these advantages have they above cables made of hemp. The second rind, the immediate cover of the Coko, when green, is eaten like Chardons, is tender, crackles in the mouth, and of the same effect in the stomach, blacks the lips and fingers like Chardons; when ripe is very hard and thin, called Charetta, and made up for divers uses; charked, it admirably tempers iron, and is accordingly esteemed by artificers. Besides the related, divers other emoluments accrue from the Palm-tree and her fruits; the Palm-tree alone being sufficient to build, rig, and freight a ship, with bread, wine, water, oil, vinegar, sugar, and other commodities. I have sailed in vessels where the bottom and the whole cargo hath been from the munificence of the Palm-tree; I will take upon me to make good what I have asserted. The vessels are by the natives called Pangayos, on which I have coasted the land of Melinde, and gone into the Red Sea: they venture not far from shore, being weak, without any binding of iron, unable to endure any strefs of weather or beating of the waves, therefore launch not out into the main ocean. The Palm-tree yields plank, though weak and spongy, as if made of tow: the planks are sewed together with fine thread, made of the outmost rind of the

† A paste like the Italian Vermicelli.

BOOK IV. Jamaica, affirm there is nothing necessary for life (*si efset rebus humanis modus*) which these Polychrests afford not.

nut (as hath been said); the seams are caulked with okum of Cayro, after laid over (as is usual) with the fat of fish, serving instead of hot pitch: where there is any use of nails, that is supplied by wooden pins, made of a certain species of the Palm-tree; the mast is provided by the same tree, and requires not much pains to fashion it: Ropes of all sizes are made of Cayro, i. e. the rind of the Coko. Sails are woven of the leaves of the Palm-tree, called Cajuris, of which are also made sacks, (called Macondas) in which they carry Millet, or any other thing at pleasure. Bread (before mentioned) the same nut supplies, either dry, then called Copra, or green, when named Puto; which grated and put into hollow canes is Cuscus: Water proceeds from the same nuts being green, before the kernel arrives to a due consistency, clear as rock water, fresher and better. Oil is made of Copra (i. e. the nut dried in the sun) in great quantity, used by all people in India, having no other of their own growth, besides what is drawn from a seed called Gergelin, of small value, used only by the poor. The wine requires more pains and assiduity. When the Palm-tree puts forth her shoot or Poyo (shaped like a Moorish scimitar) before the cluster appears, they cut three fingers-breadth from the point, and tying it near the incision with a reed to prevent slitting, put the end of the shoot into a pitcher made for that purpose, called Gorgo; leaving it there, the shoots, like vines pruned, but in greater abundance, weep that juice, which should have produced Cocos. This liquor is twice drawn in the natural day; in the morning that which was wept by night, and in the evening the distillation of the day: At these times, a man, deputed to that business, and of a certain extraction, called Bandarins, with a gourd hung at his girdle, and with a pruning-hook in his hand, climbs the tallest Palm-tree; some of which, peculiarly those called Cajuris, are of a prodigious height, they climb, as on a ladder, by notches made in the trunk of the tree, and with as much security as seamen run up to the main-top. In other less Palm-trees, (seeming to be of that class which yields Dates) they make a hole in the trunk, there lodging a cane through which the liquor distills, which when the tree affords, she bears no Cocos. This liquor is sweet, medicinal, clears the body from humours, is drunk for a regallo, and called Sura; set to the fire in great vessels, is distilled as in a limbeck, but with this caution, that they continually cast cold water upon the vessel, lest as strong water it should take fire. This is the wine made of the Palm-tree called by the natives Urraca, it intoxicates in little quantity, flies to the head, and is of a strange effect; much more powerful if distilled over again, when it becomes a quintessence. Of this Urraca is made excellent vinegar, by putting into it two or three fired sticks, or a great stone well heated. Sugar is made of the sweet Sura coming fresh from the tree, which boiled till it coagulates becomes good sugar, perfect in taste and colour.—The merchandize afforded by the Palm-tree, and laden on vessels, are dried Cocos, or nuts, the rind, and many other commodities before mentioned: this justifies the Palm-tree's building, rigging, and lading a vessel with goods, and ship-provisions for the mariners, all her own product.

“The Palm-tree being so beneficial and advantageous to human life, doubtless no tree in any known part of the world may come into competition with it; and amongst all her

What may we say then of innumerable other trees, fitted for the uses nature has designed them, especially for timber, and all other fabril em-

BOOK IV.

advantages, no other so well satisfies the sight when laden with great and smaller clusters, some ripe, others colouring; some in the blossoms, others forwarder; the grateful appearance of her fruit is no less pleasant than her admirable fecundity: Her tallness not inferior to a high Cyprus-tree, her trunk slender, without the help of boughs to climb by, her nuts retired at the top, amongst her leaves and branches, makes her resemble a fond mother, bringing her children about her the better to preserve them, and cutting off all intercourse tending to their destruction. All places produce not Coccoes of the same bigness, which are great or small according to the nature of the climate, and quality of the soil fitted for the production of that fruit. The coast of Malabar being cool, and abounding with rivers (which spring in the mountains of Gate, to whose foot this coast extends) affords such large and fair Coccoes, that the Lanhas (i. e.) young and imperfect nuts of Cochim and those territories, are every one sufficient to quench the thirst of two persons. After these are cried up those of Ceylon, where the ground is very rank and luxuriant, yet inferior to the soil of Malaca, and the places adjoining, where the Coccoes are the the greatest. Those of Arabia the Happy are fairer than any yet spoken of; the goodness of the soil, and nature of the climate, being proportionably advantageous, the name of Happy proves it. Of all these places and sorts of fruit, I am an eye-witness. Two peculiar virtues of these Coccoes, are not to be passed over in silence: The first, that when the cluster begins to appear, being yet covered with the flower, gathered, pounded, boiled in three pints of cow's milk, it is an infallible cure for the yellow jaundice; besides the opinion had of this remedy, I speak by experience, having with it in a few days cured one troubled with this disease. The second is, that in the opinion of the women, (where fancy most dominions) the water of Lanhas makes a wash for the face, which eminently betters the complexion, either by creating it where nature bestowed it not, or advancing it where nature is deficient, or preserving it where it was naturally allowed. From what hath been said, is evidently concluded, that if the Author of Nature created all trees for the service of man, the Palm-tree of all those doth most industriously serve and advantage him, by so many ways, and so considerable productions; and because that which bears Dates is of the true race of Palm-trees, something is to be said of that and her fruit.— Those trees which bear Dates, yield them not in India; there only affording the Sura before mentioned, of which wine is made. Northward, those trees grow in the greatest quantity; some have Dates, which appear in fair clusters but come not to maturity: the reason must be in the climate, which favours them not. In Africa they attain the highest perfection, Dates being the natural fruit of that part of the world; those of Arabia, where they grow in great quantities, are excellent, pleasant to the sight, in beautiful clusters, (which beginning to ripen appear in various colours, consisting of a faint vermillion, and pale whiteness, called the Date colour) and more acceptable to the taste. Arabia produceth divers sorts, particularly the Happy; (Petrea is not without them.) A baser sort there is, which serves for common sustenance, given to horses for provender: Others there are of a more exquisite taste and value, amongst them those called Muxanas, which are the least, but naturally recompensed by an excellent flavour; few of them exported out

ployments?—But I cease to expatiate farther on these wonders, that I may not anticipate the pleasures with which the serious contemplator

of Arabia; the Xarifes reserving them for themselves as excellent, and give the reason that their exquisiteness makes them properly theirs, challenging the best things in the world, as the posterity of Mahomet, and for the religion they profess, which they would falsely put off for orthodox. This fruit ripens not upon the tree if there be not near it or in sight, the fruit called the male; a secret in nature found by experience, the cause yet undiscovered.

“There are some Palm-trees which bear a fruit called Macomas, of a singular virtue, (besides their scent, more grateful than that of a Camojesa, and their perfect Date-colour;) This fruit, eaten upon an overcharged stomach, after too much repletion, in a very little time digests all, and creates a fresh appetite. God be praised, these trees are so far removed from Europe, that our epicures are without the advantage of their fruit, which would advance the luxury of those men St. Paul speaks of, *Quorum Interitus Deus est*, whose God is their belly, from their frequent sacrifices made to it. I have had experience of this natural virtue of this fruit. The stone eaten is good against hypochondriacal vapours.—Another fruit called Trefolim, (which hath the name of the tree which bears it) grows in clusters of fifteen or more, each as big as two fists joined; the first colour green, when ripe ends in a purple colour; opened hath three partitions, replete with a certain substance like ill-coagulated milk; fresh and cooling, of an insipid taste, yet commonly eaten for a regallo; the kernel of a faint white. The fruit of a Palm-tree called Areica, not much differing from the Trefolim, is of eminent esteem with the native Indians: The island of Ceylon produceth the most and the best. These Cocoes are exported, and prove good merchandize, not bigger ordinarily than an hazle-nut, the kernel firm and hard, the usual dainty of the Indians, who accustomed to chew the leaf of an herb bigger, thicker, and of a clearer green than of an ivy-leaf, are forced to champ an Areica; from warming and recovering the stomach, esteemed very cordial and delicious; the juice contracteth the mouth like alum, or a Cypress-apple, if chewed, which sometimes supplies the virtue of Areica: This fruit, like Dates, grows in clusters, two hundred or more counted in a bunch; exquisite beads are made of them, white streaked with black. The Indians so gloat on this fruit, as to have it common in their mouths, thence transmit the juice to their stomach, which it fortifies and strengthens, fastens the teeth, and helps digestion; therefore the last thing done at meals, is to chew a piece of this, which they as highly prize, as the Europeans their choicest fruit; but from the experience of both, I am for my countrymen. The Cocoa, or nut of Maldiva, is another fruit of the Palm-tree; we have already spoken of its shape, virtue, price, and value. The fruit commonly called Coco is found on the sea, or cast upon the shore; the make of the tree which produceth them, nature hath hid at the-bottom of the deep, and charged herself with its culture.

“I shall conclude this discourse of Palm-trees with this observation,—That nothing has life without enemies of that life, which by divers ways and stratagems attempt and assault it. The vegetation of the Palm-tree wants not these, by the Indians called sicknesses and diseases, which prejudice this so advantageous tree and her fruit, by which man is so plentifully provided. As he is said to live and die, the same is said of the Palm-tree,



Fig. 1.

Fig. 3.

Fig. 2.

Fig. 4.

Fig. 5.

Let the farther curious, or those who may take these wonders for a florid Epiphonema only of this work, add to the most ancient naturalists what they will find improved, on this ample subject, in the late excellently learned and judicious Malpighius, Grew, Ray, Senertus, Faber, and others, who have defined these astonishing

by an attractive virtue sucks in, with the moisture that nourisheth it, and conveys throughout from root to head) is discovered by a reddish minute sand appearing in the earth; the disease dilates not only in the body, but outwardly on the trunk of the tree; when the Bandarin perceives this, he is forced to make a great hole through the sound part of the tree, to hinder the contagion from creeping further, as is practised in Ganges, where the sound part is cut off: the parts affected without, are unbaked, and where the sand appears they run in hot irons. These cures not timely applied, the profitable tree perisheth. These disasters are accompanied with a secret of nature, worth reflection. Two or three years before this untimely death, these trees are said to be laden with Coccoes or Nuts, so beyond custom, that this unusual excess is suspicious to the natives, and awakens them to watch the diseases incident to the Palm-tree, so to hinder them by a timely prevention; nature by this overplus, seems to supply the absence and loss of this tree; and the beneficial Palm, foreseeing the end of her munificence, strives to recompense her owner. There is yet in the Palm-tree a thing more excellent, delicious, and more grateful to the palate, than hath been mentioned; a morsel to be compared with whatsoever is esteemed most delicate, is that they call Palmito, the innermost eye of the tree; which being cut out and stript of the boughs, may pass for the centre of all the branches, which in the heart of the tree, before they shoot forth, are so joined and united, as to appear the same thing. The substance of this Palmito is white like milk, delicious in extremity, coagulated, tender, of a taste above milk, more delightful and of a better confection; *in fine a Boccie* pleasing in the highest, and free from all fulsomeness. What I have said is without exaggeration; the Reader, I am sure, would if he tasted it, be of my opinion, who am able to give a sufficient account of this Palmito; for besides my experience of it in India, where other provision was not wanted, at the Cape of Good Hope, (where the vessel we came in from Portugal suffered shipwreck, at the land called Terra de Natal, and where we spent eight months on shore, in the place we were first cast upon, to build two barks to save our company) I had leisure enough to be convinced of its exquisiteness; there, scarcity of provision, obliged us to make use of what we found; it was our good fortune to light on great store of Palm-trees, not of those which yield Coccoes or Nuts, but of that species which bear Dates: there, having known in India what the Palmito was, we in a short time furnished ourselves with as many as grew in a league's compass; the Palmito served us for food and dainty, neither was its gratefulness heightened by our hunger.

“The fruitfulness and profit of the Palm-tree, last many years; there are signs for a near effects at her precise duration. This tree puts forth every year four branches, which surely display themselves in the form of a cross, and after three or four years decay; these the Palm-tree of herself casts off, or they are lopt off by the Bandarins, every one leaving a mark where it grew: By these is given a probable conjecture at the age of the tree,

operations of nature, causes, and effects, with the greatest and exactest *discussus* imaginable. But a *wise* and a *thinking* man can need none of these topics; in every hedge, and every field, they are before him; and yet we do not admire them, because they are common and obvious: Thus we fall into the just reproach given by one of the Philosophers (intro-

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Cic. de Nat. Deor. l. ii.

That it may appear how the whole Palm-tree is serviceable to human life, nothing is superfluous, but all substantially profitable, from the deepest root to the highest leaves: The root (as hath been said before, where we spoke of the virtues of the other parts) chark'd, gives an excellent temper to iron; the boughs and leaves, made up with a wick, serve for a torch, (called by them Chuli;) with this, travellers are secure from all danger of serpents, which abound in India; these are of exquisite poison, and their multitude makes them frequent the roads, and assault passengers. They fly from the light of this Chuli; of another service when they fish in the rivers, instead of a candle as is usual in Portugal; Of the leaves besides, are made great Parasols, capable to shelter two persons from the sun or rain; these require a man to carry them (there are persons deputed for that office) and are called Boy de Sombrero; small portable ones there are for the same use, none walking in the street, winter or summer, without great or little Parasols. The leaves have another use; of them are made coverings for their palanquins or litters, in which one person is commodiously carried and defended from the rain and sun. Some Palm trees afford leaves called Olhas, which serve for books and paper; with a small iron pencil instead of a pen, they open and grave the letters upon the leaf or Olha, without the use of ink, as fast and as easily, as the swiftest writer. The leaves of the tree Cajura dried, remain of a lively white colour, which are made into hats, of great account though cheap, being so becoming, so accurately wrought and light, that every body, the Viceroy not excepted, desires to wear them: the Indians call them Palliate. The bark of the Poyo, or twig on which grow the fair clusters of Cocoes, being of a thicker and stronger substance, furnishes the common people, particularly the Bandarins who dress the Palm-trees, with caps made like English ordinary riding-caps.

“To end the discourse, I shall observe (what challenges a reflection) the natural fabrick of the Palm-trees; that the trunk being very slender and disproportionable to the tallness, the whole weight of the boughs, (called Palms) and of the fruit, being at the top, in a manner at the vertical point of the slim body, the boughs, as they grow displaying themselves, and amongst them hanging the fair clusters of Cocoes, the shock of winds, should without doubt, easily break and ruin this disproportioned machine. Provident Nature, against this, hath for every new birth of those boughs provided swathes, of the same matter and texture of the Palm-tree, not unlike coarse cloth, or canvas: with these the branches and what grows there, are swathed so strongly and securely, as to defy any violence of winds to disjoint them: they are liable to be shaken, yet not where they have this Girdle, which to break is a work of iron. By these the Palm-tree, as a tender mother, gathers her children about her, as secure from being lost and scattered, as they are well defended against any violence of wind, which would tear and force them from her bosom.”

BOOK IV. duced by the Orator) to those who slighted what they saw *every day*, because they *every day* saw them: *Quasi novitas nos, magis quam magnitudo rerum, debeat ad exquirendas causas excitare*: As if *Novelty* only should be of more force to engage our inquiry into the *Causes* of Things, than the *Worth* and *Magnitude* of the Things themselves.

THE END.

EXPLANATORY TABLE.

OF THE

*Parts of FRUCTIFICATION of the different Species of Trees described
in the SILVA.*

Obs. The Parts marked with a Capital Letter are magnified.

The OAK. *Quercus (Robur.)*

MONOECIA POLYANDRIA.

- a. A Male Catkin.
- b. c. The Calyx. In some Flowers it is divided into four, in others into five segments.
- B. C. Ditto.
- d. An entire Flower.
- D. Ditto, showing the situation of the Stamina.
- e. A single Stamen.
- E. Ditto.
- f. A Female Flower.
- F. Ditto.
- g. The Acorn, or Nut, as it fits in its permanent Calyx.
- h. Ditto, separated from the Calyx.
- i. The Cup, or permanent Calyx.

The ELM. *Ulmus (Campestris.)*

PENTANDRIA DIGYNIA.

- a. An entire Flower.
- B. Ditto.
- c. The Calyx.
- C. Ditto.
- d. The Stamina.
- D. Ditto.
- e. The Pointal, or Female part of the Flower.
- E. Ditto.
- f. The Seed.
- g. A Branch, at the time of Flowering, which happens before the leaves appear,

The BEECH. *Fagus (Sylvatica.)*

MONOECIA POLYANDRIA.

- a. A Catkin of Male Flowers.
- b. A single Flower.
- B. Ditto.
- c. The Calyx.
- C. Ditto.
- d. A Female Flower.
- e. The Calyx.
- f. The Germen, or Embryo, with its three Pointals.
- g. The two Embryos with their Pointals, as they sit in the Calyx.
- h. The permanent Calyx become a Capsule, or Seed-vesel.
- i. Ditto, as it opens at the top.
- k. The two Seeds.

The HORNBEAM. *Carpinus (Vulgaris.)*

MONOECIA POLYANDRIA.

- a. A Male Catkin.
- b. A Male Flower with its Scale.
- B. Ditto.
- c. The Scale.
- C. Ditto.
- D. The Stamina.
- e. The Female Catkin.
- f. The Female Flower with its Scale.
- F. Ditto.
- G. The Scale.

- h. The Petals.
 H. Ditto.
 i. The two Pointals.

- I. Ditto.
 A. The Petals grown larger, containing the two
 Seeds.
 i. One of the Seeds.

The ASH. *Fraxinus (Excelsior.)*

POLYGAMIA DIOECIA.

- a. An entire Hermaphrodite Flower.
 A. Ditto. The Flowers have neither Calyx
 nor Petals, and are only furnished with
 two Stamina.
 B. The two Stamina.
 c. The Embryo, with its Pointal.
 C. Ditto.
 d. An entire Female Flower.
 D. Ditto. They likewise have neither Calyx,
 Petals, nor Stamina, bearing only a
 Pointal.
 e. A winged Seed. The Seeds of the Herma-
 phrodite and Female Flowers are alike.
 f. The Crust opening to show where the Seed
 is lodged.
 g. The Seed.

The CHESNUT. *Fagus (Castanea.)*

MONOECIA POLYANDRIA.

- a. A Male Catkin.
 b. A single Flower.
 B. Ditto.
 c. The Calyx.
 C. Ditto.
 d. A Female Bud of Flowers.
 e. A single Flower.
 f. The Calyx.
 F. Ditto.
 g. A single Embryo, with its Pointals.
 G. Ditto.
 H. The two Embryos with their Pointals, set
 in their permanent Calyx.
 i. The spinous Capsule.
 k. The same, opening at the top to emit the
 Nuts or Seeds.
 l. A single Nut.

The HORSE-CHESNUT. *Æsculus.*
(Hippo-castanum.)

HEPTANDRIA MONOGYNIA.

- a. An entire Flower.
 b. The Calyx.
 c. The five Petals.
 d. The Stamina.
 e. The Embryo, with its Pointal.
 f. The spinous Capsule.
 g. A Transverse Section of ditto, showing the
 Partition and Receptacle.
 h. Ditto, as it opens in three divisions.
 i. The Nuts or Seeds.

The WALNUT. *Juglans (Regia.)*

MONOECIA POLYANDRIA.

- a. A Male Catkin.
 b. Ditto, in its natural size.
 c. A single Male Flower.
 d. The Petals.
 e. The Stamina.
 E. A single Stamen.
 f. A Female Flower.
 g. Ditto, in its natural size.
 h. The Calyx.
 i. The Corolla.
 k. The Embryo, with its Pointals.
 l. The covering of the Shell. *Drupa.*
 m. The Nut divested of its covering.
 n. Ditto, split open.
 o. A Kernel.

The WHITE BEAM TREE. *Crategus*
(Aria.)

ICOSANDRIA DIGYNIA.

- a. An entire Flower.
 b. The Calyx.
 c. The Petals, or Flower Leaves.
 d. The Stamina.
 e. The Pointals.
 f. The Embryo, as it sits within the Calyx,
 with its Pointals.
 g. The Fruit, or Berry.
 h. A Transverse Section of ditto.

- i.* A Vertical Section of ditto.
k. The two Seeds.

The **WILD SERVICE.** *Crataegus (Torminalis.)*

ICOSANDRIA DIGYNIA.

- a.* An entire Flower.
 A. Ditto.
b. The Calyx.
 B. Ditto.
c. The Petals.
 C. Ditto.
d. The Stamina.
 D. Ditto.
e. The Pointals.
 E. Ditto.
f. The Fruit, or Berry.
g. A Transverse Section of ditto.
h. The Seeds.

The **WILD BLACK CHERRY.**

Prunus (Cerasus.)

ICOSANDRIA MONOGYNIA.

- a.* The Calyx.
b. An entire Flower.
c. The Stamina.
d. A single Stamen.
 D. Ditto.
e. The Embryo, with its Pointal.
 E. Ditto.
f. The Berry.
g. A Vertical Section of ditto.
h. The Stone containing the Kernel.

The **MAPLE.** *Acer (Campestre.)*

POLYGAMIA MONOECIA.

- a.* The Hermaphrodite Flowers growing on the same bunch with the Male Flowers *f.*
 A. An Hermaphrodite Flower.
b. The Calyx.
c. The Petals.

- d.* The Stamina.
e. The Embryo, with its Pointal.
 E. Ditto.
g. A Male Flower without the Stamina, &c.
 G. Ditto. The Calyx, Petals, and Stamina are the same as in the Hermaphrodite Flowers.
h. The two winged Seeds.
i. One Wing cut open to show the situation of the Seeds.
k. A Seed.

The **SYCAMORE.** *Acer*

(Pseudo-platanus.)

POLYGAMIA MONOECIA.

- a.* The Hermaphrodite Flowers growing on the same bunch with the Male Flowers *f.*
b. The Calyx.
c. The Petals.
d. The Stamina.
 E. The Embryo, with its Pointal.
f. The Male Flowers.
 G. A Male Flower. The Petals and Stamina are the same as in the Hermaphrodite Flowers.
 H. A Male Flower without the Stamina, &c.
i. The two winged Seeds.
k. One of the Wings cut open to show the situation of the Seed.
l. A Seed.

The **LIME.** *Tilia (Europaea.)*

POLYANDRIA MONOGYNIA.

- a.* An entire Flower.
b. The Calyx.
c. The Petals.
d. The Stamina.
e. The Embryo, with its Pointal.
 E. Ditto, with one Stamen and one Petal.
f. The Capsule.
g. A Transverse Section of ditto.
h. The Capsule as it opens below.
i. The Seed.
k. A Bractea, or Floral Leaf.

THE TABLE OF

The WHITE POPLAR. (*Populus Alba.*)

DIOECIA OCTANDRIA.

- a. A Male Catkin.
- b. An Entire Male Flower.
- B Ditto.
- c. The Scale, or Squama.
- d. The Nectarium.
- D. Ditto.
- E. A single Stamen.
- f. The Female Catkin.
- g. The Female Flower.
- G. Ditto.
- h. The Squama, or Scale.
- I. The Embryo, with its quadrifid Stigma.
- K. The Stigma.
- i. The Capsule, or Seed-vesel.
- L. Ditto.
- m. Ditto, discharging its Seed.
- M. Ditto.
- n. The Seeds.
- N. Ditto.
- o. The Nectarium of the Female Flower.
- O. Ditto.

The QUICK-BEAM. *Sorbus (Aucuparia)*

ICOSANDRIA TRIGYNIA.

- a. An Entire Flower.
- A. Ditto.
- b. The Calyx.
- B. Ditto.
- c. The five Petals, or Flower Leaves.
- C. Ditto.
- d. The Stamina.
- D. Ditto.
- e. The Embryo, with its three Stigmata.
- E. Ditto.
- f. The Fruit, or Berry.
- g. A Transverse Section of ditto.
- h. The three Seeds.

The HASEL. *Corylus (Avellana.)*

MONOECIA POLYANDRIA.

- a. A Male Catkin.
- b. A single Male Flower.
- B. Ditto.

- c. The Stamina.
- C. Ditto.
- D. A single Stamen.
- e. The Female Flowers.
- E. Ditto
- f. Two lacerated Scales that enclose the Embryo with its two Pointals.
- F. Ditto.
- g. The Embryo, as it sits in the two Scales.
- G. Ditto.
- h. The Embryo.
- H. Ditto.
- i. The Nut.
- k. A Vertical Section of ditto.
- z. The Kernel.

The BIRCH. *Betula (Alba.)*

MONOECIA TETRANDRIA.

- a. The Male Catkin.
- b. The Calyx, consisting of three Scales containing three Flowers.
- B. Ditto.
- C. The three Flowers with their three Scales.
- D. A single Flower.
- E. Its four segments.
- F. The Stamina.
- g. The Female Catkin.
- h. The Calyx, consisting of three Scales, each Scale containing two Embryos.
- H. Ditto.
- i. The Embryo, with its two Pointals.
- I. Ditto.
- k. The three Scales, each Scale containing two Seeds.
- K. Ditto.
- l. A Seed.
- L. Ditto.

The ALDER. *Betula (Alnus.)*

MONOECIA TETRANDRIA.

- a. The Male Catkin.
- b. The Calyx, consisting of four Scales which contain three Flowers.
- B. Ditto.
- C. The three Flowers.
- D. A single Flower.

- E. The Petals.
 F. The Stamina.
 g. A Female Catkin.
 h. The Calyx, consisting of three Scales, each Scale containing two Embryos.
 H. Ditto.
 i. The Embryo, with its two Pointals.
 I. Ditto.
 K. The Cone, or Fruit.
 L. The three Scales, each containing two Seeds,
 m. A Seed.
 M. Ditto.

The **CRACK WILLOW.** *Salix*
 (*Fragilis.*)

DIOECIA DIANDRIA.

- a. The Male Catkin growing on a different Tree from the Female.
 b. A Male Flower.
 B. Ditto, with its Nectarium c, and two Stamina d, d.
 E. The Scale and Nectarium.
 f. The Female Catkin.
 g. A Female Flower.
 G. Ditto.
 H. The Embryo.
 i. The Capsule.
 I. Ditto.
 K. A Transverse Section of ditto.
 L. As it bursts to emit the Seed.
 M. A Seed.

The **SCOTCH FIR.** *Pinus (Sylvestris.)*

MONOECIA MONADELPHIA.

- a. A Male Catkin.
 b. The Gem, or Winter-Lodge (Hibernaculum)
 c. The Scale, or Squama.
 d. A Cluster of Stamina.
 D. Ditto.
 e. A single Stamen,
 E. Ditto, with its Scale a.
 f. The future Cone.
 g. A single Scale of the Cone, with its two Embryos.
 G. Ditto.

- H. A single Embryo,
 i. The Cone.
 k. The same opened to show how the Seeds are lodged.
 Z. The inner Side of a Scale.
 m. The two winged Seeds.

The **WEYMOUTH PINE.** *Pinus*
 (*Strobus.*)

MONOECIA MONADELPHIA.

- a. The Gem, or Winter-Lodge (Hibernaculum)
 b. The Male Catkin.
 C. A single Stamen, with its Scale.
 D. The Scale.
 E. A single Stamen.
 f. The immature Cone.
 g. A single Scale of ditto, with its two Embryos.
 G. Ditto.
 H. A single Embryo with its Pointal.
 i. A Cone.
 k. A single Scale, with its two winged Seeds.
 l. A Seed.

The **SILVER FIR.** *Pinus (Picea.)*

MONOECIA MONADELPHIA.

- a. The Gem, or Winter-lodge (Hibernaculum).
 b. A Male Catkin.
 C. A single Stamen, with its Scale.
 D. The Scale.
 E. A Stamen.
 f. The Female Catkin, or future Cone.
 g. A single Scale, with its two Embryos.
 G. Ditto.
 H. A single Embryo, with its Pointal.
 i. The Cone.
 k. A single Scale, with its two winged Seeds.
 l. A single Seed.

The **SPRUCE FIR.** *Pinus (Abies.)*

MONOECIA MONADELPHIA.

- a. A Catkin of Male Flowers.
 b. A single Stamen.
 B. Ditto.
 c. The future Cone.

THE TABLE OF

- d.* A single Scale, with its two Embryos.
D. Ditto.
e. The Embryo, with its Pointal.
E. Ditto.
f. The Cone.
g. A single Scale, with its two winged Seeds.
h. A Seed.

The LARCH. *Pinus (Larix.)*

MONOECIA MONADELPHIA.

- a.* A Male Flower.
b. The Calyx.
c. The Calyx, showing the situation of the
 Stamina.
C. A single Stamen.
d. The Female Flowers, or immature Cone.
e. A single Scale, with its two Embryos.
E. Ditto.
f. A single Embryo, with its Pointal.
F. Ditto.
g. A Cone.
h. A single Scale, with its two winged Seeds.
H. Ditto.
N. B. This Figure is the American Larch.

The MULBERRY *Morus (Nigra.)*

MONOECIA TETRANDRIA.

- a.* A Male Catkin.
B. The Calyx.
c. A Male Flower.
C. Ditto.
D. One Stamen.
e. A Female Catkin.
f. A Female Flower.
F. Ditto.
G. The Calyx.
H. The Embryo, with its two Stigmata.
i. The Fruit, consisting of many Berries.
k. A single Berry.
l. A Seed.
L. Ditto.

The CEDAR. *Pinus (Cedrus.)*

MONOECIA MONADELPHIA.

- a.* A Male Catkin.
b. A single Scale, with its Stamen,

- B.* A single Scale, with its Stamen.
c. The future Cone.
d. A single Scale of the Cone, with its two
 Embryos.
D. Ditto.
e. A single Embryo, with its Pointal.
E. Ditto.
f. The Cone.
g. A single Scale, with its two winged Seeds.
h. A single Seed.

The ORIENTAL PLANE. *Platanus*
(*Orientalis.*)

MONOECIA POLYANDRIA.

- a.* A globular Catkin of Male Flowers.
b. The Calyx.
B. Ditto.
c. The Entire Flower.
C. Ditto.
d. The Petals.
D. Ditto.
E. The Stamina.
F. A single Stamen.
g. A globular Bunch of Female Flowers.
h. The Calyx.
H. Ditto.
i. An Entire Flower.
I. Ditto.
k. The Petals.
K. Ditto.
L. The Embryo, with its Pointal.
m. The globular Cluster of Seeds.
n. The Receptacle to which the Seeds are
 affixed.
O. A Seed.

The OCCIDENTAL PLANE. *Platanus*
(*Occidentalis.*)

MONOECIA POLYANDRIA.

- a.* A globular Cluster of Male Flowers.
b. The Calyx.
B. Ditto.
c. An Entire Flower.
C. Ditto.
d. The Petals.
D. Ditto.

- E. The Stamina.
 F. A single Stamen.
 g. A globular Bunch of Female Flowers.
 h. The Calyx.

II. Ditto.

- i. An Entire Female Flower.
 I. Ditto.
 k. The Petals.
 K. Ditto.
 L. The Embryo, with its Pointal.
 m. The globular Cluster of Seeds.
 n. The Receptacle to which the Seeds are affixed.
 O. A Seed.

The CORK TREE. *Quercus (Suber.)*

MONOECEIA POLYANDRIA.

- a. A Male Catkin.
 b. c. The Calyx, in some quadrifid, and in some quinquefid in the Male Flowers.
 B. C. Ditto.
 d. An Entire Flower.
 D. Ditto.
 e. A single Stamen
 E. Ditto.
 f. The Female Flowers.
 g. A single Flower.
 G. Ditto.
 H. A Vertical Section of ditto.
 i. The young Acorn or Fruit.
 I. Ditto.
 K. A Vertical Section of ditto.

The STRAWBERRY TREE. *Arbutus (Uvedo.)*

DECANDRIA MONOGYNIA.

- a. The Calyx.
 A. Ditto.
 b. The Corolla.
 c. The same cut open, to show the situation of the ten Stamina.
 C. A single Stamen.
 d. The Embryo with its Pointal, situated within the Corolla.
 D. Ditto.
 e. The Fruit.

- f. A Transverse Section of ditto.
 g. A Vertical Section of ditto.
 h. The Seeds.

The YEWE. *Taxus (Baccata.)*

DIOECEIA MONADELPHIA.

- a. A Male Flower.
 A. Ditto.
 B. The Calyx.
 D. The Stamina.
 E. Two Stamina, one viewed in front, the other on the underside.
 f. The Female Flower.
 F. Ditto.
 G. The Calyx.
 I. The Embryo, with its Pointal.
 k. The Fruit, or Berry.
 l. A Vertical Section of ditto.
 m. The Seed.

The HOLLY. *Ilex (Aquifolium.)*

TETRANDRIA TETRAGYNIA.

- a. An Entire Flower.
 b. The Calyx.
 c. The Petals.
 d. The Stamina.
 e. The Embryo.
 E. Ditto.
 f. The Berry.
 g. A Transverse Section of ditto, showing the Conceptacle.
 h. The Seeds.
 H. A Seed.

The HAWTHORN. *Crataegus (Oxyacantha.)*

ICOSANDRIA DIGYNIA.

- a. An Entire Flower.
 b. The Calyx.
 c. The Petals.
 d. The Stamina.
 D One Stamen.
 e. The Embryo with its Pointal.
 f. The three Pointals.
 g. The Berry, or Fruit.
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T E R R A:

A

PHILOSOPHICAL DISCOURSE

OF

E A R T H.

RELATING TO THE

CULTURE AND IMPROVEMENT OF IT

FOR VEGETATION AND THE PROPAGATION OF PLANTS,

AS IT WAS PRESENTED TO

THE ROYAL SOCIETY.

By J. EVELYN, Esq. F. R. S.

WITH

N O T E S,

By A. HUNTER, M. D. F. R. S. L. & E.



THE
EDITOR'S PREFACE.

THE TERRA was written by Mr. Evelyn, at the request of the Royal Society, about twelve years after the publication of the SILVA: And as every thing that came from his pen received distinguished marks of public approbation, he had the satisfaction to see it undergo several impressions during his lifetime, to each of which he added something. From the extreme veneration that I entertain for the memory of so worthy and good a citizen, I have here attempted a republication of that celebrated work; and I would fain flatter myself that it will be found free from the inaccuracies with which the other Editions abound. The occasional Notes are introduced with a design to give the Reader a more extensive view of the subject, which has received much improvement since the days of our most excellent Author. It was my intention to have added this Discourse to my first Edition of the SILVA; but, when that was ready for the press, I had made but little progress in the examination of this; and indeed it was then uncertain whether I should ever complete it, as such works are with me an amusement and not a study.

A HUNTER.

YORK, JAN. 1. 1786.

To JOHN EVELYN, Esq.

SIR,

THE Council of the ROYAL SOCIETY, considering with themselves the great importance of having the Public Meeting of the said Society constantly provided with entertainments suitable to the design of their institution, have thought fit to undertake to contribute each of them one; not doubting but that many of the Fellows of the Society will join with them in carrying on such an undertaking: and being well persuaded of your approbation of this their purpose, (so much tending to the reputation and support of the Society) they desire that you would be pleased to undertake for one; and to name any Thursday after the fourteenth of January next, such as shall be most convenient for you, when you will present the Society at one of their Public Meetings, by yourself, or some other of the Fellows for you, with such a Discourse (grounded upon, or leading to, Philosophical Experiments) on a subject of your own choice. In doing of which you will benefit the Society, and oblige,

SIR,

Your humble Servant,

BROUNCKER, P. R. S.

LONDON, DEC, 28, 1674.



To the Right Honourable

LORD VISCOUNT BOUNCKER,

PRESIDENT OF

THE ROYAL SOCIETY.

MY LORD,

I HAVE, in obedience to your Lordship, and the irresistible suffrages of that SOCIETY over which you preside, resigned these Papers to be disposed of as you think fit. I hear your Lordship's sentence is, they should be made public. Why should not a thousand things of infinitely more value, daily enriching their collection, (and which would better justify the laudable progress of that Assembly) be oftener produced, as some of late have been? This, my Lord, would obviate all unkind objections, and cover the infirmities of the present Discourse, with things indeed worthy our Institution. But, as I am to obey your Lordship's commands, so both your Lordship and the Society, are accountable for publishing the imperfections of,

MY LORD,

Your Lordship's and

Their most obedient Servant,

APRIL 29, 1675.

J. EVELYN.

T E R R A, &c.

I AM called upon by command from your Lordship, and the Council who direct the progress of the Royal Society, to entertain this Illustrious Assembly with something which, being either deduced from, or leading to, Philosophical Experiment, may be of real use, and suitable to the design of its institution.

I am highly sensible as of the honour which is done me, so of the great disadvantages I lie under for want of abilities to carry me through an undertaking of this importance, and before such acute and learned judges; but I hope my obedience to your commands will cover those defects for which I can make no other apology.

There are few here, I presume, who know not upon how innocent and humble a subject I have long since diverted my thoughts; and therefore I hope they will not be displeas'd, or think it unworthy of their patience, if from their more sublime and noble speculations (and which do often carry them to converse among the brighter Orbs and heavenly bodies) they descend a while, and fix their eyes upon the Earth, which I make the present argument of my discourse. I had once indeed pitched upon a subject of somewhat a more brisk and lively nature; for what is there in nature so sluggish and dull as Earth? What more spiritual and active than Vegetation, and what the Earth produces? But this, as a province becoming a more steady hand and penetrating wit than mine to cultivate, (unless where it transitorily comes in my way to speak of Salts and Ferments) I leave to those of this learned Society, who have already given such admirable Essays of what they will be more able to accomplish upon that useful and curious theme; and therefore I beg leave that I may con-

fine myself to my more proper element, the Earth, which, though the lowest and most inferior of them all, yet is so subservient and necessary to vegetation, as without it there could hardly be any such thing in nature.

To begin: I shall in the first place describe what I mean by Earth: then I shall endeavour to shew you the several sorts and kinds of Earth: and lastly, how we may best improve it to the uses of the husbandman, the forester, and the gardener; which is indeed of large and profitable extent, though it be but poor and mean in sound, compared to mines of gold and silver, and other rich ores, which likewise are the treasures of the Earth, but less innocent and useful.

I intend not here to amuse this noble audience, or myself, with those nice inquiries concerning what the real form of that body or substance is which we call Earth, denudated and stripped of all Heterogeneity, and reduced to its principles: as whether it be composed of sandy, central, nitrous, or other salts, atoms, and particles: whether void of all qualities but dryness, and the like, (as they commonly enter into the several definitions of Philosophers) nor of what figure and contexture it consists, which causes it to adhere and combine together, so as to affirm any thing dogmatically thereupon; much less shall I contend whether it be a planet moving about the sun, or be fixed in the centre of the universe; all which have been the curious researches and speculations of our later Theorists; but content myself with that body or mass of glebe which we both dwell on and every day cultivate for our necessary subsistence, as it affords us corn, trees, plants, and vegetables of all sorts, useful for human life, or the innocent refreshment of it.

Those who have written *de Arte Combinatoria*, reckon up no fewer than one hundred seventy-nine millions one thousand and sixty different sorts of Earths; but of all this enormous number, as of all other good things, it seems they do not acquaint us with above eight or nine eminently useful to our purpose; and truly I can hardly yet arrive at so many. Such as I find naturally and usually to rise from the pit, I shall here spread before you in their order.

The most beneficial sort of Mould or Earth, appearing on the surface, (for we shall not at present penetrate lower than is necessary for the plant-

ing and propagation of vegetables) is the natural under-turf Earth; but for a description of the rest which succeed it in strata, or layers, till we arrive at the barren and impenetrable rock, I shall refer the critical reader to the old Geoponic authors.

Most, or all, of these strata lying in beds one upon another, from softer to harder, better to worse, usually determine in sand, gravel, stone, rock, or shell; which last we frequently meet with in marshes and fenny delves, and sometimes even at the foot of high mountains, and sometimes on their very tops, after divers successions of different Moulds, and at the bottom of the profoundest pits, as in that deep perforation made at Amsterdam, in order to the building of the Stadt-House^a. All which, and the cause of the successions of the several strata of fofsils, &c. so bedded

^a Varenus informs us, that in a well which was dug at Amsterdam to the depth of two hundred and thirty-two feet, the following substances were found in succession: Seven feet of vegetable earth; nine of turf; nine of soft clay; eight of sand; four of earth; ten of clay; four of earth; ten of sand; two of clay; four of white sand; five of dry earth; one of soft earth; fourteen of gravel; eight of clay mixed with sand; four of gravel mixed with shells; an hundred and two feet of clay, and then thirty-one feet of sand.—Mr. Buffon, in the first volume of his Natural History, gives us still a more exact enumeration of the different beds of earth found at Marly-la-Ville, to the depth of one hundred and one feet.

	Feet Inch-
1. A free reddish earth, with much vegetable mould, a very small quantity of vitrifiable sand, and somewhat more calcinable sand or gravel	13 0
2. A free earth mixed with more gravel, and a little more vitrifiable sand	2 6
3. Earth mixed with vitrifiable sand in a very great quantity, and which made but very little effervescence with aqua fortis	3 0
4. Hard marble, which made a very great effervescence with aqua fortis	2 0
5. Very hard marly stone	4 0
6. Marl in powder, mixed with vitrifiable sand	5 0
7. Very fine vitrifiable sand	1 6
8. Earthy marl, mixed with a little vitrifiable sand	3 6
9. Hard marl, in which was real flint	3 6
10. Gravel, or powdered marl	1 0
11. Eglantine, a stone of the grain and hardness of marble, and sonorous	1 6
12. Marly gravel	1 6
13. Marl in the form of hard stone, whose grain was very fine	1 6
14. Marl like stone, with a grain not so fine	1 6
Carried over	45 0

thro' the whole terrestrial globe, the ingenious Dr. Woodward attributes to a total dissolution of the materials which constituted the original fabrick of the Antediluvian World, when the commotion of the waters beginning to calm and relax, the disunited floating particles promiscuously blended, sunk down, and subsiding according their specific gravities, settled in the beds and strata we now every where find. But of this, and other effects of the deluge, see the learned Doctor's Efsay ^b.

I begin with what commonly first presents itself under the removed turf, and which, for having never been violated by the spade, or received any foreign mixture, we will call Virgin-Earth; not that of the Chymists, and the searchers after the Philosopher's Stone, but what is found lying

	Ft.	In.
Brought over	45	0
15. Marl still more grofs	2	6
16. Very fine vitrifiable sand, mixed with fossil sea shells, which had no adherence with the sand, and whose colours and polish were perfect	1	6
17. Very small gravel, or fine marl powder	2	0
18. Marl in the form of hard stone	3	6
19. Coarse powdered marl	1	6
20. Hard stone, calcinable like marble	1	6
21. A gray vitrifiable sand, mixed with fossil shells, particularly oysters and muscles, which had no adherence with the sand, and which were not petrified	3	0
22. White vitrifiable sand mixed with the like shells	2	0
23. Sand streaked red and white, and mixed with the like shells	1	0
24. Larger vitrifiable sand, mixed with the like shells	1	0
25. A fine gray, vitrifiable sand, mixed with the like shells	8	6
26. Very fine fat sand, with very few shells	3	0
27. Brown free stone	3	0
28. Vitrifiable sand, streaked red and white	4	0
29. White vitrifiable sand	3	6
30. Reddish vitrifiable sand	15	0
Total depth	101	0

^b In the year 1695, Dr. Woodward published his celebrated work, entitled "An Efsay towards a Natural History of the Earth," of which Mr. Evelyn has given us a very just and concise account. The Doctor's theory met with many warm opponents, which obliged him to engage deeply in the defence of it; and so fondly was he attached to his doctrine, that he founded a Lecture in the University of Cambridge to be read there in defence of it, which he endowed with a salary of one hundred pounds per annum. The ingenious and learned Dr. Middleton was appointed the first Lecturer.

about a foot deep, more or less, in our fields, before we come to any manifest alteration of colour or perfection. This Surface-Mould is the best and sweetest, being enriched with all that the air, dews, showers, and celestial influences can contribute to it: for it is with good Earth as with excellent water; that is the best which with least difficulty receives all external qualities; for the fatness of this under-turf Mould, being drawn up by the kindly warmth of the sun to the superficies, spends but little of its vigour in the grafts and tender verdure which it produces, and easily nourishes without dissipating its virtue, provided no rank weeds or predacious plants (consummating their seeds) be suffered to grow and exhaust it, but maintains its natural force, and is therefore of all other uncultivated Moulds the most grateful to the husbandman.

Now as the rest of incumbent and subjacent Earths approach this in virtue, so they are to be valued; and of these there are several kinds, distinguishable by their several constitutions; the best of which is black, fat, yet porous, light, and sufficiently tenacious, without any mixture of sand or gravel; rising in pretty gross clods at the first breaking up of the plough; but with little labour and exposure falling to pieces, but not crumbling altogether into dust, which is the defect of a more vicious sort. Of this excellent black Mould, fit almost for any thing without much manure, there are three kinds, which differ in hue and goodness.

The next layer in series to this, is usually mixed with a sprinkling of stones, somewhat hard, yet friable, and when well aired and stirred, is

* With this loose covering the Earth is every where invested, unless it be washed off by rains, or removed by some other external violence.—“It is the Earth that, like a kind mother, receives us at our birth, and sustains us when born. It is this alone, of all the elements around us, that is never found an enemy to man. The body of waters deluge him with rains, oppress him with hail, and drown him with inundations; the air rushes in storms, prepares the tempest, or lights up the volcano; but the Earth, gentle and indulgent, ever subservient to the wants of man, spreads his walks with flowers, and his table with plenty; returns with interest every good committed to her care; and though she produces the poison, she still supplies the antidote; though constantly teased more to furnish the luxuries of man than his necessities, yet, even to the last, she continues her kind indulgence, and when life is over, she piously hides his remains in her bosom.” *Phil. Nat. Hist.* l. ii.

not to be rejected; the looseness of it admitting the refreshment of showers, renders it not improper for trees and plants which require more than ordinary moisture. Declining from this in perfection, is the darkish grey or tawny, which, the deeper your mine, rises veined with yellow, and sometimes reddish, till it end in pale; and if you penetrate yet farther, commonly in sand and gritty stone.

Of a second class, is Mould of an obscure colour also, more delicate grain, tender, cheafom and mellow; clear of stones and grittiness, with an eye of loam and sand, which renders it light enough, yet moist; of all other the most desirable for flowers and the coronary garden.

To this we add a yet more obscure and sandy Mould, accompanied with a natural fatness; and this, though rarer, is incomparable for all sorts of fruit-trees.

A third participates of both the former; fattish, yet interspersed with small flints and pebbles, not to be altogether neglected.

A fourth is totally sandy, and that of divers colours, with sometimes a bottom of gravel, now and then rock, and not seldom clay; and, as the foundations are, so it is more or less retentive of moisture, and tolerable for culture; but all sand does easily admit of heat and moisture, and yet for that not much the better; for either it dismisses and lets them pass too soon, and so contracts no ligature, or retains them too long, especially where the bottom is of clay, by which it parches, or chills, producing nothing but moss, and disposes to cankerous infirmities; but if, as sometimes it fortunes, that the sand have a surface of more genial Mould, and a bottom of gravel or loose stone, though it do not long maintain the virtue it receives from heaven, yet it produces forward-springing, and is parent of sweet grass, which, though soon burnt up in dry weather, does as soon recover with the first rain that falls.

Of pure and sheer sand there is white, black, bluish, red, yellow, harsher and milder, and some mere dust in appearance, none of them to be desired alone; but the grey-black and ash-coloured, and that which frequently is found in heathy commons, or the travelling kind, volatile, and exceedingly light, is the most insipid and worst of all. I do not here

speak of the drift and sea sand, which is of admirable virtue and use in mixtures, and to be spread on some lands, because it has been described so accurately already in a just discourse upon another occasion, by an experienced Gentleman dwelling in the western parts, where this manure is perfectly understood, and recommended to more general use.

As of sands, so are there different sorts of clays, and of as different colours, whereof there is a kind so obstinate and ill-natured, as almost nothing will subdue; and another so voracious and greedy, as nothing will satiate, without exceeding industry, because it ungratefully devours all that is applied to it, turning it into as arrant clay as itself. Some clays are more pinguid than others; some more slippery; all of them tenacious of water on the surface, where it stagnates and chills the plant without penetrating; and in dry seasons costive, and hardening with the sun and wind; most of them pernicious and untractable.

The unctuous and fatter clay frequently lies upon the other, having oftentimes a basis of chalk beneath it; but neither is this worth any thing till it be loosened and rendered more kind, so as to admit of the air and heavenly influences: in a word, the blue, white, and red clays (if strong) are all of one kind; the stony and looser sort is yet sometimes tolerable; but the light Brick Earth does very well with most fruit-trees.

I had almost forgotten Marsh-Earth, which, though of all other seemingly the most churlish, a little after it is first dug and dried, (when it soon grows hard and chaps) may, with labour and convenient exposure, be brought to an excellent temper; for being the product of rich slime, and the sediment of land-waters and inundations, which are usually fat, as also the rotting of sedge, yea, and frequently of prostrated trees, rotted and now converted into Mould, it becomes a very profitable land; but whether I may reckon this among the natural Earths, I do not contend.

Of Loams and Brick-Earths we have several sorts, some approaching to clay, others nearer marl; differing also in colour; and if it be not too rude mingled in just proportion with other Mould, an excellent ingredient in all sorts of Earth, and so welcome to the husbandman, and especially the gardener, as nothing does well without a little dash of it.

Of Marl (a substance between clay and chalk, of a cold, sad nature) we have seldom such quantities in layers as we have of the forementioned Earths; but we commonly meet with it in places affected to it, and it is taken out of pits at several depths, and of divers colours, red, white, grey, blue, all of them unctuous, of a slippery nature, and differing in goodness; for, being pure and immixed, it sooner relents after a shower, and when dried again, slackens and crumbles into dust, without induration, and growing hard. All the kinds are profitable for barren grounds, as abounding with nitre ^d.

Lastly, Chalk. This is likewise of several kinds and colours; hard, soft, fine, coarse, abstergent, slippery, and marly, and apt to dissolve with the weather into no unprofitable manure. Some kinds have a sandish, others a blacker and light surface; and there is a sort which produces sweet grafs and aromatic plants, and some so rank, especially in the vallies of very high hills, as to feed not only sheep, but other cattle, to great advantage, as we may see in divers places among the downs of Suffex. But it has a peculiar virtue above all this, to improve other lands, as we shall come to show.

I forbear to speak particularly of Fullers-Earth, Tobacco-pipe Clay, dry and astringent, the white Cimolia, and the several fictile clays, because they are not so universal and serviceable to the plough and spade; much less of Terra Lemnia, Chia, Melitensis, Hetrusca, and the rest of the Sigillatæ; nor of the Boles, Rubrics, and Ochres, Figuline, Stiptic, Smegmatic, &c. as they are diversely qualified for several uses, medicinal and mechanical, but content myself with those I have already enumerated ^e.

^d Whoever is desirous of obtaining a just and philosophical idea of marl, may consult Dr. Ainslie's account of that substance, as inserted in the *Georgical Essay*. In the same work there is a most useful Essay by the ingenious Mr. Henry, of Manchester, on the manner of compounding *facitious* marl, for the use of such farmers as reside in countries where genuine marl cannot be obtained. Sand and calcareous Earth plentifully bestowed up on heavy clay land, will, for a time, convert the surface, to the depth of some inches, into a kind of Marl. It were to be wished that the mixture of opposite soils was more attended to by the farmer, and this happy consequence would follow, that over stiff and adhesive lands would be made tender, and over sandy lands would have a texture given them.

^e Earths consist of very minute and almost impalpable particles, cohering very slightly

Now, besides the description and characters we have given of these several Moulds and Earths, as they reside in their several beds and couches, there are divers other indications, by which we may discover their qualities and perfections; as, amongst others, a most infallible one is, their disposition to melt and crumble into fine morsels, not turn to mud and mortar, upon the descent of gentle showers, how hard soever they seem before, and if in stirring they rise rather in granules, than mafsy clods.

If upon excavating a pit, the mould you exhaust do more than fill it again, Virgil tells us it is a good augury; upon which Laurembergius affirms, that at Wittemberg, in Germany, where the Mould lies so close,

together. They do not burn, nor are they malleable; are easily diffusible, but not soluble, in water. Properly there are but two sorts:

- I. *Argillaceous Earths*, which harden in the fire, and do not dissolve in the mineral acids.
- II. *Alcaline, or Calcareous Earths*, which in the fire burn to lime, and dissolve in the mineral acids.

ARGILLACEOUS EARTHS consist either of spongy, or of smooth tenacious parts: the former is called *Vegetable Earth*, or *Mould*; the latter *Clay*.

Among the Clays are reckoned:

I. *Potters' Earths*, viz.

1. Loam, which is coarse, irony, and very sandy.
2. Common potter's clay, which is heavy, without sand, of different substance and colour, whence some require a greater degree of heat to flux them than others.
3. Fine clay, or porcelain clay, which is smooth and greasy to the touch, and of various colours.

II. *Medicinal Earths*, viz.

1. Boles and Terræ Sigillatæ.

III. *Mechanical Earths*, viz.

1. Tripoli.
2. Fuller's Earth, which lathers like soap, and raises a froth in the water. But the true Fuller's Earth dissolves in acids, and consequently belongs to the Marl-Earths.

IV. *Painters' Earths*, viz.

- | | |
|--------------------|-------------------|
| 1. White. | 4. Mineral red. |
| 2. Mineral yellow. | 5. Mineral blue. |
| 3. Umber. | 6. Mineral green. |

To the ALKALINE OR CALCAREOUS EARTHS belong the following:

- I. *Chalk*. This is composed of fine particles, adhering closely together, and forming a pretty compact texture. It colours the hand upon being touched, and commonly is white, but sometimes is of different colours and kinds.

- II. *Marls*. These are of a loose, friable texture, easily reducible into powder, and readily separating and diffusing in water. When recently dug out of the ground,

as it does not replenish the fofs out of which it has been dug, the corn which is sown in that country soon degenerates into rye; and what is still more remarkable, that the rye sown in Thuringia (where the earth is less compacted) reverts, after three crops, to be wheat again ^f.

My Lord Bacon directs to the observation of the Rainbow, where its extremity seems to rest, as pointing to a more roscid and fertile Mould; but this, I conceive, may be very fallacious, it having two horns, or bases, which are ever opposite.

But the situation and declivity of the place is commonly a more certain mark; as what lies under a Southern, or South-east rising ground; but

they are pretty hard, but being exposed to the air, soon fall into powder. They are of various colours, but are seldom pure, being commonly mixed with a portion of argillaceous Earth.

* * As *Stones* are intimately connected with *Earths*, I shall in this place give a general idea of them, in order that the reader may have a full and comprehensive view of that mixed body, which is the subject of this Essay.

Stones may be comprehended under the four following *genera* :

I. *Calcareous, or Lime Stones.*

1. These effervesce with, and dissolve in, the mineral acids; and in the fire burn to lime.

II. *Argillaceous, or Clay Stones.*

1. These are insoluble in acids, and burn to hardness in the fire.

III. *Cypseous, or Plaster Stones.*

1. These are not affected by acids. They burn to plaster in the fire, and being wetted with water, presently grow hard, in which they differ from lime, which does not harden upon wetting, unless mixed with sand, and not then till after a long time.

IV. *Vitrescent, or Glass Stones.*

1. These suffer no change with acids, and in the fire run to glass. All this genus strike fire with steel, except the glass spar and the pumice stone.

* * A great many small, visible, vitrescent *Stones*, constitute what is called *Sand*, which is either coarse or fine. Sometimes *Sand* consists of one species only, but oftener of two or more. When these cohere, they form the *Grit* or *Sand Stones*, of which Mill-Stones, Grind-Stones, &c. are made.

^f This observation of *Laurebergius* has neither reason nor experiment to recommend it. It is in the last degree absurd.

this is also eligible according to the purposes you would employ it for; some plants affecting hotter, others colder exposures; some delight to dwell on the hills, others in the vallies and closer seats; and some again are indifferent to either; but, generally speaking, most of them choose the warm and more benign; and the bottoms are universally fertile, being the recipients of what the showers bring down to them from the hills and more elevated parts.

Another infallible indication is the nature and floridness of the plants which the land naturally produces; as where thistles spontaneously thrive; where the oak grows tall and spreading; and as the plant is of kind, so to prognosticate for what tillage, or other use, the ground is proper. Thyme, strawberries, betony, and sorrel, direct to wood; chamomile, to a Mould disposed for corn and hortulan furniture; burnet, to pasture; mallows, to roots, and the like, as my Lord Verulam and others observe.

On the contrary, some grounds are so cold, as naturally to bring forth nothing but gorse, broom, holly, yew, juniper, ivy, and box; which may happily direct us to the planting of pine, firs, the phillyreas, laurel, Spanish broom, and other perennial verdures, in such places,

Moss, rushes, wild tansy, sedge, flags, fern^s, yarrow, and where plants appear withered or blasted, shrubby and curled, (which are the effects of immoderate wet, heat and cold, interchangeably) are natural auguries of a cursed soil; yet I have observed some ferny grounds proper enough for coppice and forest-trees. Thus, as by the plant we may conjecture of the Mould, so by the Mould we may guess at the plant; the more herbaceous and tender, springing from the gentle bed; the coarser and rougher plants, from the rude and churlish. And as some Earths appear to be totally barren, and some, though not altogether so

§ Where fern grows luxuriantly, we may pronounce the soil favourable to turnips, corn, and trees. The other plants here mentioned are certain indications of a bad soil. Virgil describes sterile grounds by enumerating the plants that naturally grow in such places. There,

— — — — — *picæ tantum, taxique nocentes
interdum, aut hederæ pandunt vestigia nigræ.*

unfruitful, yet wanting salacity to conceive, vigour to produce, and sensibly eluding all our pains; so there are others which are perpetually pregnant, and this is likewise a good prognostic.

Upon these, and such like hints, in proposals of transplanting spices and other exotic rarities from either Indies, the curious should be studious to procure of the natural Mould in which they grow, (and this might be effected to good proportion, by the ballasting of ships) either to plant or nourish them in from the seed, till they were of age, and had gained some stability of roots and stem, and become acquainted with the genius of our climate; or for essays of mixtures, to compose the like.

By the goodness, richness, hungeriness, and tincture of the water straining through grounds, and by the weight and sluggishness of it, compared with the lighter, conjecture also may be made, as in part we have showed already.

To conclude: There are almost none of our senses but may of right pretend to give their verdict here.

And first, we judge by the odour or smell, containing, as my Lord Verulam affirms, the juice of vegetables already, as it were, concocted and prepared; so as after long droughts, upon the first rains, good and natural Mould will emit a most agreeable scent, and in some places (as Alonso Barba, a considerable Spanish author, testifies) approaching the most ravishing perfumes; on the contrary, if the ground be disposed to any mineral, or other ill quality, it sends forth arsenical and very noxious freams, as we find in our marshes and fenny grounds.

2dly, By the taste, and that with good reason, all Earths abounding more or less in their peculiar salts, as well as plants; some sweet and more grateful; others bitter, mordacious, or astringent; some flat and insipid; all of them to be detected by percolation of untainted water thro' them; though there be who affirm that the best Earth, like the best water and oil, has neither odour nor taste.

3dly, By the touch, if it be tender, fatty, detersive, and slippery; or more asperous, gritty, porous, and friable; likewise if it stick to the fingers like bird-lime, or melt and dissolve on the tongue like butter.

Furthermore, good and excellent Earth should be of the same constitution, and not of contrary, as soft and hard, churlish and mild, moist and dry; not too unctuous, nor too lean, but resolvable, and of a just and procreative temper, combining into a light easily crumbling Mould, yet consistent, and apt to be wrought and kneaded; such having a modicum of loam naturally rising with it, to entertain the moisture, does neither defile the fingers, nor cleave much to the spade, which easily enters it: this kind is usually found under the turf of pasture grounds, upon which cattle have been long fed and foddered. In a word, that is the best Earth to all the senses which is of a blackish grey, cuts like butter, sticks not obstinately, but is short, light, breaking into small clods, is sweet, will be tempered without crusting or chapping in dry weather, or becoming mortar in wet.

Lastly, By the sight, from all the instances of colour and other visible indications; for the common opinion is, though exploded by Columella, that all hot and choleric grounds are red or brown; cold and dry, blackish; cold and moist, whitish; hot and moist, ruddy; which yet, exhalations from minerals, the heat of the sun, and other accidents may cause; but generally they give pre-eminence to the darker greys; next to the russet; the clear tawny is found worse; the light and dark ash-colour (light also of weight, and resembling ashes) good for nothing; but the yellowish red worst of all. And all these are fit to be known, as contributing to noble and useful experiments, upon due and accurate comparisons and inquiries from the several particles of their constitutions, figures, and modes, as far at least as we can discover them by the best auxiliaries of microscopes, lotions, strainers, calcinations, and grindings; upon such discovery to judge of their qualities, and by essaying variety of mixtures, and imitating all sorts of Mould, foreign or indigen, to compound Earths as near as may be resembling the natural, for any special or curious use, and thereby be enabled to alter the genius of grounds as we see occasion^b.

^b I cannot in this place omit the beautiful and correct description that Virgil has given us of the various soils:

Next, of each various soil the genius hear!
Its colour, strength, what best dispos'd to bear.

The consideration of this it was which gave me the curiosity to fall upon the examining of a collection I had made of several sorts of earths and soils, such as I could find about this territory, whereof some I washed, to find by what would melt, reside, or pass away in the percolation, of what visible figure they chiefly seemed to consist, armed as I was with

Th' unfriendly cliffs, and unprolific ground,
 Where clay jejune, and the cold flint abound,
 Where bushes overspread the barren field,
 Will best th' unfading grove of Pallas yield:
 Here the wild olive woods luxuriant shoot,
 And all the plains are strewn with sylvan fruit.
 But the rich soil with genial force endu'd,
 All green with grafs, with moisture sweet bedew'd,
 Such as we oft survey from cavern'd hills,
 Whence many a stream descends in dripping rills,
 And with rich ooze the fatt'ning valley fills;
 Or that which feels the balmy southern air,
 And feeds the fern unfriendly to the share;
 Ere long will vines of lustiest growth produce,
 And big with bounteous Bacchus' choicest juice,
 Will give the grape in solemn sacrifice,
 Whose purple stream the golden goblet dyes,
 When the fat Tuscan's horn has call'd the god,
 And the full chargers bend beneath the smoaking load.
 But bullocks would you rear, and herds of cows,
 Or sheep, or goats that crop the budding boughs;
 Seek rich Tarentum's plains, a distant coast,
 And fields like those my luckless Mantua lost,
 His silver-piniou'd swans where Mincio feeds,
 As slow they sail among the wat'ry weeds.
 There for thy flocks fresh fountains never fail,
 Undying verdure clothes the grassy vale;
 And what is crop'd by day, the night renews,
 Shedding refreshful stores of cooling dews.

A sable mould and fat beneath the share,
 That crumbles to the touch, of texture rare,
 And (what our art effects) by nature loose,
 Will the best growth of foodful grain produce:
 And from no field, beneath pale evening's star
 With heavier harvests fraught, returns the nodding ear,
 Or else the plain, from which the ploughman's rage
 Has widd the forest, hoar through many an age,

an indifferent microscope, of which he pleased to take this brief account.

Gravelly and arenous earths of several sorts, before they were washed, appeared to consist mostly of rough crystals, of which some were very

And tore the tall trees from their ancient base,
 Long the dark covert of the feathery race;
 Banish'd their bow'rs, abroad they mount in air,
 While shines the recent glebe beneath the share.
 For the lean gravel of the sloping field,
 And mould'ring stones, where snakes their mansions build,
 Where in dark windings filthy reptiles breed,
 And find sweet food their lurking young to feed;
 To bees ungenial, scarcely will supply
 Their Casia-flow'rs, and dewy rosemary.
 In that blest ground, which from its opening chinks,
 At will a steaming mist emits, or drinks;
 Which blooms with native grafts for ever fair,
 Nor blunts with eating rust the sliding share,
 Round thy tall elms the joyous vines shall weave,
 And floods of luscious oil thy olives give;
 This, with due culture, thou shalt surely find
 Obedient to thy plough, and to thy cattle kind.
 Such fertile lands rich Capua's peasants till,
 And such the soil beneath Vesuvus' hill;
 And that, where o'er Acerrae's prostrate tow'rs
 Clanius his swelling tide too fiercely pours.

Rules to know diff'rent soils I next dispense;
 How to distinguish from the rare the dense.
 This best for vines, that golden grain approves,
 Ceres, the dense; the rare, Lyaeus loves.
 First chuse a spot that's for the purpose fit,
 Then dig the solid earth; and sink a pit;
 Next, to its bed th' ejected soil restore,
 And press with trampling feet the surface o'er;
 If the mould fail, 'tis light; that soil inclines
 To fatten herds, and swell thy cluster'd vines,
 But o'er the pit replenish'd, if the ground
 Still rise and in superfluous heaps abound,
 O'er the thick glebe let sturdy bullocks toil,
 Cleave the compacted clods and sluggish soil.
 The land that's bitter, or with salt imbud,
 Too wild for culture, for the plough too rude,
 Where apples boast no more their purple hues,
 And drooping Bacchus yields degen'rate juice,

transparent and gemmy; few of them sharp or angular, but roundish and mixed with particles of a mineral hue, which being well dried, and bruised on a hard serpentine stone, and mullar of the same, was with little labour reduced to an impalpable whitish sand, untransparent, as it happens in the bruising of most bodies, though never so diaphanous before.

Yellow sand had the appearance of amber; but, when bruised, it became a paler untransparent sand.

Fat rich earth, full of black spots, without much discolouring the water, (as hardly did any of the sands) being dried, was reduced to a delicate sandy dust, with very little brightness.

Marsh-earth contained a considerable quantity of sand, the rest resembled the fat earth.

The under-pasture Mould had likewise a sandy mixture, and what passed with the water after evaporation, seemed to be an impalpable and very fine untransparent sand.

Clay consisted of most exceedingly smooth and round sands of several opacous colours.

Potters' Earth, of different sorts, ground small, became like sand, of a yellowish grey and other colours, exceedingly polite and smooth.

May thus be known: Of twigs a basket twine,
 Like that from whence is strain'd the recent wine;
 This with the soil and crystal water fill,
 Then squeeze the mafs, while thro' the twigs distil
 The big round drops in many a trickling rill;
 Soon shall its nature from its taste appear,
 And the wry mouth the bitter juice declare.
 We learn from hence a fat and vifcid land;
 It sticks like pitch uncrumbled to the hand:
 The moister mould a rank luxuriance feeds,
 Of lengthen'd grafs, and tall promifcuous weeds;
 O may be mine no over-fertile plain,
 That shoots too strongly forth its early grain!
 The light and heavy in the balance try,
 The black and other colours strike the eye;
 Not so the cold; lo! there dark ivy spreads,
 Or yews or pitch-trees lift their gloomy heads;

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A certain yellowish loamy earth, which had been brought to me with some orange-trees out of Italy, was reduced to a bright soft sand, appearing more gemmy than in the other loams.

Chalk resembled fine white flour, and some of it sparkled, especially the harsher sort; but the tender, not.

Fullers-earth appeared like gum tragacanth; a little wetted, seemingly swelled, yet glistening; but, when reduced to a fine dust, became a smooth sand.

Tobacco-pipe earth, not much bruised, was just like white starch; washed and well-dried, it resembled the whitest flour of wheat a little candied. I had not the opportunity of examining the several sorts of marls; so I proceed to the dungs.

Neats-dung (the cattle fed only with fodder, or little grafs, for it was in the winter I made my observations) appeared to be nothing but straws in the entire substance, and colour a little altered, save what a certain slippery mucilage gave them, sprinkled with a glistening sand like atoms of gold; but, upon washing and drying again, the tenacious matter vanished, and the straws appeared separated and clear.

Sheeps-dung was much like the former, only the spires and blades of a fine short grafs were conglomerated and rolled up into pellets, about which the glew was left viscous, but it passed also away in the lotion.

Swines-dung had the resemblance of dirty bees-wax, mingled with straws and husks, which seemed like candied Eringo, and some like Angelica roots.

The soil of horses appeared like great wisps of hay and little straws, thin of mucilage, and which, being washed, was easily to be discerned by a naked eye.

Deers-dung much resembled that of sheep.

Pigeons-dung consisted of a stiff glutinous matter, easily reducible to dust of a grey colour, with some husky atoms, after dilution. Lastly,

The dung of poultry was so full of gravel, small stones, and sand, that there appeared little or no other substance, save a very small portion both of white and blackish viscous matter twisted up together. This, of all others, the most fœtid and ill smelling.

These were all I had time and leisure to examine: I cannot say with all the accurateness they were capable of, but sufficiently to encourage the more curious, and to satisfy myself, that the very finest earth and best of moulds, however to appearance mixed with divers imperfect bodies, may, for ought we know, consist more of sandy particles than of any other whatsoever, at least if from this criterion we may be allowed to pronounce what they seem to the eye, sands, crystals, or salts, call them what you please; the consideration of which being so universally the cause of vegetation, was no small inducement to me to see if, by examining the several earths, (though but by a cursory inspection) I might possibly detect what rudiments of such a principle there were lurking in them, abstractedly taken; not that I think earth to be salt alone, and nothing else, (though perhaps little more besides sulphur) for so it produces no vegetable that I know of, without water to dissolve and qualify it for insurrection, and perhaps some other vegetable matter, fitted to manure and receive the seeds, and keep the plant steady, which yet, for ought I can discern, is also but a finer sort of sand, the clamminess of it being rather something extrinsic and accidental to it, than any thing natural, and originally constitutive: for, the combination of these several moulds which gives the ligature, slipperiness, and a diverse temper, seems rather to be caused by the perpetual and successive rotting of the grass, plants, leaves, branches, moss, &c. (than any peculiar or solitary principle apart) which, in long tract of time, has amassed together a substance heterogeneous to the ruder particles, which after the dilutions of the superficies (that is of the rich and fatter mould) appears to be little other than sand, or fixed salts, of various figures and colours; since even the most obdurate and flinty pebble beaten and ground to powder, or by calcination reduced to an impalpable dust, is as fine both to the eye, and smooth to the touch, as the most smectic earths and marls themselves; such at least as

you shall collect from the subsidence (to appearance) of the most crystal waters, precipitated by deliquated oil of tartar, or the like; and the more they be subdued and broken, the harder they will prove, if (cleared of their nitrous parts) they pass the potter's fire, however they seemed before to be of different constitution. This is evident in vessels made of tobacco-pipe clay, or whatever the material be, which has of late been so successfully employed by Dr. Hook, a worthy Member of this Society, for the finding out a composition (if I may so call it) nothing inferior to the hardest porcelain, and almost as beautiful. And now upon contemplation of that almost universal ingredient, sand, through all our trials, I cannot but incline to the sentiment of that excellent philosopher, as well as physician, the learned Dr. Lister, that sand might be the first mantle and universal covering of the newly-created earth. *See his discourse upon a map, discovering sands and clay, reduced to tables, presented to the Royal Society*¹.

But to return to our superficial earth, which we call the Mould. I affirm it to grow and increase yearly in depth from the causes aforesaid; and, in some places, to that proportion as to have raised no inconsiderable hills and eminences by the accidental fall and rotting of woods and trees, such as Birch, Beech, &c. which are not of a constitution to remain long in the ground (as Fir, Oak, Elm, and some other timber will do, and grow the harder) without corruption, and relenting into mould as soft and tender as what they first were sown or planted in; and of this I am able to give undeniable instances. I insist not here on the perpetual successions and generations of flints and other stones, in the same places

¹ Dr. Lister was of opinion, that, by examining the earth from the surface downwards, as often as an opportunity offered, a pretty just theory might be formed of its contents in general: for it appeared from his own observations, that upper natural soils infallibly produce the same internal minerals and materials. He has thrown out an hint to every naturalist for extending this useful knowledge, by advising that a soil or mineral map should be made, properly distinguished into countries, and enriched with observations for general use, arising from remarks on the bounds and produce of every particular soil.—The Doctor likewise thought that sand was once the exterior and general cover of the surface of the whole earth, and that clay was another coat in the more depressed and hollow parts. The following are his Tables of Sands and Clays which he drew up in 1673, from observations made in the northern parts of England, and is the matter here referred to by Mr. Evelyn.

A TABLE OF SANDS.

Sharp, or rag sand, composed of small transparent pebbles, naturally found upon the mountains, not calcareous.

SAND

<p>Fine</p> <p>Coarse</p> <p>Of Westmoreland.</p>	<p>White</p> <p>Grey</p> <p>Reddish</p> <p>Brown</p> <p>Grisley</p> <p>Brown</p>	<p>{ Struteham-Moor in the road washed up very white pebble-Flamborough-Head, of which the light-house there is composed.</p> <p>{ Catons sand burns reddish, but falls not in water.</p> <p>{ Section banks near Harthpool, on the Tese mouth.</p> <p>{ Eckerick in the gravel pit there; a vein of exceeding fine sand.</p> <p>{ The pillow-sand in the Baltic.</p> <p>{ In a spring at Hastingon.</p> <p>{ The sand at the Park in Somersetshire.</p> <p>{ Acomb near York, drifted sand.</p> <p>{ Hatton Moor washed.</p> <p>{ Thorp Fels.</p> <p>{ Ouse at York.</p> <p>{ Nid at Non Mookhon.</p> <p>{ Dug up at Rawcett near South.</p> <p>{ Wharfe at Eekly and Benton.</p> <p>{ Aire at Cartleton in Craven.</p> <p>{ Fire at Craven.</p> <p>{ Ganton.</p> <p>{ Ganton in Lincolnshire.</p> <p>{ Bromely Common.</p> <p>{ Skipwith Common.</p>	<p>{ From here</p> <p>{ Stone, with mica of different pur-</p> <p>{ tures.</p> <p>{ Mica—in Yorkshire.</p> <p>{ A vein at Ousecliffe.</p> <p>{ in Lincolnshire.</p> <p>{ Sea sand about the Selkirk sands.</p> <p>{ In Cleveland, and about Scarborough.</p> <p>{ One chest of shells found at Rawcett.</p> <p>{ A vein of mica in Hastingon gravel pit.</p> <p>{ Mica argentica in red sand rock near Ripon, plentifully.</p> <p>{ Mica aurea of Cleveland.</p>
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A TABLE OF CLAYS.

Pure, that is, such as is soft like butter to the touch, and has little or no grittiness in it.

CLAY

<p>Mixed</p> <p>With round sands, or pebbles.</p> <p>With flat or thin white sand, glittering with mica.</p>	<p>Greasy; to be reckoned amongst the medicinal earths, or <i>terra sigillata</i>.</p> <p>Yellowish.</p> <p>At Birkhill in Northampshire.</p> <p>At — under the Yorkshire Wolds.</p> <p>Brown, about Halifax.</p> <p>White, in Derbyshire lead-mines.</p> <p>2. Ball } in Cleveland.</p> <p>3. Pale yellow, in the marl-pit at Hildesley.</p> <p>4. Coveseon clay, or the soap-stone lying in coal-mines.</p> <p>5. A dark, blue clay, or marl, at Towthorpe.</p> <p>6. Crick, properly so called, or the milk-white clay of the Isle of Wight.</p> <p>7. The potter's pale yellow clay, of Walsell-Moor.</p> <p>8. The blue clay of Bellingbrook pottery, in Lincolnshire.</p> <p>9. A blue clay of Buggthorp Beck, in which the above-mentioned</p> <p>10. Yellow clay in the seams of the red sand rock at Bithonigh.</p> <p>11. Fine red clay in the red sand rock at Luffery and Ripon.</p> <p>12. A soft chalky blue clay, } at Batherstunth.</p> <p>13. A soft chalky red clay.</p> <p>Stony when dry.</p> <p>14. A red stone clay, } in the bank of Whiter-Pool, near Jappington, and at Huddersfield.</p> <p>15. A blue stone clay } ran to the top of it.</p> <p>16. Clamby, a white stone clay in Clumber-Parish.</p> <p>17. The yellow loam of Selwinton Moor in Yorkshire.</p> <p>18. A red sandy clay in the neighbourhood of Sandon, of beyond Nottingham, near the flood-tilt, } in the neighbourhood of Sandon.</p> <p>19. A red sandy clay in the red sand rock at</p> <p>20. French white-clay in Leeky, } at the top of the red sand rock at</p> <p>21. Grey or bluish tobacco-pipe } at the top of the red sand rock at</p> <p>22. A red clay in the red sand rock at</p>
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where they have been sedulously gathered off, by many (not improbably) thought to proceed from worm-casts, hardened by the air, and a certain lapidescent succus or spirit which it meets with; and this, for happening most on downs very much exposed, (yet undisturbed) is the more probable; as, on the other side, it establishes our conjecture of the purest moulds being capable of such a change; that which is thus cast up by the worms being so exceedingly elaborated and refined. Nor perhaps are all those innumerable perforations, especially through the hardest surfaces, the labour of worms alone, but the effect of some nitrous spirit that spews out those moleculæ. In the mean time, let no man be over confident that because some earths are soft, fat, and slippery, they may not possibly consist of sands (of which there are so many kinds) since it is evident that even all fessile bodies, which can be reduced and brought to sands, may, by contrition of the particles, be rendered so minute as to emulate the finest earths we have enumerated; the compactness and accidental mixtures resulting, as we affirm, from things extrinsical, not excluding exhalations, passage of liquors, and several juices to them, or conveyed by subterraneous steams and influences, be the stones, or rock, *glareous, metallic, testaceous*, salts, or any other concretes whatsoever. And what if we should indeed suspect all earth to be arrant salt, nay glass; and that glass, how hard soever, the offspring and child of water, the most fluid, crystalline, sincere, and void of all other qualities? It is not impossible, I think, but by the different texture of its parts, even that liquid element may be brought to the consistence of a most different body to what it appears. We know that water (besides that it was the first immense body which invested the chaos) was by some thought to be the Mother of Earth^k, (nay the *principia soluta* of all mixts whatsoever) and that the bottom of the sea was made by a perpetual hypostasis or subsidence, which precipitated from every part of it to the centre. I do not stand to justify these speculations, but to illustrate what I am about, namely, that water is apt enough to be condensed and made hard; and crude

^k This was the opinion of Thales, the Milesian, who taught that all things originated from water. Milton, where he describes the formation of the earth, makes a beautiful allusion to this doctrine:

On the wat'ry calm
 His brooding wings the spirit of God outspread,
 And vital virtue infus'd, and vital warmth
 Throughout the fluid mass,

PARADISE LOST,

mercury, and running metal, crystals, gems, and pearls, do more resemble it than that dirty and opaque body which we usually denominate Earth. Besides, we find how divers waters not only indurate and petrify other substances, but grow into stones, and leave a rocky callus where they drop and continually pass, and that all sands and stones are not diaphanous, therefore that is no eviction but that they might once have been fluid, since their opacity may be adventitious, and proceed from sundry accidents; so as granting this hypothesis, we are left to wonder that this matter is above all other so disposed to vegetation, and apt to produce plants endued with colour, weight, taste, odour, and with sundry medicinal and other virtues, as I think that excellent philosopher Mr. Boyle, the great ornament of this Society, does somewhere make out from the various percolations, concoctions, and circulations of that fruitful menstruum; and if that be true, that there is but one catholic, homogeneous, fluid matter, (diversified only by shape, size, motion, repose, and various texture of the minute particles it consists of, and from which affections of matter, the divers qualities result of particular bodies) what may not mixture and an attentive inspection into the anatomical parts of the vegetable family in time produce, for our composing of all sorts of moulds and soils almost imaginable, which is the drift of my present Discourse? And why might not Solomon by this means have really had all kinds of plants in his incomparable gardens? even ebony, cloves, cinnamon, and from the cedar to the shrub, such as grew only in the remotest regions, furnished (as he doubtless was) with so extraordinary an insight into all natural things and powers for the composing of earths, and assigning them their proper mixtures and ferments¹. I do not here inquire whether there be not a *pansperme* universally diffused, individuated, and specified in their several matrixes and receptacles *pro ratione mixti*, as they speak, but I think there might very unexpected phenomena be brought to light in vegetable productions, did men seriously apply themselves to make such possible trials as is in the power of art to effect; and how far

¹ It is Climate, and not Soil, that occasions such a variety in plants; so that unless we can give a foreign plant something of its own climate, it will be in vain to rear it even in its own earth. Of this, Mons. Tournefort, in his Travels into the East, had very convincing proofs. At the bottom of Mount Ararat, he found the common plants of Armenia; a little higher up, those of Italy; higher, those which grow about Paris; afterwards, the Swedish plants; and lastly, on the top, the alpine plants of Lapland.

soils may be dissembled, and the air and water attempered, (at least for some curiosities which may give light to more useful things) I do not conclude; but I should expect very rare and considerable things from an attentive and diligent endeavour. To this end, the raising of artificial dews and mists, impregnated with several qualities for the more natural refreshment of exotic plants, were, it may be, no hard matter to effect, no more than were the modification of the air abroad, as well as in our more confined Reserves, where we set them in for hyemation, and during the most rigorous colds. As for mixtures of earth; plants we know are nourished by things of like affinity with the constitution of the soil which produces them, and therefore it is of singular importance to be well read in the alphabet of earths and composts; for, as we have said, plants affect the marsh, bog, mountain, valley, sand, gravel, fat and lean mould, according to their tempers; and for want of skill in this, the same plant not only languishes and starves, but some we find to grow so luxuriant as to change their very shapes, colours, leaves, roots, and other parts, and to grow almost out of knowledge of the most skilful Phyto-logist; not here to speak of what alterations do accrue from transplanting and irrigations alone. I mention this to incite the curious to essay artificial compositions in defect of natural soil; to make new confections of earths and moulds for the entertaining of the most generous and profitable plants, as well as the most curious, especially if, as I hinted, we could skill to modify also the air about them, and make the remedy as well regional as topical; and why not for other fruits (strangers yet amongst us) as for oranges, lemons, pomegranates, figs, and other precious trees, which of late are become almost endenized amongst us, and grow every generation more reconcileable to our climate? For, according to Theophrastus, it is not the excessive fatness and richness of the soil which invites these exotics and varieties to stay with us, or indeed any other plants to prosper, but something which is *connatural* and suitable to the species.

Here we might enlarge upon the several inquiries formerly suggested; as, How far principles might be multiplied and differenced by alteration and condensation? Whether earth, stripped of all heterogeneity and ununiform particles, retains only weight and an insipid siccity? And whether it produces or affords any thing more than embracement to the first rudiments of plants, protection to the roots, and stability to the stem; unpro-

life, as they say, till married to something of a more masculine virtue, which irradiates her womb ; but otherwise, nourishing only from what it attracts, without any active or material contribution? It is in the mean time wonderful to consider how such vast, tall, and monstrous trees as Firs, Pines, and other Alpestrals, (whose footing and roots insinuate into the most dry and impenetrable rocks, without any earth or mould to nourish them) can grow, exposed as they are to the most rigid colds, fierce winds, and other inclemencies of weather, if the rains, dews, mists, the air, or other visible principle, appear in no proportion to the stature, bulk, and substance of these goodly trees. These, indeed, with many other queries, do appositely come in here ; but it would perhaps render this Discourse more prolix than useful to enter upon them in detail ; nor is it for me to undertake speculations of so abstruse a nature without unpardonable ostentation ; and therefore, having only offered something towards the discovery of the great varieties and choice of earths, (such as we gardeners and rustics for the most part meet with in our grounds) my next endeavour shall be to show how we may improve the best, and prescribe remedy to the worst, by labour and stirring only ; which, being the least artificial, approaches the nearest to nature.

At the first breaking up of your ground, therefore, let there be a pretty deep trench, or furrow, made throughout, of competent depth, (as is the manner of experienced gardeners) the turf being first pared off and laid by itself, with the first mould lying under it, and that of the next in succession, that so they may both participate of the air, showers, and influences, to which they are exposed ; and this is to be done in severals, as deep as you think fit, that is, so far as you find the earth well-natured ; or you may fling it up in several small mounds or lumps, suffering the frosts and snows of a winter or two (according as the nature of it seems to require) to pass upon them, beginning your work about the commencement of autumn, before the mould becomes too ponderous and sluggish ; though some there are who choose an earlier season, and open their ground when the sun approaches, not when he retires ; but certainly to have the whole winter before us does best temper and prepare it for those impregnating agents.

In separating the surface-mould from the deeper, whether you make a trench, or dig holes to plant your trees in, be it for standards, espaliers,

or shrubs, the longer you expose it and leave the receptacles upon, (were it for two whole winters) the better it will recompense your expectation; and especially if, when you come to plant, you dispose of the best and fattest earth at the bottom, which, if it be of sweet and ventilated mud of ponds, or highway dust, were preferable to all the artificial composts you can devise. In defect of this, (where it cannot be had in quantity) cast in the upper turf, if not already consumed, the sod downwards, with the next adhering mould for half a foot in thicknes; on this, a layer of well-matured dung; then as much of the earth which was last flung out, mixing them very well together. Repeat this process for kinds, mixture, and thicknes, till your trenches and holes be filled four or five inches above the level or area of the ground, to which it will quickly subside upon the first refreshings, and a very gentle treading to establish the tree. Fruit planted in such mould, you will find to prosper infinitely better than where young trees are clapped in at adventure in new broken-up earth, which is always cold and sluggish, and ill-complexioned; nor will they require (as else they do) to be supplied every foot with fresh soil, before they be able to put forth lusty and spreading roots; but which it is impossible to convey to them so as to affect the under parts, by excavating the ground and undermining the trees, after once they arrive to any stature, without much trouble and inconvenience, and the manifest retarding of their progress.

If you will plant in pits and holes, and not give your ground an universal trenching, (which I prefer) make them the larger; five feet, at the least, square, but not above half a yard or two feet deep, according to the nature of the tree^m. In dressing the roots be as sparing as possible of the fibres, small and tender strings, (which are, as it were, the emulgent veins which insune and convey the nourishment to the whole tree) and such of the stronger and more confirmed parts which you trim, cut sloping,

^m It is certainly the best way to trench the whole land before planting; but the expense of doing that by the spade, in large undertakings, does generally induce the planter to perform the work by making holes in the manner here described, though not recommended. Since the days of our excellent Author, the trenching plough has been much improved, and indeed, when properly worked, it is capable of preparing the greatest extent of land for planting at a price infinitely less than the spade.

so as the wound may best apply to the earth. The heads or tops I advise you to let alone till after the most penetrating colds be passed, and then about February to take them off, and shape them as you please, as the skilful gardeners can direct you, or as it is described graphically in *Monf. de la Quinteny's Complete Gardener*, and his industrious epitomizers. Now, the earth in which you thus plant your fruit-trees, will require four annual stirrings; namely, at the approach of March, a spade-bit deep, covering it with some mungy stuff, heaps of grafs or weeds, to protect it from the parching sun; in May following, after a gentle rain, stir again, but not so deep as to molest the subnascent weeds; again in the month of July; and lastly in October, after the same method you are taught in March.

This, for standards planted out for good and all. The nursery requires a busier process, as it is excellently described by Squire Cotton in that late incomparable Manual published by that worthy person. Briefly thus.—Three weeks before Midsunmer lay some green fern about the ranks, after the ground is laboured, to defend it from the heats; in which work, care must be also had not to offend the tender roots; therefore you shall stir it deeper in the middle of the lines or interstices; and when winter comes, bury the ferns in the place, by making little trenches, or rather taking away some of the earth you shouldered up when the stocks were first drawn out of the seminary and planted in those rows; yet so as to leave it somewhat higher than the area, to secure them from the frosts. In March following stir your nursery again, chopping and mincing in the fern, and mingling it with the loosened mould which you took from the imps when you first applied the fern; then back them up again as before. Repeat this three or four years successively till your stocks are fit to graff on. To an orchard thus planted, spring and autumnal stirring of the mould is of incredible advantage; and even during the hottest summer months carefully to abate the weeds, (but not to dig above a quarter of a spit deep for fear of exposing the plants to the sun, unless it be after plentiful showers) is very necessary.

^a In the year 1658, Mr. Evelyn published a translation of Mons. de la Quinteny's *Complete French Gardener*. It has gone through several editions, and is a work of considerable merit.

There are, I confess, who fancy that this long exposure of earth, before it be employed for a crop, causes it to exhale and spend the virtue which it should retain; but, provided nothing be suffered to grow on it whilst it lies thus rough and fallow, there is no danger of that, there being in truth no compost or lætation whatsoever comparable to this continual motion, repastination, and turning of the mould with the spade; the pared-off turf (which is the very fat and efflorescence of the earth) and even weeds with their vegetable salts, collected into heaps and exposed, when reduced, fall into natural, sweet, and excellent mould. I say, this is a marvellous advantage, and does in greater measure fertilize the ground alone, without any other addition; for the earth, which was formerly dull and unactive, or perhaps producing but one kind of plant, will by this culture dispose itself to bring forth variety, as it lies in depths, be it never so profound, cold, and crude, the nature of the plant always following the genius of the soil; but indeed requiring time, according to the depth from whence you fetch it, to purge and prepare itself, and render it fit for conception, evaporating the malignant halituses and impurities of the imprisoned air, laxing the parts, and giving easy deliverance to its offspring.

I do not dispute whether all plants have their primogenial seeds, (as in truth I believe they have) and that nothing emerges spontaneously and at adventure; but, that these would rise freely in all places, if impediments were removed, (of which something has already been spoken) and to show how pregnant most earths would become, were these indispositions cured, and that those seminal rudiments, wherever latent, were free to move and exert their virtue, by taking off these chains and weights which fetter and depreß them.

It is verily almost a miracle to see how the same land, without any other manure or culture, will bring forth and even luxuriate; and that the bare raking and combing only of a bed of earth, now one way then another, as to the regions of heaven and polar aspects, shall diversify the annual production, which is a secret worthy to be considered. I am only to caution our labourer as to the present work, that he do not stir the ground in over wet and slabby weather; that the sulcus or trench be made to run from north to south, and that if there be occasion for opening of a

fresh piece of earth for present use, he dig not above one spit deep, which will be sufficient to cover the roots of any plantable fruit, or other tree ; he must not disturb it again till the March following, when, if he please, and that the ground seem to require an hastier maturation, there may be a crop of beans, pease, or turnips sown upon it, which will mellow it exceedingly, and destroy the noxious weeds ; after which, with a slight repastination, one may plant or sow any thing in it freely, especially roots, which will thrive bravely, and so will trees, provided you plant them not too deep, but endeavour to make them spread and take in the succulent virtue of the upper mould ; and therefore too deep trenching is not always profitable, unless it be for esculent roots, such as carrots, parsnips, beets, and the like, since trees, especially fruit, should be tempted even by baits to run shallow ; such as penetrate deep, commonly spending more in wood and leaves than in the burden for which we plant them.

There is only this caution due, That you never plant your trees where the stiff and churlish ground is likely to touch their roots ; for though it be neither necessary nor convenient they should penetrate deep, it is yet of high importance they should dilate and spread, which they will never do in obstinate and inhospitable land (but revert back towards the milder, and better-natured mould) which crumples the roots, and perverts their posture, to their exceeding damage : Andⁿ to this infirmity our rare exotic plants and shrubs are most obnoxious, confined as they are to their wooden cases and testaceous prisons, and therefore require to be frequently trimmed, and supplied with fresh and succulent mould to entertain the fibres, which else you will find to mat in unexplicable intanglements, and adhere to the sides of the vefsel, where they dry or corrupt.

Having said thus much of the natural, I should now come to artificial helps, by application of dungs and composts ; and indeed, *stude ut magnum sterquilinum habeas*, was old and good advice ; but as some there be who affirm any culture of the earth preferable to dung, even things so slight as the haulm of pease and lupines, or any other pulse, (for when I speak of dungs, I mean those excrementitious and sordid materials which we commonly heap up and lay upon our grounds) I shall beg your patience to suspend a while my stirring that less pleasant mixture, and, till it be well aired and fit for use, proceed on our former subject, and try what aid we may expect yet from more kind and benign means, before we come

to the grofs and violent. For, besides that such compost (at least so prepared as it ought to be) is not every where, nor always to be had in quantities, to confide in dungs and ordure, is neither so safe, nor of that importance to our husbandman, as some are made to believe; since if we shall look back into the best experience of elder days, (Hesiod) we shall find they made very little or no use at all of stercoration°. I know some there be who attribute this neglect to the natural fertility of the country, considering dung as the busy nurse of vermine and nauseous accidents; but waving these, (without intending to desert the aid of soil in place and time) I proceed with what I call more natural helps; namely, *opening, stirring, and ventilating* the earth, and sometimes the contrary, *coverture, shade, rest, and forbearance* for a season, as we daily see it practised in our worn-out and exhausted lay-fields, which enjoy their sabbaths. It is certain, that for our gardens of pleasure, the fairest beauties of the parterre require rather a fine, quick, friable, and well-wrought mould, than one rank or richly dunged: And even all fruit-trees affect not to stand upon artificial and loose composts, but in naturally rich and sweet mould, within the scent and neighbourhood of well-consumed soil for the next layer under, and above, so as the virtue thereof may be derived to it through a colature of natural earth; those forcing mixtures being more

° Mr. Tull, who revived a mode of husbandry anciently practised, was a great enemy to dung, being of opinion that frequent ploughing was all that was necessary towards rendering the earth fertile. By his theory, earth, minutely pulverized, constitutes the food of plants, and under that erroneous influence there is no wonder that he recommended the constant working of the plough and horse-hoe. By his method, commonly called the *New Husbandry*, no change of species is required, as wheat land is continually cropped with that grain, and so of others. The seed is drilled in rows with an interval of four feet, which in summer is continually worked with the horse-hoe. This interval, kept clear of weeds, constitutes a fallow for the succeeding crop; and in this manner the land annually produces the same grain. However ingenious this method may appear in the closet, it loses its excellence, when reduced to practice in the field, as from the experiments of Sir Digby Legard, of Ganton, in Yorkshire, and even of Mr. Tull himself, the crop does not sufficiently pay the cultivator for his additional trouble and expense. And here I wish to be understood as speaking of the drill husbandry with wide intervals; for drilling of grain in equidistant rows constitutes quite a different system. My very worthy and excellent friend the late Rev. Sir William Anderson, has given the public a very just idea of this last method, for which the reader is desired to consult the *Georgical Essays*, p. 357. Mr. Tull's system has infinite merit, when applied to beans and turnips, which, to the shame of this country, still continue to be cultivated in the old method. In Scotland the drilling of beans and turnips is well understood.

proper for annuals and exotic plants, which having but little time to live, refuse no assistances, whilst trees of longer duration care not much for accelerations.

I shall here then begin with an experiment I have been taught by a learned person of this illustrious Body (Dr. Beal) from whom I have long since received the choicest documents upon this and many curious subjects. And first, I think it will be evinced, as constant and undeniable, that amongst the mechanical aids, (wherein stercoration has no hand) that of pulverizing the earth by contusion, and breaking it with the plough or spade, is of admirable effect, to dispose it for the reception of all the natural impregnations we have been discoursing upon. For the earth, especially if fresh, has a certain magnetism in it, by which it attracts the salt, power or virtue (call it either) which gives it life, and is the reason of all the labour and stir we keep about it, to sustain us; all dungings, and other sordid temperings, being but the succedaneums to this improvement, which of all other makes its return of fruit, or whatsoever else it bears, without imparting any of those ill and pernicious qualities which we sensibly discover from forced grounds, and that not only in the plants which they produce, but in the very animals which they feed and nourish.

I know Laurembergius (somewhere) denies this, and that animals in preparing chyle, transmute, alter, and insume what is only their proper aliment, rejecting all that is superfluous; but as our early asparagus, cauliflowers, and divers roots, manifestly refute it, so does the taste of the flesh of fowl, and the milk of cattle that feed on the wild garlic, fenny-grafs, and other rank things, not here to insist on their sweet and delicate relish upon change to a more odoriferous pasture. But to the experiment:

Take of the most barren earth you can find, drained, if you please, of all its nitrous salts, and masculine parts; reduce it to a fine powder, (which may be done even in large proportion, by a rude engine, letting fall a kind of hammer, or beetle, at the motion of a wheel); let this pulverized earth, and for the time incessantly agitated, be exposed, for a summer and winter, to the vicissitudes and changes of the seasons and influences of heaven: by this labour, and rest from vegetation, you will

find it will have obtained such a generous and masculine pregnancy, within that period, as to make good your highest expectations: And to this belongs Sir Hugh Platt's contrition, or philosophical grinding of earth, which upon this exposure alone, without manure or soil, after the like revolution of time, will, as he affirms, be able to receive an exotic plant from the farthest Indies, and cause all vegetables to prosper in the most exalted degree; and to speak magnificently with that industrious man, to bear their fruit as kindly with us as they do in their natural climates; and this Dr. Munting pretends to have done in Holland. But a little to abate of this, modestly we may say, that this culture (easy and simple as it is) will be found effectually able to render the soil of a most extensive capacity for the entertainment of foreign and uncommon plants. For to enumerate some of its perfections; such as refuse dung and violent applications, have here pure earth; and such as require aid, a mellow and rich mould, impregnated with all the blessings which the influence of the heavens and efflorescence of the earth can contribute to it, fitted as it is for generation, (and yet so restrained from it) as greedily to receive the first seeds, which are committed to it, with a passion and fervency, as it were, of animal love^p. What high and sublime things are spoken more upon this, I forbear to prosecute; but in Sir Kenelm Digby's Discourse of Sympathetic Powder, he affirms, that the earth, in the years of repose, recovers its vigour by the attraction of the vital spirits which it receives from the air and those superior irradiations which endow simple earth with qualities promoting fermentation. And indeed, such a vegetative activity I have often observed in the bare exposure of some plants but for a few hours only, as has raised my admiration, particularly in the aloe and other kinds of sedums, which, when to all appearance shrunk and shrivelled up, have filled themselves in a moment, set out in the air, when a very few drops of water (at the time, that is, winter time) would certainly have made them rot and turn to a mucilage, as to my cost I have experienced. And these ferments of the earth, by this amity and genial intercourse with the air, are innumerable, to concoct, digest, accelerate, and restore; equal to, yea, beyond any artificial enforcements of dungs

^p Virgil supposes the earth to be in this state, when he says,

Vere tument terræ et genitalia semina poscunt.

and composts whatsoever⁹. But to return to dust again. By the toil we have mentioned, it is found that soil may be so strangely altered from its former nature as to render the harsh and most uncivil clay obsequious to the husbandman and to bring forth roots and plants, which otherwise require the lightest and hollowest moulds.

In other cases and affections, the earth may be likewise fertilized, as from without, so from within, by more recondite and central causes and agitations, which if in excess, may be allayed with some feminine or other mixture; since oftentimes qualities too intense rather poison dry and choleric grounds, than conduce to their advantage, as we shall come to show; and that which makes a cold and moist ground fertile, will destroy the contrary, as we see in the too free applications of salt; and therefore it requires no ordinary dexterity to be able to direct where and what remedies are to be administered, since we find it the same in vegetable productions as in the animal, where complexions should be suited; for want of which care, through avarice and other sordid circumstances, noble families themselves are many times rendered childless, which might else have multiplied and been perpetuated. To illustrate this by our present subject; we find, that a thin sifting, or sprinkling of ashes, has enriched all the higher pastures, when, where strewed too thick, the ground became totally barren. Sometimes, again, defect of sufficient depth may be cause of sterility; and so it frequently happens, that the proper remedy of some hungry and shallow surface, is to superinduce and lay more earth upon it, and to find out the medium, by diligent trials of some degrees of depths in the same soil; but solitary, single, or over hasty experiments, before the earth be prepared by some of our fore-mentioned essays, may prove discouraging and insufficient, as my Lord Bacon has oft adverted us.

⁹ From accurate experiments made by Dr. Stephen Hales and others, it is certain that the leaves of plants draw from the air a considerable portion of aqueous fluid, in which a large share of nutriment is minutely dissolved. This nutriment is certainly produced by putrid steams, generated upon the surface of the earth, which flying upwards, become blended and incorporated with the atmosphere. Showers of rain bring down these particles again to the earth, and probably they are delivered to the mouths of the vegetable creation in a more elaborated state, in consequence of their solution in the atmospheric vapours.

Earth is also sometimes improved by mixtures of fern, rotten leaves, and the poriture of old wood, the haulm of beans, pease, and other legumina, which heat and accelerate concoction; for which, and all other medications, the nature of the mould is carefully to be examined, that application be made accordingly; as for instance, if it be sandy, or other light mixed earth, to imbody it with something of a fatter nature, as lime or marl, (for I yet forbear the touch of ordure or animal composts, as the least natural) and be sure so to stir and lay it (especially if lime) that it may not sink too deep and suddenly, as it is apt to do, and so desert the surface-mould, where it should do the feat, and therefore it is to be the oftener renewed. But marl enters as properly here, and so does mud, slub of slimy waters, especially if the soil be gravelly and mixed, which it will sadden and impinguate, and consequently bind; but if the gravel be wet and cold, lime is preferable: Wherefore the nature of the mould should be well examined before the application: as here arenous and sandy earth wants ligature, and besides, consisting of sharp and asperous angles, wounds and galls, curls and dwarfs our plants, without extraordinary help to render the passages more slippery and easy; therefore relenting chalks, or chalk-marl, is also profitable, with calcinations of turf, or sea-wreck, where it is at hand; and if the soil be exceedingly bibulous, spread a layer or couch of loam, discreetly mingled at the bottom, to entertain the moisture. In the mean time, there are yet some plants which thrive almost in nothing so well as in sand alone, or with very little mixture, nor that of any dung: So melons are said to grow in Jamaica, and some vast timber-trees have little or no mould adhering to their roots; such is that beautiful stranger the Japan Lily, called by those of Guernsey (from whence we only have them) *La Belle de nuit*; and a certain palm of the same Japan, which shrinks and dries at the least touch of water, as if it were laid before the fire, which is, it seems, the only remedy that restores it, or the sudden replanting it in scales of iron, or the most burning sand. But what if sand itself, however vulgarly reputed, be not so hot or interiorly ardent as it is given out to be? Indeed, for being of an open and loose contexture, it is apt to put forth a forward spring, as more easily admitting the solar rays; but it does not continue, and is an infirmity which may be remedied with loam, which not only unites it closer for the present, but is capable in time to alter

and change its very nature also, so as too hot a compost be no ingredient in it^r.

Here I take notice, that husbandmen observe a too clean and accurate gathering of stones from off those grounds which lie almost covered with them, rather impoverishes than improves the land, especially where corn is sown, by exposing it to heat and cold. Certain it is, that where the stones are not too grofs and plentiful, a moderate interspersion of the smaller gravel preserves the earth both warm and loose, and keeps it from too sudden exhalation; whilst the over-fine grain, or too nice a sifting, makes it apt to constipate and grow stiff upon wetting, so as the tender seedlings can hardly issue through; and this is a document for ignorant gardeners, who, when they have a fine flower, think they can never make the ground fine enough about it; yet the finer the plant or seed, the finer should the mould be which entertains it; though, when all is done, trees thrive best where they have easier footing.

Chalky grounds come next to be considered, and they should be treated like gravel, sand, and stony, if harsh; but if of the melting kind, it is apt to mix with all the sorts of moulds; and being of itself so husbanded, composes a kind of natural soil fit for most uses sought for, and of admirable effect in dry grounds.

^r Light sandy soils are best improved by marl, but as that most excellent earth cannot be procured every where, some judicious persons recommend clay, which, from various trials, is found to answer very well upon light lands. In proportion to the lightness of the soil, the quantity of clay must be increased or diminished. The best and most profitable method of applying clay to sand land, is thus described in the Geographical Essays:—
 “Where the land has never been broken up, the clay may be carried and spread, and suffered to lie a whole year before it is ploughed in. The swarth will set the clay a-working; but, where there is no swarth, a coat of dung will be necessary before the land is sown. Where the clay is short, and the soil light, 120 loads will be required for an acre; but where the clay is strong, and the land not so light, then 60 or 80 loads will be sufficient. It is better to lay on too little than too much; it will be sufficient if the land is made moderately cloddy. About a cubical yard of clay makes a load. Carry the clay at any convenient time of the year. If time permit, carry it after harvest, and lay it upon a wheat stubble; there let it remain spread all the winter. In March plough it in; plough again in May; and twice in June; and sow turnips about Midsummer. In Norfolk, they formerly paid one guinea for filling and spreading 120 loads of clay, but now (1772) they are obliged to allow something more.” p. 424.

Here now of course we are to say something concerning calcinations, all reducing of stone into ashes being of excellent use where lime is upon any occasion proper; and indeed all our composts and dungings serve but to this end, namely, so to qualify and mix the soil as may artificially answer to the varieties of the natural earth, or such a constitution of it as the skilful husbandman requires: As for instance, (since all fertility is the result of mixture contrary in quality) if it want due heat, to apply additions of a fiery nature; and therefore it were profitable, if in the using lime with turf and swarth it were laid alternatively, turf on lime, and lime on turf, in heaps for six months, by which means it will become so mel-low (and rich in nitrous salts) as to dissolve and run like ashes, and carry a much more cherishing vigour than if amassed in greater quantity; and so, by a too violent application, burn out and exhaust the vegetative virtue which it should preserve. There is (by the way) this caution to be used in burning of earth, that though what is torried into blackness will exceedingly fructify; yet if it proceed to adustion beyond that degree, it consumes the nitre, which is the principle that should be preserved; as we shall come to show when we speak of salts, which we are the most carefully to keep entire in all our animal or other composts*.

This husbandry (long since used by the Romans, even in Britain, but discontinued after their expulsion) was revived in Flanders; from thence it was brought into Devonshire, and about sixty years after cultivated more generally. It had great success at first, (especially on chalky and barren grounds) but sensibly diminishing, occasioned the proverb that, "What is good for the father, is sometimes naught for the son;" however the fertility is again restored, by feeding sheep upon the ground; a dressing of all others the most desirable.

Two loads of turf will make a load of ashes, which, spread on sterile lands, spontaneously produce the Cinqufoil[†]. Lime, a little slected, is

* Turf reduced to ashes by a vehement and open fire forms a hard substance called *glafz*; so that burn-baking, under such circumstances, can do no service, the vegetative powers being changed into a body incapable of the least solution in any menstruum. A moderate and confined heat, on the contrary, reduces the vegetable substances contained in the turf, to an alkaline salt, well known to be a great promoter of vegetation.

† My very worthy friend, General St. Leger, has communicated to me the following experiment, which with great exactness ascertains the quantity of ashes to be obtained from an acre of land by burn-baking. "In August, 1707, I pared and burnt one acre

excellent for cold, wet grounds, and stiff clays, but over-burns the drier^a. It is the very best destroyer of mofs and rushes, as quick lime does furzes, being first extirpated.

I come next to marl, (amongst other parts of agriculture introduced by the same Romans) of excellent use to fix light sand and dry grounds; some

“ three roods of limestone land, and carefully collected the ashes into two heaps for a future experiment. Having so good an opportunity, I measured the ashes, and was much surprized at the quantity, being eighty cart loads, thirty bushels to the load.” *Georgical Essays*, p. 382.

Upon this subject there is a very curious and interesting paper, written by Mr. Brown of Derby, and published in the *Transactions of the Society of Arts*.

“ I beg leave to communicate to the Society, and, if thought worth notice, by them to the world, a composition for manure. Fearful it would not answer the purpose so fully as I could wish, I deferred it from year to year; but I now find, both by numerous trials made by my friends, as well as myself, the very great utility of the composition, as well as its cheapness, with the capability of its being made in any situation and in any quantity. The mode of making it is as simple as, I trust, it will be found productive. It is nothing more than green vegetable matter decomposed by quick or fresh-burnt lime. A layer of the vegetable matter about a foot thick, then a very thin layer of lime, beat small, and so on; first vegetable, then lime, alternately. After it has been put together a few hours, the decomposition will begin to take place; and unless prevented, either by a few sods, or a forkful of the vegetables at hand, it will break out into a blaze, which must at all events be prevented. In about twenty four hours the process will be complete, when you will have a quantity of ashes ready to lay on your land at any time you wish. Any and all sorts of vegetables, if used green, will answer the purpose; say weeds of every description. They will doubly serve the farmer, as they will not only be got at a small expence, but will in time render his farm more valuable, by being deprived of all noisome weeds.

“ But if this composition answers the purpose, as I flatter myself it will, a very short time will see almost every weed destroyed, which supposing to be the case, I have made my calculations with clover, grown for the purpose; for instance, I will take one acre of clover, which at one cutting will produce from fourteen to eighteen tons of green vegetable matter, and about three tons of lime: this, when decomposed by the above process, will yield ashes sufficient to manure four acres, the value of which I estimate at something under four pounds; the clover, according to the value of land here, I will say two pounds, which, take the average of the kingdom, is too much. The lime I will also say two pounds; but that will vary, according to the distance it is to be fetched. Take them together, I think will be about the average value. Now if this is the case, and as far as I have been able to try it I find so, how valuable must it be to the community in general! If it answers the purpose, I shall feel myself much obliged by the Society making it as public as they possibly can.

“ The vegetables should be used as soon after they are cut as possible, and lime as fresh from the kiln as the distance will allow of; as on those two circumstances depends the goodness of the composition.”

^a There are two kinds of lime used in husbandry. The one is magnesian, and the other

commend the white and grey, others the blue, and red, (which I think the best) according as it is more or less apt to resolve after wetting; but none of them discover their virtues for the first year: It does incomparably on pastures; some on arable, a good coat of compost suitable to the land being first spread where you will lay it: If your marl be very unctuous and rich, apply it less copiously; the too thick covering is the worst extreme, nor is it always to be used without alloy and mixture with other proper soil; for some marls are more sandy and gritty than others, and should be qualified with a contrary. Give lean and emaciated earth a covering of the fattest marl; apply hot and dry to the cold and moist: and this is also to be observed in the application of all other composts and medications*.

calcareous. If too great a quantity of the former be used, vegetation will be greatly retarded, it being experimentally found, that the spot on which a heap of magnesian lime has laid, will remain in a state of barrenness for a number of years; while, on the contrary, the land on which a heap of calcareous lime has laid, will, in a short time, be productive of white clover, and other natural grasses. Beds of these two kinds of limestone, are often found contiguous to each other. In the neighbourhood of Doncaster, the magnesian limestone is discovered, and at Knottingly, the calcareous kind predominates. The neighbouring farmers practically know the difference, using the one liberally, and the other sparingly. The difference between those two kinds of lime is this. The Doncaster lime contains about three parts of calcareous earth, and two parts of magnesia. The Knottingly lime is wholly calcareous. It is remarked, that magnesia is highly injurious to vegetation, a circumstance that explains the reason why magnesian lime is so injurious to land on which too large a quantity has been put. These two kinds of lime differ in another quality. During an exposure of three months, the calcareous lime has been found to absorb four-fifths of the fixed air requisite to saturate it, while in the same space of time, the magnesian lime does only absorb forty two hundredths of that combined with it before it was burnt. In the county of Derby there is found a limestone wholly calcareous, of which, when burnt into lime, the farmers lay from eight to twelve chaldrons per acre on their grass lands. This subject is learnedly discussed in a paper read by Mr. Tennant before the Royal Society of London, and which will probably be published in their Transactions, in the course of the present year. For this Discourse the farming world is much indebted to Mr. Tennant, as it gives the ready solution of a phenomenon that, before his time, was only practically known.

* When marl can be procured, we need not be scrupulously nice either in its kind or application; for, as far as I can learn, it never disappoints the expectations of the farmer who has spirit and industry to use it. It invariably loosens a stiff soil, and gives texture to a loose one: a circumstance of the utmost importance to the tillage farmer; and indeed all that is necessary for him to know concerning the nature of this earth.

Marsh and churlish earth will be civilized by the rigour and discipline of two winters ; *bis frigora*, is the old method to make the stubborn clod relent ; and, with the mixture of a little sand, if it be too close of body, it will become excellent mould.

Clay is, of all other, a cursed step-dame to almost all vegetation, as having few or no meatuses for the percolation of the alimetal showers, or expansion of the roots ; whether it be the voracious, hungry, weeping, or cold sort. In these cases, laxatives are to be prescribed, such as drift sand, small gritty gravel, saw-dust, with marl or chalk, and continually vexing it with the spade or plough ; but, above all, with sea-sand, where it may be procured, and the burning of the ground to ashes, with all that it bears, the more the better ; for by no less severity will this ill-natured mould be subdned. Rotten wood, and the bottom of bavinestacks, is a good ingredient to this manure ; and, if the land be of a cold and wet quality, strewings of soot is good ; if very stiff, rubbish of brick, lime-stone, and such trash, may properly be laid at the bottom, and, on the upper part, composts of dung ; for otherwise no limings (which being sleeked is raw and cold) may at any hand be applied, especially to the hungry sort, which (as also most kinds of marsh-earth) is subject to chasm, and gape in dry seasons ; to prevent which, a discreet mixture of ashes and sand is used : for, if it be in excess, it over-heats the latter.

I do not reckon loams among the clays, though it seem to be but a succulent kind of argilla, imparting a natural ligament to the earth where you mix it, especially the more friable, and is therefore, of all other, the most excellent mean between extremes, fastening and uniting that which is too loose or stony, cooling that which is hot, and gently entertaining the moisture. The flower-garden cannot be without a mixture of it, nor well any fruit, especially the best cyder-apples, so it be accompanied with a lighter soil.

To sum up all we have said concerning natural improvements, by mixtures of earth with earth, rather than dungs, let us hear my Lord Bacon : He reckons up marl, chalk, sea-sand, mould upon mould, pond-earth with chalk, and the several blendings and tempering of them ; among all which, we find marl to carry the pre-eminence with his Lordship, as the most pinguid, rich, and least over-heating ; next to this, sand, as the

most abounding in salt; chalk more heating, and therefore proper for clay, cold, and spewing grounds, being suffered to lie a competent time to resolve before you turn it in; earth on earth, that is (I suppose he means) the under part upon the upper, or the second spit on the first, as we have directed at the breaking up of fresh ground with the spade.

Another mixture he commends (and on which we have likewise newly touched) of substances, which are not mere earth, as soot, ashes, not the hard and dry cinders of sea-coal, (which we are too busy with in places where the ground is naturally too hot and dry) but such as is apt to relent; and even the sprinkling of salt, where it is wisely sown.

A third is the permitting vegetables, abounding in fixed salts, to die into the ground, as pease-haulm, bracks, and all sorts of stubble cast on about the beginning of winter: So leaves of trees mingled with chalk, and proper composts of dungs, to heat and preserve the ground from souring with them when they are used alone¹.

A fourth is (on which we have also touched) heat and comfort, procured by calcinations, the burning of ling, heath, sedge; covering the ground with bushes for a time; inclosures of walls and mounds, when the land lies in the eye of the weather; and in other cases, meridian exposures, and the warmth of the woolly fleeces of sheep as well as manure, folded or pastured: And to this we may add the very grazing of cattle, which in some cases has succeeded better than the best dungy compost, especially for old and decayed orchards, which have been observed to recover to admiration, when mowing has been pernicious; for even the biting of cattle gives a gentle loosening to the roots of the herbage, and makes it to grow fine and sweet, and their very breath and treading, as well as soil, and the comfort of their warm bodies, is wholesome, and marvellously cherishing: But this is to be understood of places where the trees are of full growth, and where the beast cannot reach to crop².

¹ The leaves of some trees sooner become mould than others. The leaves of Oak, Birch, Spanish Chesnut, and Oriental Plane, are with great difficulty converted into vegetable earth, even when put into the fold-yard, and trodden with cattle.

² Nice farmers consider the lying of a beast upon the ground, for one night only, as a sufficient tilth for the year. The breath of graminivorous animals does certainly enrich the roots of grafs; a circumstance worthy of the attention of the philosophical farmer.

Lastly, Irrigation and Watering, both by admitting and excluding moisture : and certainly this has (since his Lordship's time) been found one of the richest improvements that ever was put in practice, especially where they have the command of fat and impregnate waters, without grittinefs, or being over harsh and cold ; whether it percolate through rich ground, or, which is better, descend from eminences and moderate declivities, from whence we find the valleys so luxurious and flourishing ^a.

To this belongs the cure of wet and boggy lands, by cutting trenches deeper than the cause of the evil, which proceeds from concealed springs hindered from emerging forth by the sluggish incumbent earth. This makes the ground to heave and swell, but, not giving vent, it stagnates and corrupts both the water and the mould about it ; and though it lie loose and hollow, yet it gathers no vigour from above, but remains cold and insipid. The remedy is opening the ground till you meet with a sound bottom, and cutting your furrow upwards to the bog, about a foot beneath the spewing water: this is to be done in several places, and when the drains appear to have wrought the effect, you may fill them up again with spray and bavine, great and rough flints, brick-bats, tiles, horse-bones, or any other rubbish which will remain loose and hollow ; cover them with the grafsy side of the turf which you pared off and

^a The advantages of water-meadows are little known in the northern parts of this kingdom. Such gentlemen as have lands that are capable of being artificially flooded, will find it best to send into those counties where water-meadows are well understood, for experienced persons, rather than trust to their own agents, whose knowledge can only be collected from books. And I most cordially recommend this idea in all cases where a new improvement is to be brought from one county to another. It is of the utmost importance for the farmer to have early grafs for his ewes and lambs, and no method hitherto known (water-meadows excepted) does effectually provide him with it. It is not necessary that the water employed should come from a river, or be loaded with earthy particles, as pure-spring water when drawn over the surface of grafs-grounds during winter, and kept continually gliding, is found of equal use. I have often remarked upon heath lands, where springs frequently break out, that the earth which receives the water is full of verdure at an early season; and at the same time I have observed, that the heath was effectually killed in all places over which the water had spread. From this we may conclude, where circumstances will allow, that drawing water from the high springs, over dry and barren heaths, will bring them sooner into cultivation than the expensive methods now practised of paring and burning the surface, as preparatory to the plough.

laid apart, and on that throw your other mould, which, being cast up in heaps for some time, will be much improved with spreading; lastly, sow it over with hay seeds^b.

But the cure is yet easier, if the land lie considerably sloping, and if it happen to be a planted ground, then cut your trench deeper than the roots of your trees, and apply the foresaid rubbish to intercept the moisture. About the latter end of October, trench the ground all over for near a foot and a half in depth, and when you are come within three or four feet of the stem, cut off all the larger roots sloping inwards, sparing only the fibres, and such of them as you find tender, and about as big as your finger; leaving also the more perpendicular to keep the tree steady. This done, cast in some rubbish of brick-bats, limestone, (not chalk) and other materials, that the mould may lie easily about them, and with a mixture of good earth, plenty of rotten stubble or other soil, apply it near the root, and fill your trench with the rest; and if your ground require it, (as being too cold it commonly does,) add to your compost the dung of sheep, pigeons or poultry, very well consumed; and because mofs is oftener caused by starving and wet grounds, than by hot and over dry, (for both produce it) the cure is likewise to be effected by ablation, and baring the roots as above; and for the latter, by a mixture of loam, with the scouring of pond or ditch earth, which of itself is the most excellent manure, and the planting your trees at greater intervals, for admision of air and sun; since the scraping of it off, which may also be done in wet weather, is but temporary, and if nothing else be performed, it will be sure to grow again. And here upon observation how men carbonade and cut so many rills, and narrow trenches irregularly crossing one another, to drain their meadows and lower grounds, which take not up a little part of the turf, I should rather recommend the cutting of a large trench through the whole length of the pan and bottom

^b A few years ago, Mr. Elkington obtained a bounty from Parliament for making public his mode of draining land; and in order that the information should be properly warranted, the Board of Agriculture sent Mr. Johnstone down to visit the principal drainings that Mr. Elkington was then making. This gentleman, in the most satisfactory manner, has, in a quarto volume, described Mr. Elkington's mode of draining, of which the principal merit seems to consist in tapping the drains with an auger, in cases where the water lies lower than the drain.

of the ground, and of competent depth to receive and drain the weeping springs, instead of those frequent slashes and gutters I have mentioned; since besides the beauty of the canal, the profit of the fish, &c. the earth and mud cast out on both sides, and spread upon the depressed and lower parts of the ground, will not only raise the unprofitable marsh, but thereby improve it for pasture. One needs go no farther to see the effects of this husbandry, than to St. James's Park, where, before the canal, I remember all that pleasant valley, now yielding most rich pasturage, (with the fish, decoy, and walks planted with fragrant Lime-trees) was nothing but a noisome, unwholesome bog and morafs of mofs and rushes. The use of the plough is for this work the most expeditious, and cheaper than the spade alone, which, after every journey of the first, will be necessary to cast and shovel out the loosened earth on both sides, to fill up the hollows and depressures of the ground, and with the rake to trim the banks and level the rest as is requisite. This, undertaken in dry summer weather, the plough still succeeding the spade till the channel be of convenient depth, will of all other be the most effectual; and, if near the mansion house, a graceful addition to it. But to return to other remedies.

Lands which are cold and dry, are (as we have hinted) to be improved by contraries; namely, by application of composts, which are hot and moist; as sheeps-dung, burning and calcining of the earth with the vegetables on it, and the like, to excite heat and fermentation; but which is not to be effected without repugnant remedies, and such as are of heterogenous parts, to stir and lift up the mould, and render it less inactive. If it be cold and clinging, as frequently it is found, there, lime-rubbish, the small harsher chalk, sea-coal ashes, a moderate sprinkling of sand, with some compost, may perform the cure^c.

^c Some lands are wet and poachy in winter from a bed of clay keeping up the water that falls from the heavens. The best method of rendering such lands firm and dry, is thus described by my excellent and learned friend, T. B. Bayley, Esq. whose activity and diligence in the public service merit the highest praises.

^d From a very extensive experience I recommend the following method of draining land, as effectual, durable, and cheap.

^e First make the main drains down the slope or fall of the field. When the land is very wet, or has not much fall, there should, in general, be two of these to a statute acre; for the shorter the narrow drains are, the less liable they will be to accidents.

^f The width of the trench for the main drains should be, at the top, about thirty inches;

Hungry grounds require to have the cause well looked into (the water turned as above directed) or if in want, such as is well enriched.

Lands that are hot and burning, allay with swines' dung (as some say) the coldest; or with neat's, which will certainly refresh it.

but the width at the bottom must be regulated by the nature and size of the materials intended to be used. If the drain is to be made of bricks ten inches long, three inches thick, and four inches in breadth, then the bottom of the drain must be twelve inches; but if the common sale bricks are used, then the bottom must be proportionably contracted. In both cases there must be an interstice of one inch between the bottom brick and the sides of the trench, and the vacuity must be filled up with straw, rushes, or loose mould. For the purpose of making these drains, I order my bricks to be moulded ten inches long, four broad, and three thick. These dimensions make the best drain; and I beg leave to be understood, throughout this essay, as speaking of bricks formed in the above manner.

“The method I pursue in constructing my main drains is as follows:

“When the ground is soft and spangy, the bottom of the drain is laid with bricks placed across. On these, on each side, two bricks are laid flat, one upon the other, forming a drain six inches high and four broad. This is covered with bricks laid flat. *Fig. 2, Plate 1.*

“When I first engaged in this mode of draining, I conceived that in places where the bottoms of the main drains were firm and solid, as of clay or marl, it would be an unnecessary expence to pave them with brick. Under this idea, I recommended them to be constructed as in *plate 1, fig. 3.* the sides being formed by placing one brick edgeways, instead of two laid flat. But after the experience of some years, I found that the access of air, and the alternation of wet and dry, occasioned the hardest clay or marl to crumble down, whereby the side bricks, not having a paved bottom, were made to fall in. From the experience of this circumstance, I now direct the main drains to be invariably paved with brick, as represented in *plate 1, fig. 2.* This will render them as lasting as the sod, or pipe drains, which I have found free and open after being constructed twenty five years.

“When stones are used instead of bricks, the bottom of the drain should be about eight inches in width. And here it will be proper to remark that, in all cases, the bottom of the main drains must be sunk four inches below the level of the narrow ones, even at the point where the latter fall into them.

“The main drains should be kept open till the narrow ones are begun from them, after which they may be finished: but before the earth is returned upon the stones or bricks, it will be adviseable to throw in straw, rushes, or brush-wood, to increase the freedom of the drain.

“The small narrow drains should be cut at the distance of sixteen or eighteen feet from each other, and should fall into the main drain at very acute angles, to prevent any stoppage. At the point where they fall into, and eight or ten inches above it, they should be made firm with brick or stone.

“In making the narrow drains I employ four labourers. The first man, with a common

For earth which is too light, there is nothing better than pond-mud, after a winter has pafsed over it.

Earth over rank (for there be some too fat as well as too lean) sand and ashes will take down, but still have regard to what you design to plant

spade, takes out the turf, or sods, eighteen inches wide, (the drains being before marked out) and lays them carefully on one side; the second man, with a common spade also, digs out two, three, or more spits of earth (laying it on the other side of the trench) till he has cut through the soil, or staple, and come to the under-stratum of clay, marl, or other hard and solid body of earth. The bottom and sides of this trench must be cleanly wrought; and, allowing for the sloping of the sides in working, should, at the bottom, be clear sixteen inches wide.

“ In this trench the frame, *fig. 5. plate 1.* is laid; and, in the middle of it, the third man, who ought to be the strongest and most expert, works the long-narrow-draining spade in the body of the clay. By taking care to work it at its full depth, he is always sure of his level, if the drains are properly laid out. The wooden frame is of great use; it gives a firm support to the feet of the workman, keeps the bottom of the trench smooth and clean, and serves as a purchase to the wings of the narrow tool. *Fig. 1, 2, 3, 4, 5, plate 2.*

“ When thirty or forty yards have been cut out by the draining spade, the fourth man cleans the bottom of the drain with the scoop, *fig. 6. plate 2.* and works it quite smooth; he then covers it with the sods, laying the grafs side downwards. In this part of the work too much care and attention cannot be used. The sods should be sound and dry, cut even on the sides, and fitted closely to each other. No broken or rotten pieces should be put in; and if any of the sods taken out, in cutting the trench for the narrow drains, are bad, good ones, firm and full of roots of rushes, strong grafs, &c. should be got in the other parts of the field, and their place supplied with the decayed ones. In marshy bad fields, where sound turf cannot be had, little sticks may be placed across the trench, and the loose and tender sods safely laid upon them. The narrow drains being thus covered, the earth must be thrown in again, taking care that the clay, &c. brought out by the narrow tool, be not mixed with it. No greater length of these drains should be cut than can be finished the same day. The price varies with the depth. For the main drains cut thirty inches above, and thirty-eight deep, laid with bricks, covered, &c. I give about ninepence per rod (eight yards). For the narrow drains, constructed and completely finished according to the foregoing directions, their whole depth (including that of the trench, and that of the draining spade) being thirty-two or thirty-four inches, I give fivepence halfpenny per rod (eight yards*.)

“ From my much-respected friend, the Rev. Mr. Whateley, of Nonsuch-Park in Surry †, I first received an account of the Hertfordshire and Essex method of draining; at the same time he obligingly sent me a set of the tools made use of there, with very particular directions.

“ The great price of stone and brick in my neighbourhood rendered the Hertfordshire

* At this price my labourers, after they were a little acquainted with the work, earned, even in winter, two shillings a-day each.

† Professor of Rhetoric in Gresham College.

Fig 1.



Fig 4.

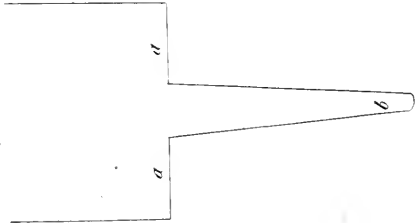


Fig. 2.

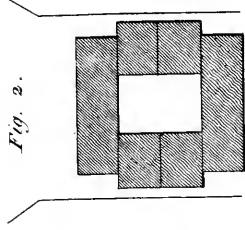


Fig 3.

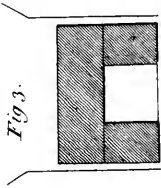
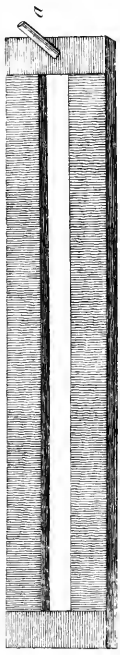


Fig 5.



upon it. Neither the almond nor the hazel will endure a wanton mould; and though it seem a paradox that any soil should be too rich, (upon which some critics have suspected the text in Theophrastus, which asserts it twice in two successive chapters) it is yet a truth indubitable, and holds

method too expensive. Hence I took the idea of the sod drains, and the improvement of the tools. Mr. Young, in the second edition of his justly-esteemed Six Months' Northern Tour, calls me the inventor of this method of draining. All the merit I claim, is that of having introduced, together with an amendment of their construction, the application of these celebrated tools to a mode of draining with sods or turf, where stone, brick, or even brush-wood is extremely scarce and dear.

"Wherever this is the case, I can, from my own experience, recommend the hollow drains covered in the above manner.

"I must observe that, in loose crumbly soils, where the wetness does not arise from the retention of water by an under-stratum of clay, but from springs, these drains are improper: For such lands they should be made of brick or stone. On the contrary, which is most commonly the case, when the wet is prevented from passing off by an under-stratum of clay, marl, or a mixture of both, these sod drains are excellent.

"For if the whole staple or soil is cut through, as it ought to be, the narrow tool will be wholly worked in a solid body, and leave a firm compact ledge, or shoulder, of six inches wide on each side, for the sod to rest on. *Fig. 4. plate 2.* The strength with which the sods are supported, and their depth in the ground, will effectually prevent their removal by any weight on the surface, and secure them from all effects of the weather. Being at their least depth, twelve inches below the surface, they will also be beyond the reach of the plough.

"With respect to the shape of the narrow drains, it will be scarce necessary to observe, that their great depth and contracted width enable them to draw in the moisture of the earth, and at the same time to keep themselves clear and open.

"The tools should be formed of well-wrought iron, and made with great care and exactness. Including the shaft, the narrow tool should weigh 12lb*.

References to the plates.

"*Plate 1. fig. 1.* A field with the drains properly laid out. *AAA* the main drains; *aaa* the narrow sod drains. *Fig. 2.* A brick drain. Proper whether the bottom be hard or soft. *Fig. 3.* A brick drain, formerly recommended when the bottom was hard, as of clay or marl, but now discontinued for reasons already given.

"*Fig. 4.* A narrow drain; *aa* the shoulders for the sods to rest upon; *b* the cut made by the narrow spade. This, and *figs. 2* and *3*, may be measured by the scale of *plate 2.*

Fig. 5. The wooden frame to be laid in the trench. It is made of two oak boards, (inch

* These tools are made by Mr. Benjamin Royle, smith, in Dolefield, Danesgate, Manchester; and by Mr. William Staveley, smith, in Stonegate, York.—Price 12s.

as well in plants as animals, which growing very fat, are seldom prolific. Some lands, on the contrary, are so lean, dry, and insipid, as hardly any pains will make them fruitful. Such are mineral and metallic soils, devouring clays, light and ashy sands; some again are putrid and fungous; others, though fruitful, producing only venomous plants, hemlock and the deadly aconite; and some, though wholesome ground, may be poisoned with unskilful or malicious mixtures, and with damps or arsenical vapours, which sometimes (though natural) are yet but accidental, and for a season; as when after extraordinary droughts and stagnant air, the earth hath not been seasonably opened, refreshed, and ventilated.

Moreover, ground is sometimes barren and becomes unfruitful, by the vicinity of plants, sucking and detracting the juice of the earth from one another. Thus we see the reed and fern will not be made to dwell together; hemlock and rue are said to be inimicable; the almond and the palm are seldom fruitful but in conjunction; and perhaps there are effluvia, or certain inconspicuous steams of dusty seeds, which not only impregnate places where never grew any before, but issue likewise from one to another, as I observe in our junipers and cypresses flowering about April, which are trees of consort, and thrive not well alone. The figs never keeps her fruit so well as when planted with the caprific^d. By what irradiations the myrtle thrives so with the fig, or why the vine affects the

thick) each twelve feet long and six inches in breadth. They are fastened together at the ends by two ribs on the upper side, leaving a slit of five inches for the entrance of the narrow spade. *a* the handle.

“ *Plate 2. fig. 1.* A front view of the narrow draining spade. *a* the shaft; *b* the wings for the workman’s foot; *c* the iron part of the spade, which is gently concave.

“ *Fig. 2.* A side view. *a* the shaft; *b* the wings; *c* two sharp fins, one on each side, for cutting the next spade graft; *d* the iron part.

“ *Fig. 3.* A back view. *a* the shaft; *b* the wings; *c* the cutting fins; *d* the iron part, which is convex.

“ *Fig. 4.* A back view in perspective. *a* the shaft; *b* the wings; *c* the fins; *d* the iron part.

“ *Fig. 5.* A front view in perspective. *a* the shaft; *b* the wings; *c* the fins; *d* the iron part. It will be here proper to remark, that the perspective views must not be measured by the scale.

“ *Fig. 6.* The scoop. *a a* the wooden handle; *b* the iron scoop.

^d Tournefort, during his abode in the islands of the Archipelago, had an opportunity of observing this curious fact. For his account of it, consult the notes on the *Silva*, p. 149. vol. ii.

Fig. 4.

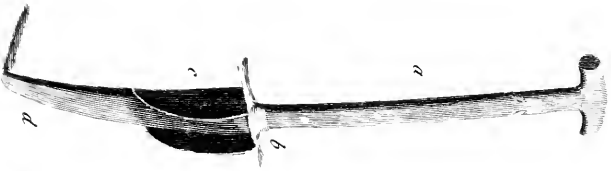


Fig. 1.

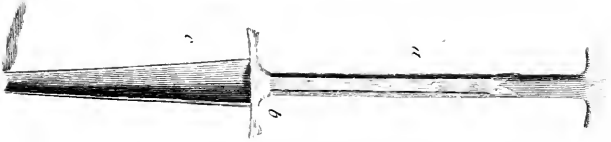


Fig. 2.



Fig. 3.

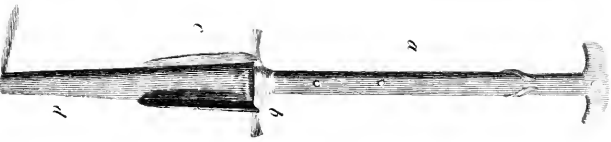
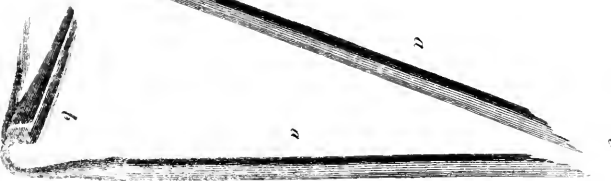


Fig. 5.



Fig. 6.



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Scale of Inches.

elm, and olive, (which is at antipathy with the oak, and imparts also such a bitterness to the mould, as kills lettuce and other subnascent plants) and why some affect to live in crowds, others in solitude, is hard to say; but that firs, pines, cedars, elms, and divers other trees, aspire and grow so tall in society, may be (as from other causes) so from their not overglutting themselves with nourishment (for compost is not their delight) which inclines them rather to shoot upwards than expand and spread.

Lastly, Ground is rendered barren by shade, and the dripping of umbrageous trees. To these air and sun may be soon restored, by removing the screens which intercept them; and yet all shade is not unpropitious where the soil and climate are benign, as well as that which casts the umbrage; and of this we have a notable instance in some parts of Africa, where the soil and air are so genial, that the olive is said to grow under the date-tree, the fig under the olive, under the fig-tree the grenade, under that the vine, and under the vine a crop of corn, and at the feet of the corn a certain pulse; none of them impeded by the more than reduplicated shades. But there are some, we must confess, amongst us, which are not so propitious; trees of all sorts (though the perennial greens least) breathe as much after the air as the soil, and do not thrive without it, nor except it be wholesome.

But to return to barren Earths, which are either out of heart by being spent, or from the nature of the soil, (in both which cases the plants produced, though never so unprosperous, run hastily to seed, or make an offer) they are to be restored by the plough, the spade, and the rake; by stirring and repose, appositions and mixtures of Earth, calcinations, and composts; and above all, by *the eye of the master, and dust of his feet*, as the Italian proverb has it. For after this process, and innumerable other trials, (mixtures of things being endless) all other sorts of Earths and imperfect Moulds may be treated and meliorated; namely, if it be too hard and close, mollify and relax it; if too loose, give it ligature and binding; if too light, ballast; if too meagre, fasten and impinguate it; if too rich and luxuriant, emaciate and bring it down; if too moist, apply exsiccatives; if too cold, fermenting composts; if excessive hot, cool and refresh it; and thus Earths should be married together like male and female, as if they had sexes; for being of so many several complexions,

they should be well considered and matched accordingly, things (as was said) becoming fruitful from the mixture of repugnant qualities ; so as cold and dryness, without a warm and cherishing moisture, produces nothing. For this therefore you see what choice I have presented you of sand, ashes, chalk, lime, marl, mixture of Mould, calcinations, air, sun, dew, rain, frosts and snows, trenching, drilling, watering, infusions, and finally, of animal stercorations and other composts, which is the next and last part of this (I fear) over-tedious discourse ; since indeed it is not sufficient to find out even the best and most grateful Mould in nature, so as to rely for ever upon the same performance, without supplies of all sorts, stirring and repose, constant dressing, and (after all we have said) artificial letations likewise, to encourage and maintain it in vigour.

We proceed then in the next place to what farther advancement we may expect from stercoration, and manuring the ground by composts, and to discover the qualities which may be latent in their several ferments, and how to apply them by a skillful and philosophical hand, without which they do always more hurt than good ; and therefore, first, we will enumerate their several kinds ; we shall next inquire what it is we chiefly seek for and expect from them ; and lastly, show how to treat them, so as to render them fitting for our service.

From animals, we have the soil of horses and other beasts of burden, neats, sheep, goats, hogs, pigeons, poultry, and fenny fowl : We have also flesh, fat, blood, hair, feathers, urine, shavings of horn, hoofs, leather, skins, fish, garbage, snail-mud, &c. From vegetables, (as of nearest affinity) we have vine-cuttings, stalks, fallen leaves, marc of the wine and cyder presses, lees of wine, oil, rotten fruit, gourds, weeds, fern, haulm, stubble, rotten wood, saw-dust, refuse of the tan-pit, seaweed and old rags ; also brine, pickle, ashes, soot ; and of things promiscuous, washings of dishes and barrels, soap-suds, slime, and scouring of ponds and highways, dust, sweepings ; in sum, whatsoever is apt to rot and consume in any competent time, and is either salt, unctuous, or fatty ; to which let me add impregnating rains and dews, cold and dry winters, with store of snow, which I reckon equal to the richest manures, impregnated as they are with celestial nitre. But with all these auxiliaries, we are not yet to imagine that any of them are therefore profitable and good, because they retain an heady scent, are hot, moist, rotten and slip-

pery, fat or unctuous, and the like, which are all qualities that alone, and of themselves, effect little till they are corrected and prepared ; but, for that among these materials we detect the causes of fertility more eminently than in other substances, partly from their fixed salts, or some virtue contained in them, or rather drawn from without, and imparted to the exhausted and defective Earth ; and that by such a process, as by converting them into a chyle (as it were) it facilitates their being insumed, assimilated, and made apt to pass into nourishment, promoting vegetation. This obtained, the next thing is, skilfully to apply what we have prepared ; and this indeed is a difficulty worthy the heads, as well as hands, of the profoundest philosophers, since it requires a more than superficial knowledge and penetration into causes.

We know indeed, that the Earth is, without any artificial auxiliaries, endued with a wonderful prolific virtue ; but this, for being possible to decay and be lost, (at least for a longer time than our necessities can support) and from some grounds never to be expected without such helps, it may be worth our while a little to consider by what expedients of digestion, or other ways, the desired effect of perpetuating its vigour might best be accomplished.

That the secret we inquire after, and which dost most apparently seem to evirtuate towards this end, is some vegetable salt or matter, I suppose is generally agreed ; for salt it is which gives ligature, weight, and constitution to things, and is the most manifest substance in all artificial composts.

It is salts which entice roots to affect the upper and saline surface of the Earth, upon which the nitrous rains and dews descend ; and the cause that some plants, the most racy, and charged with juice, of all other (for such is the vine) thrive so well amongst rocks and pumices, and in whatever best, maintains this vital pickle.

It is salt which makes all covered and long shaded Earths to abound in fertility, and renders the dung of pigeons, poultry, and other salacious

corn-fed birds, so eminently effectual before the soil of horses and other beasts, in which it less abounds, as having less virtue to attract it ^e.

It is salt that gives such vigour to places sprinkled with urine, soot, ashes, &c. which have them not diluted; and to bones, flesh, horn, hair, feathers, blood, and the rest of those animal excrements: And whence those seminal masses should proceed after calcination of the Earth, when it comes to be exposed again, is hard to divine; whence, I say, they should derive their life and energy, without being destroyed by so powerful an agent as fire, unless they lurk in some vegetant and indissoluble salts, (volatile, fixed, or nitrous Earth,) from whence they (Phoenix-like) emerge, though I do not say without any other specific rudiment: But it is strange, what, as I remember Dr. Morison affirms of the *Erysimum*, or *Iris*, so seldom seen to grow spontaneously in England before the late prodigious conflagration of this City, when there appeared more of it amongst the ruins, than was known to grow in all Europe besides: it being a curious exotic, to be found most about Naples in the time of Fabius Columna, and but rarely elsewhere ^f.

It is salt which resuscitates the dead and mortified Earth, when, languishing and spent by indulgence to her verdant offspring, her vigour seems to be quite exhausted, as appears by the rains and showers which gently melt into her bosom what we apply to it, and for which cause all our composts are so studiously made of substances which most ingender or attract it.

^e The richness of poultry and pigeon dung appears rather to arise from its being overcharged with oil and mucilage, than any thing saline. For further information upon this subject, consult the note upon the 27th page of the 1st vol. of the *Silva*.

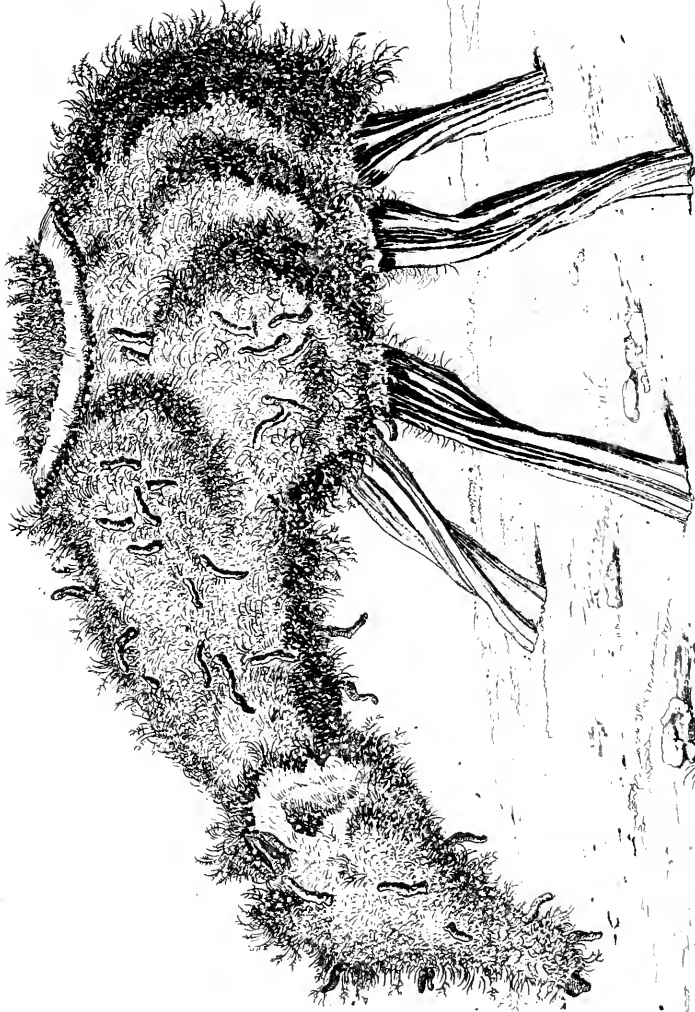
^f This is the *Silybrium (Iris) foliis runcinatis dentatis nudis, caule levi, siliquis erectis*. Lin. Two years ago a crop of wild mustard (*Erysimum vulgare*. Bauh.) was reaped from the banks raised at Hull to form a dock for the reception of shipping; and it is generally observed that a spontaneous crop of this vegetable makes its appearance, for two successive years, upon the banks of all large drains made in Holderness. Similar appearances have been observed in the isle of Asholme and other low countries. This phenomenon proves that seeds, when kept from air, may retain their vegetative power many years beyond the term seemingly allotted them.

It is salt which fertilizes and renders Egypt so luxuriously fruitful after the inundations of the Nile; and the nitrous grounds of Jamaica, and other places, cause a stupendous growth of plants and trees.

It is the want of salt which emasculates the virtue of seeds too long macerated in hungry water, and renders floated wood such unprofitable fuel, and to turn into such insipid ashes; and whatsoever it be some plants may appear to affect, as to the external differences of appetite, some of them seeming to draw in more air, some Earth, and others water in extraordinary measure, according to the several contextures of their parts, or by whatever magnetisms and attractives, it is still to come at their salts, which doubtless create that inclination, and compose the various saps and juices which they present us. Nay, what if I should say that all the several parts of vegetables were endowed with their peculiar and distinct salts, through different motions, complications, and percolations? Or, that so many Earths, so many kinds of salts digested and transported by their different vehicles and strainers; and those also, though unlike in quality, yet perfectly congruous to what they produce and nourish? But what this vehicle or menstruum is, I contend not. It is evident that salts unite best with water, vernal and autumnal showers and dews, as the most apt to convey their insinuations. You know, who have dignified salt with the prerogative of being named Element-Earth, the vigour and close of all things; yea, the first and last of elementated bodies. What shall I say, *Quid Divinum!* the original of all fecundity; nor can I say less, since there was nor sacrifice, nor discourse, acceptable without it. And verily, upon serious contemplation of the premises, and the little experience I have had of their effects in this work of vegetation, as far as I am able to penetrate into causes by them, I am not displeas'd at the magnificent epithets which are given it. In the mean time, I know there be who are so averse to this doctrine, as to prefer water alone before it; nor contend I with them, so they allow the near affinity and friendship which is between them, as I have deduced it at the entry of this Discourse, where I describe my Autoptical Observations of the several Earths: all that I pretend from hence being only to excite us to make diligent inquiry what may more likely be the cause of vegetation, and whether salt have not a dominion almost monarchial in this great work of Nature, being so

absolute an ingredient in all our dungs and composts. I cannot in the mean time but wonder how a thing so eminently sacred and fertile, should come to be the symbol of malediction ; when, as the custom was, they used to sow salt in the place of Cities they had erased and cursed ; there being in all nature nothing so pregnant and fruitful, unless it were to invite the plough to go there, and that the fertility of the spot for corn and grain might divert them from rebuilding and covering it again with houses. Indeed, to apply salt in excess, burns the Earth for a time, so as nothing will grow upon it ; but, when once the rains have well diluted it, vegetables spring up more wantonly than ever. This I daily find by sifting common salt upon the gravel walks of my garden, and for which cause I have left it off ; and we find that the Earth itself over-marled, and too highly manured, is as unprofitable as if it were barren for the time, and that there is in all things a just proportion to be observed.

But neither all this while do I pretend, much less determine, that the principle I so much celebrate, is our common artificial salt, composed of urine, and the like, which of itself is so burning and destructive till its acidity be qualified by the air and showers from heaven, (which endows it with a natural magnetism to receive their irradiant virtues,) but a certain more unctuous spirit, or airy nitre, pregnant with a vital balm, which is the thing we endeavour to find in the materials of composts ; but whether it be accidental or essential, coporeal or more spiritual, principal or organical, or (to speak with the Chymists and later Atomists) whether communicated by effluvia, salts embryonate, or undigested and not specificate, from ferments, spermatic vapours, influences celestial, or from liquor only impregnated and concocted, I leave to those who affect to wrap up *easy* notions in *hard* and uncertain terms, whilst the things would be of use to the philosophical husbandman, were they reduced into just classes, for the better discriminating of the several composts ; as which of them most abound in nitrous or urinous parts ; or which partake of the nature of our crude common salts, and Kali's mineral, or other. This would enable us to pronounce, *where*, and *how* we may apply them with safety and success : for some we know are plainly exitial and deadly to plants, (such as the mineral,) others properate too fast, and some are sluggish and scarce



J. Halpenny fecit.

The Institution Bank.

Rev. 1857.

advance them at all ^g. It should therefore be considered, whether any salts do universally nourish all plants alike; or rather partly, some one plant, some another: for upon the clear decision of this secret, depends all that is truly curious in this affair; laying, as I do, for position, that the improvement of all the Earths and soils I have spoken of, results from some salt or spirit, (call it which you please,) as from an indispensable principle in this vegetation, and perhaps the first rudiment of life in all things else; and till we shall arrive to this, (by what I have observed in the discreet use even of our common salt, brine, the effects of urine, and the like) I firmly believe, that were saltpetre (I mean factitious nitre) to be obtained in plenty, we should need but few other composts to meliorate our ground; since whether that which so fertilizes it, by any mixture we can yet devise, effect it from any other cause, is greatly to be doubted; nor do I think but the charge of extracting it (at least sufficient to impregnate water in convenient quantity) might be compassed by the industrious farmer without much inconvenience or difficulty, were he competently instructed in the process of calcination, resolution, percolation, evaporation, and separation, put into honest *English*, and easily to be learned: soon we should then see that this were not to be extracted altogether out of stinking dung, and found in heady trash, (which yet is material,) but rather in the well-impregnated and natural Mould itself, charged with a more generous spirit, or medicinal nitre, (in congress with a certain sulphur,) capable of warming and exciting to vegetation, beyond all we can promise from any mere artificial ferments, much less our common mixtures and ways of stercoration, which in time grow cold and languish, and are so quickly checked ^h.

^g Without multiplying distinctions, we may divide manures into four kinds:

1. Such as give nourishment only; as rape-dust, soot, malt-dust, blood compost, horn-shavings, pigeons dung, and all top-dressings.

2. Such as give nourishment, and add to the soil; as horse dung, cows dung, human ordure, rotten animal and vegetable substances.

3. Such as open the soil, and do not nourish in their own natures; as lime, light marls, sand, and vegetable ashes.

4. Such as stiffen the soil, and at the same time nourish a little; as clay, clay marls, and earth.

^h All the boasted compositions of nitre, and other salts, for increasing the fertility of land without other assistance, are now experimentally found to be of little value. Dung, that is putrid animal and vegetable substances, constitutes the only fertilizer for the use of the

And now, after all this, I dare not say that there is nothing more than this mere salt, or spirituous nitre, which concurs to those desired effects that promote fertility, and set the ferment on working: What ignite particles beside, and special composts there may be of consanguinity and near alliance to the respectable vegetables, (which we know to be of vast difference one from another,) we pretend not to determine; for some plants are very brisk and quick, others insulse and flat; some are acid, others more dulcerous and sweet; they are salt, sour, luscious, austere, hot, bitter, moist, dry, astringent, and of strangely different qualities, not to speak of their effects, which it were hard to number. Therefore, that the same compost, or remedy, should be promiscuously universal, is the more unlikely, and should be well considered: But admitting this to be salvable, and that we find, by experience, a well-digested compost beneficial to almost all the vegetable family, may it not in all probability spring from its participation of all those varieties of ferments, (in some at least, though in different proportion,) which we have been speaking of? As by which each single species draws and assimilates that only to itself, which it finds most congruous to its nature; and if so it be, then we have no more to do than to learn how to prepare our ferments, and apply them accordingly; namely, acid to acids, sweet to sweets, benign to benign, and so the contrary, as we would promote its natural quality; and this perhaps either by reducing some parts of them into composts, as their leaves, stalks, fruit, or by some more refined extraction of their salts, conveyed in proper vehicles. And for the better administering of this, the nicer texture of vegetables should diligently be considered, their several vessels and organic parts, since every impregnate liquor is not presently fit for all alike, the figuration of their Labiola and curious pores (which it is likely draw several juices and spirits) being very different, as the most sagacious Dr. Grew, and the learned Malpighius, (both ornaments of this illustrious Society) have begun the way to us in those elaborate anatomizations, which the world will shortly admire. I insist the rather on this, because we find some plants to reject divers rich compounded liquors, especially such as pretend to work miracles in the Protean changes

farmer. I must however except the oily manures, as rape-dust and soot, which nourish without undergoing the putrid ferment. And here I beg leave to be understood as agreeing that worn-out lands may in time be restored to their former vigor by the influence of the atmosphere, without any foreign assistance: but this is a circumstance not to be accomplished *instantaneously* by the application of nitre, or any other substance whose basis is saline.

of colours, and other qualities, from mineral, or other substances; and that the very rains and dews differ in several climates: so as even from this reason alone, to instance in no more, all plants do not easily become denizens in all places:

———"Nec omnis fert omnia tellus."

I might add to this, the niceness of their palates, and fondness to their own homes, and to live some in consort, some in solitude, some on dry banks, some in watery puddles, and some as it were in the very air, and fiery soils; nay, some are found to destroy the vegetable virtue where they grow, for such are said to be woad, hemp, the Scythian lambⁱ, &c.

ⁱ This vegetable is called the Tartarian Lamb, from its resemblance in shape to that animal. It usually has four stalks which look like feet, and its body is covered with a brownish kind of down. Travellers report that it will suffer no vegetable to grow within a certain distance of its seat. Sir Hans Sloan read a Memoir upon this plant before the Royal Society; for which consult their Transactions, N^o. 247, p. 461.—Mr. Bell, in his "Account of a Journey from St. Peterburgh to Ispahan," informs us that he searched in vain for this plant in the neighbourhood of Astrachan, when at the same time the more sensible and experienced among the Tartars treated the whole history as fabulous. This journey was undertaken in the year 1715. The annexed plate is taken from Mrs. Blackwell's Herbal, and seems a just representation of the plant. That given by Edwards has too much the appearance of fancy. It is the Polipodium (*Barometz*) frondibus bipinnatis; pinnis pinnatifidis lanceolatis serratis, radicibus lanatis, Linn. Dr. de la Croix, in correct and easy Latin verse, has described this supposed animal production:

“ Est ubi præterea tingit sua purpura succos,
 Itque cruor nostro similis, qui Caspia sulcant
 Æquora, sive legant spumosa Boristhenis ora,
 Sive petant Asiam velis, & Colchica regna.
 Hinc atque inde stupent visu mirabile monstrum,
 Surgit humo Barometz. Præcelso in stipite fructus
 Stat quadrupes. Olli vellus. Duo cornua fronte
 Lanae, nec desunt oculi, rudis Accola credit
 Eise animal, dormire die, vigilare per umbram,
 Et circum exesis pasci radicitus herbis:
 Carnibus ambrosiæ sapor est, succique rubentes,
 Posthabeat quibus alma suum Burgundia nectar;
 Atque loco si ferre pedem natura dedisset,
 Balatu si posset opem implorare, voracis
 Ora Lupi contra, credas in stirpe sedere
 Agnum equitem, gregibusque Agnorum albescere colles.

and if this be true and constant, all our imbibitions of salts and composts signify little to Earth pre-impregnated with a salt or virtue different from what the plant does naturally delight in, some obscure footsteps of which every ploughman seems to discover, which makes him change the crop in some places yearly. For the first, second, or third burden of the same grain, especially wheat, will exhaust that which is its proper aliment, and then leave the rest to more ignoble grain, which will be found to thrive well enough, till at last several successions of different seeds quite wear it out, and then the land must repose, or be manured with composts for fresh life and vigour^k. And to this we may add, how some plants again require little change or help of art; such as most of the perennial greens, and amongst these the most resinous and oily, as the pine, fir, cedar, &c. which thrive on barren hills, and grow in rocky crannies, without any Earth almost to cover and protect their roots. Of this sort I have a cedar table, which was sawed out of a spur only of a monstrous tree growing in Barbadoes, which held six feet long, five feet broad, and three inches thick, formed and wrought as it stands upon the frame; and his Royal Highness had another of a much larger dimension; namely, eighteen feet in length, and nine in breadth, cut out of the stem, which was of prodigious growth, fed and nourished as it was between the barren

Hoc è fonte fluit, me iudice, fabula Graium;
 Hæc olim æripedes Tauri, vigilesque Dracones
 Vellera servavere, hac ibat dote per undas
 Medea, his visus renovari fructibus Æson,
 Et succo præsentè senex revocasse juventam.”

CONNUB. FLOR.

^k It does not seem a well-founded opinion, that plants of different kinds select different particles from the same Earth. Accurate experiments rather prove that they all live upon the same general food. Some require more, some less. Some take it near the surface, others take it deeper. Upon these principles we may rationally account for the necessity of changing the species in the old husbandry. With regard to the different tastes and odours of different plants growing upon the same bed of Earth, I shall only remark, that the modification of the particles of the general nutriment produces all the differences. Matter, considered as matter, has no share in the qualities of bodies. It is from the arrangement of it that we have so many substances in nature. We may eat the earth, and drink the water that moistens it, and yet from the modification of its parts by the different vessels of plants, it is capable of becoming both bread and poison. A lemon, grafted upon an orange stock, is capable of changing the sap of the orange into its own nature, by a different arrangement of the nutritive juices. The same mass of innocent Earth can give life and vigour to the bitter aloe, and to the sweet cane! to the cool houseleek, and to the fiery mustard! to the nourishing grains, and to the deadly nightshade!

rocks. But to proceed; we find that most esculent and culinary roots do rather chuse a rich, natural, and light mould, inclining to sand, than what is forced or over-mucked; and how much they yield to soil, growing hard, short, and fibrous, and contract the smell and relish of the ferments applied to accelerate their growth (for according to the Italian proverb, *Ogni pianta serba della sua radice* “Every plant has a smack of the root”) I have already mentioned; so as to confide in dungs, as our vulgar gardeners about this city do, is no encouragement; and therefore some, not without good reason, prefer the corn and grain which is reaped from marl, chalk, lime, and other more natural manures, before what is produced from a crop, which, in comparison, grows on a dung-hill; experience also showing, that the cause of smuttiness many times proceeds from the impurity and rankness of the dressing; and therefore we omit to enumerate, amongst our soils, *stercus humanum*, which howsoever preferred by some before all other, and mentioned by Columella with that of fowl and cattle, does (unless exceedingly ventilated and aired) perniciously contaminate the odour of flowers, and is so evident in the vine, as nothing can reconcile it¹.

To give some instances of the nature of particular and simple composts, (for so I beg leave to use a solecism) whatever they be, they are by no means fit for the earth and use of the husbandman, unless, besides their richness, they be perfectly well digested, made short, sweet, and almost reduced to a crumbling Mould; so ordered, as not only not to lose any of their virtue, but to improve it, and to excite, entertain, and communicate heat and vegetative spirits to whatever you apply them: and that this is not done *per se*, that is, by immediate application, without prejudice (unless it be for the hot-bed, which yet has an *intermedium* of Mould) experience tells us, especially in the soil of animals, which is of all other the most active, as consisting of heterogeneous parts and repugnances, without which no fermentation could be obtained. Now, since

¹ This is the richest species of manure that possibly can be introduced into the field. In Flanders they use it with great success, either strewed upon the land in the form of powder, or dissolved in water and thrown on with a wooden scoop. In large families, this excellent top-dressing may be easily prepared by filling the pits of the *Necessaries* with Moor-earth, and in this state it may be put upon the land with great advantage and cleanliness.

many of these being freshly made, are not sensibly hot, but mordacious and burning, they are with caution to be used. That every kind of Earth (as well as the dung of beasts, &c.) has its peculiar ferment, and operates accordingly, either by attracting something to it, or embasing what approaches it, sufficient has been said; together with directions how to mingle and attemper it, as best may qualify it for culture. That we may do the like with the several sorts of soil, let us consider what their natures are, what their correctives, and how to apply them.

Horfe-dung, the least pinguid and fat of any, taken as it falls, being the most fiery, excites to sudden fermentation above any; wherefore, as we said, it is then fit only for the hot-bed, and when that fervour is past, may be spread on fields where we would have a rank grafs to spring; but is at no hand to be admitted into the garden, or where you desire good roots should grow, unless the ground be very stiff, cold, or wet, and then too it had need be well rotted, lest, instead of curing it, it leave couch-grafs and pernicious weeds, worse than the disease. The seeds of hay and other plants, of which the horses eat, come oftentimes entire from them; and we observe, that such vegetables do commonly spring up from the soil of cattle as they chiefly eat; as long knot-grafs from this beast; short, clean, and sweet pasture from sheep and cows; the sonchus, or sow-thistle, from the swine. Ground mucked with horse-dung is always the most infected of any, and if it be not perfectly consumed, it makes your roots grow forked, fills them with worms, and imparts to them an displeasing relish; but being laid on at the beginning of winter, and turned in at spring, it succeeds sometimes with pulse.

The dung of asses is highly esteemed, for its being better digested by the long mastication and chewing of that dull animal; but since we have no quantity of it in this country, it does the least concern us.

The dung of cows and oxen is of all other, the most harmless, and the most useful; excellent to mingle with sandy and hot grounds, lean or dry, and being applied before winter, renders it the most like natural earth, and is therefore for the garden and orchard preferred to any other. To use it therefore with the most certain success in such thirsty grounds, apply a plentiful surface of it, so blended, as the rain and showers may wash in the virtue of it thoroughly; but this is best done by making the dung

the finer, and what if reduced to powder, sprinkled for the garden, or otherwise working it in at a soaking wet (not stormy) season; but leave it covered with it for some time, if the rain descend in too great excess.

The next is sheep-dung, which is of a middle temper between that and pigeon's; profitable in cold grounds, and to impregnate liquors, of choice use in the garden.

The dung of swine is esteemed the coldest and least zcrimonious, (though some there be who contradict it) and therefore to be applied to burning lands; but always so early interred as never to appear above ground, where it is apt to produce weeds in abundance, from the greedy devouring of what that animal eats.

This, though not so proper for the garden, (and the most stinking) is said yet to edulcorate and sweeten fruit so sensibly, as to convert the bitterest almond into sweet, and therefore recommended, above all others, for experiments of change and alteration; Some qualify it with bran, or chaff well consumed, greatly comfortable to fruit-trees, but especially the hairs and bristles buried about the roots of pear-trees.

Pigeon-dung, and that of poultry, (especially of aquatic fowls, which is too fiery) being full of volatile salts, is hot and burning, and therefore most applicable to the coldest ground. There is nothing more effectual to revive the weak and languishing roots of fruit-trees than this laid early to them; but first be sure they pass their mordicant and piercing spirits, and be discreetly mixed: Be this therefore observed as a constant rule, That the hotter composts be early and thinly spread, *è contra*, the colder.

Very efficacious is this dung to keep frosts out of the earth, and therefore of great use to cover the mould in cases of exotic and tender plants; but if the heat be not well qualified, the very steam will kill them in a moment; therefore let a full winter pass over this latation for most uses. The best way of preparing it, is to reduce it into powder, and mingle it with the mould, and to water with its infusion, which alone does wonders; or, if it has been well exposed and abated, you may use it at the spring without addition; but if you desire something that is exquisite,

macerate it well rotted in the lees of wine, stale urine, and a little brimstone beaten very fine; then mingle it with your earth, for one of the richest composts. But let this be noted, that, as the effect of this dung is sudden, so it lasts not long, and therefore must the oftener be renewed.

The flesh of carrion and dead animals, being (as I think my Lord Bacon tells us) prepared already by so many curious elaborations of its juices, is highly effectual; but it should be very well consumed and ventilated, till it have quite lost its intolerable smell, and therefore never applied too crude ^m.

Blood is excellent almost with any soil where fruit is planted, especially the mural. To improve the blood of the grape, it is of great advantage, being somewhat diluted, and poured about the roots. It has been assuredly reported by divers eye-witnesses, that after the battle of Bradock Down, in Cornwall, (where Sir Ralph Hopeton obtained a signal victory) the carnage being great, the blood of the slain did so fertilize the fields, where corn had been sown a little before, that the year following produced so extraordinary a crop, as most of the wheat-stalks bare two, three, four, yea seven, and some even fourteen ears; a thing almost incredible. The owner of the land seeing his ground so miserably trodden by the horse and soldiers after the conflict, intended to resow it, as believing all his former labour lost; but, being dissuaded from his purpose, (perhaps to make the experiment) it happened as you have heard ⁿ.

Urine, for being highly spirituons and sharp, had need be well corrected; and then, being mingled with other composts to allay its acrimonious salt, it hardly has its equal.

^m The offal of the shambles, when mixed with earth and fresh horse dung, makes a compost of the richest quality; but this cannot be obtained in large quantities. Some year ago, I recommended a compost, the basis of which was whales' flesh, after the oil had been taken from it. This, compounded with horse dung and earth, is now much used by the farmers who live in the neighbourhood of sea-ports where ships are fitted out for the Greenland seas. The manner of preparing this rich kind of manure is described in the Geographical Essays, page 385.

ⁿ Blood, mixed with saw-dust, makes a very good hand-dressing to be sown upon wheat in the spring. It equals soot, and does not come to half the price.

Hair, horn-shavings, bones, skins, leather, &c. are deeply to be buried, and so as not to touch, but lie about the roots: These, with rags, coarse wool, and pitch-marks, improve the earth, as being full of volatile salts, drawing and retaining the dews. Fish is likewise spread to great advantage of grounds, where it is to be had in plenty; and for being quickly consumed, may soonest be applied^o. We come now to vegetables.

The marc and pressings of the grape make a good compost, and so do lees of wine mingled with mould. This is of singular comfort to the roots of orange-trees and case-plants; and if you sift a little brick-dust with it, and bury it near the roots of rosemary, the plant will thrive wonderfully: It may be a laudable compost for moist grounds, where that vegetable grows so unwillingly.

The leaves of trees are profitable for their own fruit, and natural, being well rotted, and not musty: The peach leaf, hurtful to cattle, is excellent for the tree from which it falls; and the walnut leaf, noxious to grafts, is helpful to the tree.

Duck-weed, the slime and spongy ouze of stagnant waters, mixed with proper mould, make a kind bed for aquatics.

Saw-dust, rotten-wood, found in the hollow of decayed trees, under the stacks, and where trees grow thick together, as in great and old woods, but especially that which is taken out of an inveterate willow-tree, is preferable to any other for the raising of seedlings of choice plants, mixed as it should be with a little loam, lime-rubbish, and mould, as we have taught. This and the rest being well ventilated, is of great effect to loosen and mellow ground, as tenacious of moisture.

^o In all towns upon the sea-coast, the refuse of fish may be obtained upon moderate terms. It is matter of surprise that this hint of our excellent Author, given in the year 1675, should have operated so little, that at this time (1778) the use of refuse fish is hardly known. The sea, with generous bounty, throws at the feet of the husbandman her richest treasures, and invites him to partake with freedom; but, instead of embracing the proffered riches, he drives his team to some distant town to purchase, at a high rate, what the watery element offers without a price.

Wood-ashes, rich and impregnate with salts, are fit for wet ground without mixture, and in pasture excellent, not sifted on over thick. In the West Indies near Guatimala, Gage tells us their manure is the burning of trees to ashes^p. These kill the worm; but in earth which is subject to over-heat and chap much, ashes and burning composts do but increase the fever, and therefore contrary remedies are to be sought, such as the dung of oxen and swine; but not so when lands are naturally or accidentally cold. Wherefore we should endeavour by all means to detect, as far as we are able, the quality predominant both of the earth we would improve, and the composts we apply, and not throw them promiscuously upon every thing without considering of what temper and constitution they be; for grounds are as nice as our bodies, and as obnoxious to infirmities upon every defect and excess; and therefore it requires skill, and no little study, to be able rightly to marshal this *Materia Medica* (as I may call it) of composts, the virtue of which does sometimes lie very hidden; at least, if it be true which Sir Hugh Platt affirms, that what we all this while seek after, is indeed altogether invisible to human eyes, and to be discerned only by the eyes intellectual, because it is veiled and clad under so many different bodies, whereof some are more ponderous, such as marl, chalk, the dung of beasts, &c.; and some more light, as their flesh, bones, hair, &c.; and some yet lighter, as grain and generous seeds: for in such as have virtue to multiply their own species, that spirit is invested with a very thin and curious integument, as in effect we have instanced in the blood and flesh of animals, so much more powerful for the enriching of land than their dung and excrements—this industrious man computing it to no less than twenty times; and to the same advance above this, hair, wool, and calcined bones^q. As to the coarser soils, he says, that the

^p In Sweden, Finland, Livonia, and the greatest part of Rufsia, where woods are plentiful, the countrymen cut down large tracts, and after burning the wood they sow the land with corn, which husbandry they continue for three years, the wood ashes remaining in force for that time. On the fourth year they remove to another woody quarter, and in this manner they proceed till the first sown land be again covered with wood, which is generally in about twenty years. This operation is called in the north, *Sveäjieland*. See Osbeck's Voyage to China, p. 50. vol. 1.

^q Bones should by no means be calcined, as their virtue is dissipated by the fire, and nothing but a *caput mortuum* left behind. My worthy friend, Gen. St. Leger, has favoured me with the following account of bones used for manure. The subject is curious as well as important:

“ Eight years ago I laid down to grafs a large piece of very indifferent limestone land

dung of pigeons and poultry does far exceed that of beasts which feed on grofs vegetables, and tells us it has been found upon experience, that one load of any sort of seed contains as much virtue, as ten loads of ordinary dung; therefore it is adviseable, upon all removals of corn-ricks, hay-stacks, &c. that the husbandman reserve all he can of the bottoms, offal, and shakings, and mingling them with chimney-soot and blood, let him reduce the whole into the form of a paste. To this add as much dried

“with a crop of corn; and, in order that the grafs-seeds might have a strong vegetation, I took care to see it well dresed. From this piece I selected three roods of equal quality with the rest, and dresed them with bones broken very small, at the rate of sixty bushels per acre. Upon the lands thus managed, the crop of corn was infinitely superior to the rest. The next year the grafs was also superior, and has continued to preserve the same superiority ever since, insomuch that in spring it is green three weeks before the rest of the field.

“This year, I propose to plough up the field, as the *Festuca Sylvatica* (*Prye Grafs*) has overpowered the grafs-seeds originally sown. And here it will be proper to remark that, notwithstanding this species of grafs is the natural produce of the soil, the three roods on which the bones were laid have hardly any of it, but on the contrary have all along produced the finest grafses.

“Last year, I dresed two acres with bones in two different fields prepared for turnips, sixty bushels to the acre, and had the pleasure to find the turnips greatly superior to the others managed in the common way. I have no doubt but these two acres will preserve their superiority for many years to come, if I may be allowed to prognosticate from former experiments most attentively conducted.

“I also dresed an acre of grafs ground with bones in October (1774) and rolled them in. The succeeding crop of hay was an exceeding good one. However, I have found from repeated experience that, upon grafs ground, this kind of manure exerts itself more powerfully the second year than the first.

“It must be obvious to every person, that the bones should be well broken before they can be equally spread upon the land. No pieces should exceed the size of marbles. To perform this necessary operation, I would recommend the bones to be sufficiently bruised by putting them under a circular stone, which being moved round upon its edge by means of a horse, in the manner that tanners grind their bark, will very expeditiously effect the purpose. At Sheffield it is now become a trade to grind bones for the use of the farmer. Some people break them small with hammers upon a piece of iron, but that method is inferior to grinding. To ascertain the comparative merit of ground and unground bones, I last year dresed two acres of turnips with large bones, in the same field where the ground ones were used; the result of this experiment was, that the unground materials did not perform the least service; while those parts of the field on which the ground bones were laid were greatly benefited.

“I find that bones of all kinds will answer the purposes of rich dresing, but those of fat cattle, I apprehend, are the best. The London bones, as I am informed, undergo

neats dung, tempered with urine, and made up in cakes as big as household loaves; and after all is well dried in the shade, crumble the mafs to dust, to be sifted or sprinkled, on the ground for a very considerable improvement; we say sprinkled, because it should never be sown too thick, especially for corn, which it either cloyes or over heats, according as it is qualified'. Thus, pigeons dung burns seeds on hot ground, but is excellent for barley, &c. sown on the colder mould.

“ the action of boiling water, for which reason they must be much inferior to such as retain their oily parts; and this is another of the many proofs given in these essays that oil is the food of plants. The farmers in this neighbourhood are become so fond of this kind of manure, that the price is now advanced to one shilling and fourpence per bushel, and even at that price they send sixteen miles for it.

“ I have found it a judicious practice to mix ashes with the bones; and this winter I have six acres of meadow land dressed with that compost. A cart load of ashes may be put to thirty or forty bushels of bones, and when they have heated for twenty four hours (which may be known by the smoaking of the heap) let the whole be turned. After laying ten days longer, this most excellent dressing will be fit for use.” Georgical Essays, page 461.

My very excellent friend, Edward M. Mundy, Esq. of Shipley, in the county of Derby, this moment informs me, that a gentleman in the neighbourhood of Matlock has lately erected a mill for grinding bones, which he profitably applies both to pasture and arable lands.

These observations of Sir Hugh Platt, relative to the nutritive powers of all kinds of seeds, are fully confirmed by the present practice of using the powder of rape-cakes upon corn lands. This species of manure is much used upon the thin limestone lands in Yorkshire. They generally use three quarters per acre for wheat, and four quarters for barley. It is sown by hand and harrowed in with the grain; and costs about nineteen shillings per quarter. If rain fall within a week or ten days after sowing, the barley crop is generally good; but if no rain fall till long after, the benefit of this expensive dressing is in a great measure lost; neither does the succeeding crop receive much advantage from it. For wheat, rape-dust is considered as a certain dressing, rain generally falling within a short time after sowing that grain: The strong mechanical powers employed in drawing the oil from the rape-seed, must, as I conceive, diminish the goodness of the dust used by the farmer. However, some experienced farmers contend that it is full as good as when it contained more oil. This deserves to be carefully investigated, and should be the object of correct experiment. On this subject I have fully enlarged in the note upon the twenty-eighth page of the first volume of the *Silva*, and I think I have there proved, that oil, or mucilage, is the food of plants; if so, the violence used in extracting the oil from the seed, must render the rape-cake of less value.

In all light soils, whether deep or shallow, what is called *Top-dressing*, constitutes a system of farming, that is highly judicious; for which reason I do recommend the farmer to employ his ingenuity and attention in forming a body of manure that may be put on by hand, either at the time of sowing the grain, or after it has come up. The use of pigeons dung and

Of like effect is earth blended with malt-dust, or decayed corn reduced to meal; so is the dust of old furze-bushes, (in Devonshire called *Drefs*) but this last should not be taken in seed-time, lest it infect the ground with a plant not easily to be extirpated.

Lastly, the mud of ponds and stagnant waters of ditches, shovelled up and well aired, is best applied to roots of trees, but especially the dust of unstonny highways, where the drift of cattle and much pasage is *. Let it be carried off from March to November; for, it being already a kind of refined soil, continually stirred and ventilated, there is no compost preferable to it for any use. It is prepared in the highest degree, and will need no wintering, but may be used immediately; and so may straw,

soot, is universally known, but the application of rape-dust is only attended to in a few counties. The expense incurred by the farmer for the above-mentioned hand-dressings, is so considerable, that it should induce him to invent similar ones of a less expensive nature. A good top-dressing may be made by mixing a due proportion of shambles-blood and saw-dust, both which articles may be procured in every large town at a moderate price: When the heat and putrid ferment is over, the compost is fit for use. Another top-dressing, but of a richer quality, may be obtained by putting saw-dust, or moor-earth, at the bottom of the necessaries, a practice that is followed in Flanders, with considerable advantage. No kind of manure exceeds human ordure in strength, and on that account the farmer should be careful to let it down to a suitable standard, before he applies it. All large towns may be made to supply this kind of compost, at a price considerably under what is given for soot and pigeon-dung. A farmer would be benefited, if, at his own expense, he was to erect commodious necessaries in places where numbers of manufacturers assemble. The common sewers should in no town be permitted to run to waste. Their contents should be directed into reservoirs, filled with the sweepings of the streets and all kinds of light materials. Much excrementitious matter is conveyed into the ocean by rivers, where probably it supplies the submarine plants with food, but of that circumstance we have but an imperfect knowledge. Man, however, has this last substance returned to him by the fish taken from the sea; and in the end the balance may be in his favour. This is an harmonious rotation, which only the philosophic farmer can see and admire. Every farmer knows that the animals under his protection must be supplied with proper food, and he exerts every nerve to procure it; but he should also know that the vegetables which grow at his feet, require also their food. Let him take the same pains to procure it, and he may rest assured that the earth will return with plenty and gratitude all that he bestows upon her.

* The pulverized materials of our turnpike roads are well calculated for cold clay lands, whether in pasture, or under the plough. But the commendable practice of removing the dung of horses as soon as it has dropt, has diminished the value of this kind of manure

haulm, and other litter trampled on in dirty streets, after it is a while rotted and mingled. Mr. Ray tells us, that in some places about the Alps, he found them sowing dust upon the snow, as he supposes, for manure, and to fertilize the dissolution.

Thus with no little industry are found out the several kinds of composts, and materials for improvement, and what is the most genuine and true medicament of every soil for arable, pasture, or garden. I do not say all, as if I thought there were no more; for what if indeed there should be as many sorts of composts as there are of ferments or salts; and as many sorts of salts as there be of vegetables, or any other putrifiable matter. The more there be, the greater ought to be our industry and skill to be able to distinguish them, and to know how and when rightly to apply them.

Nor is it sufficient to consider the nature of the earth, mould, and several composts, but of the very plants themselves, for the application of what you administer, be it for food or medicine; as if they be cold of constitution, to make use of the hotter composts; if hot, to prescribe the cold. For instance in a few of the most useful only.

Fruit-trees do generally thrive with the soil of oxen and swine; most flowers, but especially roots, with that of sheep. Peter Hondius tells us, (in his book intitled *Dapes inemptæ*,) that by the sole application of sheep-dung he produced a raddish root in his garden as big as half a man's middle, which being hung up for some time in a butcher's shop, people took it for an hog.

Apples affect a pretty rich soil with a dash of loam, but they will bear even in clay well soiled, and mixed with chalk, especially the more hardy winter fruit; and in chalk alone for some years; but they produce, though sweet, not so large fruit: But both apples and pears have a better relish in grounds that are not over moist, and where they may stand warm: and the last will prosper well enough where the soil is mixed with gravel, and has an harder bottom.

Cherries, summer and stone-fruit, such as have their roots like thrums, desire a fine light mould, sand or gravel, with chalk and good compost,

unless it be very coarse and stony; in which case it should be well soiled, and the pit you plant in filled with rich mould, as far as the roots are likely to extend before they reach the gravel, so as to make good spread; and this is to be renewed every third or fourth year; and for this reason it is profitable sometimes to bait steril grounds, by laying your composts at reasonable intervals, thereby to tempt and allure the roots towards it, and keep them from wandering, which they will be subject to do in search of fresh nourishment: For to bear constantly well, and much, fruit-trees must have frequent lätations. Nor are we to judge that what is excellent ground for one sort of vegetable is so for another; since that which is perfectly good for corn, is not so for all fruit-trees; and a slender straw will be fed and brought up with a great deal less substance and virtue, than what will serve to furnish the stem, bulk, and head of a fertile and spreading tree.

The vine (than which no plant more sensibly retains the different qualities of earth, or whose juice is of more variety) rejoices in a light, but vigorous mould, rather sandy, and inclining to dry, than either fat, luxuriant, or moist. Lime, tempered with blood, exceedingly recreates it, after the first heats are passed over.

Fig-trees (though affected to dry grounds) are no lovers of stercoration; yet in some countries they apply olive oil and pigeon-dung[†] to cause them to bear early fruit; but omitting the oil, if the dung be mingled with lime and ashes, it is not to be reproved: This fruit thrives and ripens even in the shade, and in our northern exposures in the meridional parts of England; but much better in the south, and best of all in cases, and under shelter in winter: an industry worth the pains for the most delicious fruit in nature, were it skilfully cultivated.

Artichokes thrive exceedingly with sheep-dung, which, applied to the roots, make them produce very great heads: In the island of Jersey they use sea-wrack, to a wonderful improvement of that plant.

[†] This composition is similar to the oil-compost recommended in the Georgical Essays.

Melons, Asparagus, and most hasty growers, participate evidently of the soil, and therefore we have already showed how new and heady dung contaminates; and this is, amongst others, the reason why in the more southern countries (where they are planted in the natural and unforced mould) they are so racy, and superior in taste and flavour to ours. I should therefore recommend the use of sheep-dung, well reduced, or rather the ashes of burnt straw, and the hotter dungs calcined, for some trials to reform it; or, as they do in Italy, mingle dust and earth manured with sheep-soil and wood-ashes: if, after all we have said, the cause of our application of composts and dungs to these rarer and choice productions be not to prevent the rains only; for otherwise too rich soils impair the most delicious fruits, rather than improve them; and grapes and other fruits are sooner ripened which stand near the highways, much beaten by passengers, than by all that you can lay to the roots, or spread on the ground for that purpose, the dust investing both the tree and fruit with a kind of refined soil, mellowed with the dews and gentle showers which fall from heaven.

To give some instances: Roots, as we have showed, desire deep ground; fruit-trees should never go deeper than the usual penetrations of the sun, for no farther is the mould benign. Besides, they but too propensely sink of themselves, especially bulbs of flowers, whose fibres easily draw them down, and then they change their artificial and accidental beauty, and (as we call it) degenerate; but trees will grow and thrive, if planted on the very surface, with little covering of the mould, so they be oft refreshed, and established against the wind. Besides, we find that even the goodliest fruit (as well as some timber-trees) have many times the hardest footings with reasonable depth of earth. So little does it import to have it profound, that, in soft and deeper sands, they thrive nothing so well as on chalk and gravel, so long as the root can be kept from descending; in which case you should (as we have showed) bait the ground towards the surface, and keep the roots from gadding too far from the stem, for the lower roots are frequently starved by the upper, which devour the nourishment before it arrives at them. Thus gardeners should sometimes humour their plants, cook and dress their foods to their appetite, and as they can well digest; but by no means suffer the roots of fruit-trees, Standards or Mural, to be planted in dunged earth which is not exceedingly well digested, and little different from the natural soil.

To give some other profitable instances of this nature ; In transplanting trees (beginning early, and when the earth is most tractable) endeavour to make your mould as connatural to that of the place or nursery from whence you remove them, as you can. It is not therefore material it should be so much richer ; but where Imp-gardens are poor, the tender plant, like a child starved at nurse, does seldom thrive wherever you set it ; and therefore you should have fair and spreading roots, and well fed, whatever some pretend. For other rarer shrubs and plants, the orange (Herera tells us) thrives well with the ashes of burnt gourds and leaves, and needs not change of mould, even in the case, above twice a year, and that towards the surface ; but the *Amomum Plinii* is a strange waster of earth, and should continually be enriched and planted as it were all in dung ; so the myrtle and pomegranate ; whilst the red rose, capers, samphire, and other shrubs and plants thrive better in gravel and rubbish, Sage loves ashes, and purslain delights in dust and sweepings ; rue affects the dry mould, lettuce the moister. Flowers, for the most part, detest the dung-hill, but, if they love any, it is that of sheep or cows mixed with loam and light earth. Tulips delight in change, and rather in poor than rich mould, yea, sharp and hungry, to preserve their variegations. But because it is sometimes troublesome to transplant them yearly, place a layer of short stable-litter a foot beneath your mould, and they will remain unremoved for some years without prejudice. The iris loves the dry bed ; crocus, a mixed, rich, and light soil ; carnations desire a loamy earth, qualified, if too stiff, with sea-sand and sheep-dung ; if too poor, with richer mould ; so the peony, anemomy, ranunculus, and other flowers ; but then lay it at the bottom, such as you take from the last year's hot-bed, giving it a surface of under-turf, which has been foddered on, sweet, and aired. In this plant your roots, but so as not to touch the artificial soil ; for all dunged Earths canker the bulbs of flowers, whilst their fibres reaching the heartier mould, draw from it without danger. But if you would indeed be provided with excellent earth to plant most flowers in, lay turf of pasture ground in heaps for two winters, till it be perfectly consumed ; this is also admirable for tuberous roots ; and indeed all upland mould, whether sandy or loamy, may be made perfectly good with the dung of oxen laid on the surface about Michaelmas for one year, that it may wash kindly in ; then in September after, pare this turf off as thin as you can, and for the first foot deep, of earth, you have bedding for bulbs and tuberous roots superior to any other

Another proper mixture, much in esteem with our gardeners, is Willow-earth, a fourth part, sifted from the grofser sticks, with almost an equal portion of sheep-dung, (Laurembergius says, that goats is better,) natural mould making up the other two parts; and indeed this is excellent to raise any seedlings of flowers; but for the more minute and delicate, such as cyprefs, mulberry, the samera of elm, and the like, prepare a mould as fine as powder, and let it be gently refreshed with a dewy sperge or brush, not with the watering-pot, which plainly gluts it.

Auriculas, anemonies, &c. should be raised in the Willow-Mould described above, but planted forth where the dung of oxen and loam is sifted among the Pasture-Earth.

The pine and bigger kernels make (as some affirm) great advance by being coated with dung, but, being grown to great trees, they abhor it. Touching change of crop, something has been said already: Pease degenerate betimes, at least in two or three years, be the land never so good; so it is observed, that most plants long standing in the same bed, impair both the ground and themselves, especially sorrel.

To conclude: For a general good garden-soil, take the natural under-turf, if it be not too stiff; add to it a quarter part of oxen or sheep-dung perfectly consumed; one bushel of slacked lime to each load of mould, with some sweet, though rotten wood-pile or Willow-earth; mix these well together, and you have a choice composition for all your rare exotics, oranges, and case-shrubs, remembering to place the spray of rotten bavins, hampers, or baskets, to keep the mould loofe, with limestone, brickbats, shells, and other rubbish at the bottom, that the water may pass freely, and not rot the fibres. And therefore be careful never to make your cafes close below, but rather so barred as to be able to keep the coarse materials from dropping through, whilst auger-holes, though never so thick bored, are apt to be stopped up, and then your roots do certainly rot, and your trees grow sick. The same is to be observed in pots, and that you place them about an inch from the ground, that they may freely drain, and as freely receive refreshing. But I must not quit these curiosities, to speak of the cooler composts, till I have described the best hot-bed that I know of.

Dig a pit or fosse, hot-bed depth, (four feet is sufficient) and of what figure and dimension you think will best entertain your furniture for it; if it be twenty feet in length, and ten broad, I think it competent. Line the sides with a wall of brick and half thick; fill this pit with fresh soil from the stable, trodden as other hot-beds are, but without any mould on the surface. On this place half-inch wooden cases, made like coffins, (but not contracted at the extremes, nor lidded) of what length and breadth you think best, but not above a foot in depth; let these be dove-tailed, with wooden handles at each end to lift in and out, and bored full of auger-holes at the bottoms. Your cases thus fitted, fill them with proper mould, such as you would sow melon seeds in, or any other rare seed, and thus place them in your bed of dung. The heat will pass kindly through the perforations, and continue a cherishing warmth five times as long as by the common way of hot-bed, and prevent you the trouble of making new and fresh for the whole process of the melon, or what other of choicer plants require more than one removal. The heat of this bed continues eight or ten weeks without need of repairing; and if it should, it is but casting in some fresh-made soil and litter beneath and about your cases, of which some you may glaze chevron-wise at the top, and with spiracles or casements, to refresh and give them air and sun at pleasure. And these beds, where you cannot conveniently sink them for want of depth, because of water, you may build above ground as well; and you may, or may not, extend a tent over them, to protect them from rain, wind, and sun, according as you find occasion. Thus have you a neat and useful hot-bed, as I have been taught to make it by the Right Honourable the late Lord Viscount Mordaunt, at Parsons-Green, whose industry and knowledge in all hortulan elegancies require honourable mention. *Note*, That ordinary fresh mould, so it be not poor and very lean, or apt to clog, is a better surface for the hot-bed to entertain and cherish the most curious seeds, than what gardeners universally make use of, sticky and over loose; at least let a due proportion of natural Earth be sifted amongst it.

Being now at last come to set down the several ways of preparing composts of dungs, and those other ingredients we have mentioned, we shall begin with the rudest, as that which best accommodates to the grosser part of husbandry, (which yet requires a special maturation) and so descend to the more refined. These I distinguish into the moist, the dry, and the

liquid for irrigation. But first, here by the way, greatly to be reprov'd is the heaping of a deal of undigested soil, and other trash, exposed (as we commonly find it) to the heat of the sun, continual rains, and drying winds, as it lies in the wide field, without the least coverture or shade; by which means all the virtue is drawn forth and carried away, leaving little more than a dry and insipid congestion of *caput mortuum*, and perhaps a florid green circle, or fairy dance, at the bottom, which the impregnated rains have enriched with what has washed from the heap; wherefore to prevent this, and make one load of our prepared soil worth ten of it:

Cut a square, or oblong pit, of thirty or forty feet in length, at the least four feet in depth, and ten feet over, or of what dimensions or figure you think will suffice to furnish you with store: Let one of the sides or edges be made so sloping, as to receive a cart or wheelbarrow to load and unload easily, and let the bottom and sides also be so well paved, or laid with a bed of small chalk, clay, or the like, that it may be capable of retaining water like a cistern: If to this you can commodiously direct any channels or gutters from your stable, and other sinks about the house, it will be much the better. The pit thus prepared, and under covert, (for that I should have premised,) so as at least the downright rains may not fall upon it, (but when you please,) cast into it, first, your stable-soil with the litter, a foot or more thick, according to the depth of your pit; upon this lay a bed of fine mould, on that another bed of cyder-marc, rotten fruit, and garden offal; on this a couch of pigeon and poultry dung, with more horse-dung; then a stratum of sheep-dung, a layer of earth again, then oxen-dung; lastly, ashes, soot, fern, a moist and dry bottom of wood-stack, saw-dust, dry scourings of ponds and ditches, with all other ingredients, as you happen to amass them, till the cistern be full and heaped up; upon all this cast plentiful water from time to time, which if you can have out of some pond where cattle use to drink and cool themselves, it will be excellent. At the expiration of two years, you may confidently open your magazine, and separate the layers as they rise, to cast them into other small pits or receptacles made a little concave to receive them, where you may stir, air, mingle, and work them in with fresh mould, or one with the other, as you find cause, till they become comparatively sweet and agreeable to the scent. Lastly, you may pass them through a screen made of laths, placed at moderate intervals,

and with the liquor remaining in your great cistern sprinkle the several composts, and make them up for use, casting the coarse remaining stuff, which would not pass the riddle, into the cistern again for farther mortification; and so keep your pit filled with fresh materials from time to time after the same method: Others, in the mean time, lay their several ingredients by themselves in some shady corner, which being frequently stirred, after two or three years thus mingle them at discretion^u.

There are some who advise us to suffer our mixture to remain till it be quite dry, after it is thus refined; and then, being beaten to dust, to strew it upon the ground. And indeed this seems in Pliny's time to have been the custom; nor do I contradict it, provided you could water it, or were sure of a shower before the sun had drank too deeply of the spirit and vigour of it, which, reduced in this manner, it does easily part with.

Now the reason of our thus treating composts of various soils and substances, is not only to dulcify, sweeten, and free them from the noxious qualities they otherwise retain, and consequently impart, when applied, as usually we find them, crude, undigested, and inactive; but for being immoderately hot and burning, or else rank, and apter to engender vermine, weeds, and fungous excrescences, than to produce wholesome plants, fruits, and roots, fit for the table, and grateful to the palate; for which effect it should be thoroughly concocted, aired, of a scent agreeable, and reduced to the next disposition of a sweet and natural earth, short and tractable, yet not so macerated as to lose any of its virtue. The proper season therefore for this work, is the beginning of the autumnal equinox, and wind westerly, both to prepare and lay it on your land, that, whether it be of wet or dry consistence, it may have a gentle soaking into the earth. As for fresh dung, such as sheep make when they are folded, it

^u In large families a rich species of manure may be collected, by supplying the pits under the necessaries with vegetable offal from the gardens, and fresh mould from the commons. We cannot pay too much attention to the formation of compost dunghills; for, without their assistance, the utmost exertion of the plough and spade, will but little avail. In this particular the farmer should be scrupulously nice, and he should embrace every opportunity to improve his stock of dung.

is good advice to cover it with mould as soon as possible, before the sun has over-dried it, for the reason before hinted^a; and by this early application you will find all that is stiff and any ways countemacious, subdued and perfectly prepared before you turn it in. If you would meliorate ground for fruit-trees of the orchard, or roots and esculents of the olitory garden, be cautious that the hotter dungs approach not immediately to their stems or roots without such a circumposition of natural mould as we have commended. But this is a note for such as think fit to use the soil steaming as it comes from the heap; but, if it be prepared as we have showed, there is no danger even of immediate contact. And the same is to be observed in ablaqueation, where we find cause to bare the roots of trees, and expose them to the air for fresh influence, or to abate exuberances; and that the cavity be not filled all at once, (when we conceive the roots have been sufficiently aired,) but gradually from month to month, as from October till the beginning of March; and, upon other occasions, leaving the surface rough, rather than too compt and exquisitely trimmed, if only you dig your ground, which once in two or three years, four or five (as you perceive your trees require culture) is advisable, and then to mingle the earth with a thorough-soiling, and refresh it with the impregnate water of your cistern, will exceedingly recover a worn-out plantation. This irrigation may also be yearly given to the roots of your fruit-trees about June and July; and the spreading of a little good soil upon the surface, and rough chopping it in with the spade before winter, is good husbandry, for it draws the roots upwards, the shallow running of which is of so great importance. But of this already.

And thus having showed how to prepare, ripen, separate, and apply the several composts, (which for distinction sake we call the dry mixture,) I am next to describe the liquid, in many particulars not much differing from the former process.

Betwixt east and north erect a pergola, or shed, so contrived with a cover as to exclude, or admit, the rain, snow, and weather at pleasure;

^a In this manner plenty of rich compost may be raised. Some people bed the ground, on which sheep are folded, with sand, which enables them to remove the rich manure to any distant place at pleasure.

under this, sink a pit for the cistern, into which cast all the acid plants, bitter and rank weeds that come in your way, and grow in the neglected corners of your grounds, such as esula, hemlock, docks, thistles, fumitory, tobacco-stalks, wormwood, cabbage leaves and stalks, aconites, the leaves, trash, and offal, such as cattle will not touch; to these add pigeon and poultry dung, with their quills and feathers; all sorts of ashes, soot, hogs-hair, horn, bones; also urine, blood, garbage, pickle, brine, sea-water, (if conveniently to be had,) otherwise pond-water, to sprinkle it with, and keep it moist to accelerate putrefaction; but when all is well consumed, forbear the pouring on of insipid liquors, and thus leave it till it be dry; then air, mingle, and work your composts as you were directed above, or boil it into petre, casting what you find not well digested into the cistern again for another year, and, with a little addition, it will give you half the quantity of the former, and, provided that you supply the magazine, a continued and farther increase. Indeed this salt and compost is not immediately fit for use, till it be well dulcified and purged from its over acrimony, therefore mix it well with your mould, and dilute it as you see cause. A receipt is set down by old Glauber for the effecting of wonderful vegetation, by the assistance of certain circulatory vessels to prepare the oily succus, and pinguid juice, which that author teaches in his *Miraculum Mundi*, to extract not only out of these materials, but out of turf, wood, and stone itself, by calcining and burning them in close and reverberating furnaces, to which a tube, adapted near the bottom, may convey the spirits into a recipient, as he describes the process. I mention this the rather, for the real effects of which I have been told of this menstruum from very good testimony: And doubtless he who were skilled to extract it in quantity, (and to dulcify and qualify it for use) a true spirituous nitre may do abundantly more, in the way of the improvements we have celebrated, with a small quantity, than with whole loads, nay hundreds or loads of the best and richest of dry composts which we can devise to make⁷. But besides this, any house of ordure, or rancid mould,

⁷ The whole of this passage is an unnecessary and expensive multiplication of the farmer's trouble; and indeed it seems to have been given by our excellent Author rather in conformity to the philosophy of the times, than from his own experience or opinion. The boasted receipts of chymists for forwarding the powers of vegetation, are now justly exploded, and the present age boasts of a philosophy in farming, that has truth and experiment for its foundation.

strong salts, vinous liquors, urine, ashes, dust, shovellings of the kennels and fireets, &c. kept dry and covered for three or four years, will be converted into petre without half this trouble, especially if you mingle it with the dung of pigeons, poultry, and other salacious fowl which feed on corn: Or, those who would not be at the charge of distilling for these advantages, may make experiment of the so famous muck-water, not long since cried up for the doing wonders in the field: Throw off the shortest and best marl into your cistern, exceedingly comminute and broken, which you may do with an iron rake, or like instrument, till the liquor become very thick; cast on this the dung of fowl, conies, sheep, &c. frequently stirring it; to this add the soil of horses and cows, grains, lees of wine, ale, beer, any sort of beverage, broths, brine, fat and greasy stuff of the kitchen; then cast in a quantity of lime, or melting chalk, of which there is a sort very unctuous; also blood, urine, &c. mixed with the water, and with this sprinkle your ground at seasonable times; and when you have almost exhausted the cistern of the liquid, mingle the residue with the grosser compost of your stable and cow-house, and layers of earth, sand, lime, S. S. S. frequently moistened with uncrude water; the taking up of which you may much facilitate, by sinking a tub or vessel near the corner of the cistern, and piercing it with large holes at the bottom and sides, by which means you may take it out so clean as to make use of it through a great syringe or watering engine; such as is used to extinguish fire, will exalt and let it fall by showers on the ground, and is by much the more natural way of irrigation; it also despatches the work.

This liquor has the reputation also for insuccation of corn and other grain, to which some add a fine sifting of lime-dust on it, and when that is dry, to repeat it with new infusions and siftings: But,

There is yet a shorter process, namely, the watering with fishmonger's wash, impregnated with the sweepings of ships and vessels trading for salt, adding to it the blood of the slaughter-house, with lime, as above; but this is also much too fierce for any present use till it be perfectly diluted; which is a caution indispensably necessary whenever you would apply such powerful affusions, lest it destroy and burn up, instead of curing and enriching. Another is as follows:

Take rain water of the equinox, a sufficient quantity. Boil with store of dung of oxen till it be very strong, then dissolve one pound of saltpetre in every pottle of the water; in this, a little tepid, macerate your seeds for twenty-four hours; dry them gently, rather with a cloth than by the fire, and sow in the most barren earth, or water fruit-trees with the liquor, for prodigious effects. Or thus:

Take two quarts of the same water, dung of oxen as before; boil to the consumption of half; strain and cast into the percolation two handfuls of bay salt, and as much saltpetre. Another:

Take rain-water which has stood till putrified; add to it oxen, pigeon, or sheep-dung; expose it for insolation a week or ten days, then pass it through a coarser strainer; infuse more of the same soil, and let it stand in the sun a week longer; strain it a second time, and add to it common salt and a little ox-gall. Another:

Take quick lime, and sheep-dung at discretion; put these into rain-water, four fingers eminent; to ten pints of this liquor, add one of aquavita; macerate your seeds, or water with it any lean earth, where you would plant for wonderful effects. Another:

Infuse three pounds of the best Indian nitre in fifteen gallons of water; with this irrigate your barren mould. It was successfully tried amongst tulips and bulbs, where the earth should by no means (as we have said) be forced by composts. But a gentler than either, is,

A dilution of milk with rain-water, sprinkled upon unslacked lime, first sifted on your beds; and so after every watering the lime repeated.

These, with divers more which I might superadd, not taken and transcribed out of common receipt-books, and such as pretend to secrets, but most of them experimented, I thought fit to mention, that upon repetition of trials the curious might satisfy themselves, and as they have opportunity improve them; whilst, perhaps as to irrigations, less exalted liquors were more natural. And what if essays were made of liquors *perlivivium*, the plant reduced to ashes: might it not be more connatural, since we find by more frequent trial, that the burning of stubble, before

the rains descend on it, impregnates ground by the dissolution of its spermatic salts? I only name the naked phlegm of plants distilled, either to use alone, or extract the former salt; but I say I only mention them for the curious to examine, and *ex abundanti*. For certainly (to return a little, and speak freely my thoughts concerning them) most exalted *menstrua*, (and as they dignify them with a great name) Essentiated Spirits, all hasty motions, and extraordinary fermentations, though indeed they may possibly give sudden rise, and seemingly exalt the present vigour of plants, are as pernicious to them as brandy and hot waters are to men; and therefore wherever these ardent spirits are applied, they should be poured at convenient distances from any part of the plant, that the virtue may be conveyed through some better qualified medium. But, when all is done, waters moderately impregnated and embodied with honest composts, and set in the sun, are more safe, and, I think, more natural²; for, as the learned Dr. Sharrock truly affirms, water is, of its own constitution alone, a soil to vegetables, not only as the most genuine vehicle of the riches which it imparts to plants, through the several strainers, and by means of which all change and melioration is effected, but for that it is, of all other substances, best disposed to insinuate into and fertilize the earth, which is the reason that floated and irriguous grounds are so pregnant. Besides, it is, of all that pretend to it, nearest of blood (as I may say) to the whole Vegetable Family. For to assert with any confidence what part of the mere Earth passes into their composition, or whether it serve (as we touched before) only for stability, or as a womb and receptacle to their seeds and eggs, (for so we are taught to call the seeds of plants,) I shall not undertake to discuss. Every body has heard of Van Helmont's Ash-tree³; and may, without much difficulty, repeat what has been experimented, by exquisitely weighing the mould before and after a gourd

² Here our excellent Author, after enumerating the wild and phantastical opinions of others, at last gives his own, than which nothing can be more just.

³ Van Helmont planted a willow-tree, which weighed five pounds, in two hundred pounds of earth dried in an oven, and watered it with rain, or distilled water, after carefully covering the case in which it stood, with a perforated tin-cover, to prevent the admission of any other earthy particles. Five years after, he weighed the tree, adding all the leaves it had produced in that time, and found its weight amount to one hundred and sixty-nine pounds two ounces, while the earth was only diminished about two ounces.

is planted in it, and till it be grown to bulk and full maturity, fed with water only; by knowing how much liquor is insumed, and how little of the earth consumed, some conjecture may be made; though I do not yet conceive the earth to be altogether so dull and unactive as to afford no other aid to the generation of what she bears; the diversity of soils being (as we have showed) so infinitely various, and the difference of invisible infusions so beyond our arithmetic. But if we give liquids predominion, at least the masculine preference, be they salts or spirits (that is, nitrous spirits) conveyed into her bosom how they will; sure we are, that water and vegetables are much nearer of alliance, than either water or air are with the Earth and mould. But neither do I here also by any means exclude the air, nor deny its perpetual commerce and benign influences, charged as it comes with those pregnant and subtle particles, which insinuating into the earth's more steady and less volatile salts, and both together invading the sulphur, (and freeing them from whatsoever they find contumacious) that intestine fermentation is begun and promoted, which derives life, and growth, and motion, to all that she produces. That by the air, the most effete and elixivated mould comes to be repaired, and is qualified to attract the prolific nitrous spirits, (which not only disposes the earth to this impregnating magnetism, but converts her more unactive fixed salts into quite another genius and nature) the learned Dr. Mayow has ingeniously made out; and all this by a naked exposure to the air alone, without which it produces nothing: Nor can plants (totally excluded from the air) live, or so much as erect themselves to any thriving purpose, as being deprived of that breath and vital balm, which no less contributes to their growth and nourishment than does the earth itself, with all our assistances. For that plants do more than obscurely respire, and exercise a kind of peristaltic motion, I little doubt from the wonderful and conspicuous attraction and emissions which some of them discover; particularly the aloes and other sedums, and such as, consisting of less cold and viscid parts, send forth their aromatic wafts at considerable distance^b.

^b From the experiments of Malpighius, Grew, Hales, and Duhamel, it is abundantly evident that all plants, without distinction, inspire and expire. The leaves perform these salutary operations, so that deciduous trees and shrubs, from the time they lose their leaves to the expansion of their buds, may be considered as in a state of perfect insensibility, resembling that class of animals called *Sleepers*.

Besides, we find that air is nearer of kin and affinity to water than water is to plants; unless I should affirm that air itself were but a thinner water; for how else are those vines, and other trees of prodigious growth, maintained amongst the barren rocks and thirsty pumices, where rains but seldom fall, if not from this rorid air: not to insist again, that perhaps even these rocks themselves may once have sprung from liquid parents; and how little, even such as are exposed to continual showers, in other climates, abate of their magnitude, since we rather find them to increase; and that also the fruits and juices of vegetables seem to be but the concretion of better concocted water, and may not only be converted into lignous and woody substance, (as the learned Dr. Beale has somewhere instanced in a Discourse presented to you, and recorded in the Public Transactions,) but is apt enough to petrify and become arrant stone.

Whatever then it be which the earth contributes, or whether it contain universally a seminal virtue, so specified by the air, influences, and genius of the clime, as to make that a cinnamon-tree in Ceylon, which is but a bay in England, is past my skill to determine: but it is to be observed with no little wonder, what Monsieur Bernier, in his history of the Empire of the Mogul, affirms to us of a mountain there, which being on one side of it intolerably hot, produces Indian plants, and on the other as intemperately cold, European and vulgar. Not here to pass without notice at least, what even the most exhausted mould will (to all appearance) produce spontaneously, when once it has been well exposed to the air and heavenly influences, if what springs up be not possibly from some volatile rudiments and real seeds, transported by winds, higher than we usually place our experiments. But Porta tells us, with more confidence, that he took Earth from a most profound and dry place, and exposed it on such an eminence as to be out of reach even of the winds; but it produced, it seems, only such plants as grow about Naples, and therefore may be suspected.

To return then again from this digression, and pursue our liquids; where there is good water there is commonly good Earth, and *vice versa*; because it bridles and tempers the salts, abates the acidity and fierceness of the spirits, and imparts that useful ligature and connection to the mould, without which it were of no use for vegetation. In the mean

time, of all waters, that which descends from heaven we find to be the richest and properest in our work, as having been already meteorized, and circulated in that great digestory, enriched and impregnated with astral influences from above at those propitious seasons; whence that saying, *Annus fructificat, non Tellus*, has just title to a truth we every year's revolution behold and admire, when the sweet dews of spring and autumn (hitherto constipated by cold, or consumed with too much heat) begin to be loosened, or moderately condensed, by the more benign temper of the air, impregnating the prepared earth to receive the nitrous parts descending with their balmy pearls, yet with such difference of more or less benign, (as vapours haply, which the earth sends up, may be sometimes qualified) that nothing is more uncertain. And this we easily observe from the labours of the industrious bee, and her precious elixir, when for some whole months she gathers little, and at other times stives her waxen city with the harvest of a few propitious days. But I am gone too far, and therefore now shall set down only a few directions concerning watering, and so dismiss the subject and your patience.

1 It is not good to water new-sown seeds immediately, as frequently we do, and which commonly bursts them, but to let them remain eight-and-forty hours in their beds, till they be a little glutted with the natural juice of the earth: But then neither must you so neglect their beds, as to become totally dry; for if once the seeds crack through the heat, their little souls exhale^c: therefore till they peep, you must ever keep them in a just temper for moisture, and be sure to purge them of predacious weeds betimes: In a word, these irrigations are to be conducted according to the quality of the seeds, those of hard integuments requiring more plentiful refreshings.

2. Never give much water at one time; for the surface of the earth will often seem very dry when it is wet enough beneath; and then the fibres rot about autumn, especially in pots and cases wintered in the green-house. To be the more secure, we have already cautioned gar-

^c This expression has an uncommon degree of simplicity and beauty.

deners to keep their bottoms hollow, that nothing stagnate and fix too long, which should be but transitory. If such curiosities strike no root by September, the leaves desert them certainly at spring. The reason is want of air, not moisture. Therefore in all intervals of severe frosts, and rigorous winter-weather, be sparing of refreshings, and unless you perceive their leaves crumple up and fall, (which is the language for drink) give them as sparingly as you can. Indeed, during the summer, and when they are exposed, they require almost perpetual irrigation, and that the liquor be well impregnated with proper compost. It is ever advisable to water whilst the ground is a little moist, and not totally dry, especially during the growing seasons, for it stunts the plant and intercepts its progress. But in hard frosts, or foggy seasons, watering your housed plants endangers them by mustinefs, and a certain mill-dew which they contract. On the other hand,

Applications too dry create an intemperate thirstinefs, and then they drink unmeasurably, and fall into dropsies, jaundice, and fevers, swell, languish and rot; and if the liquor prove too crude, (as commonly it does, if taken from running and hungry fountains) it extinguishes the natural heat, and obstructs the pores; and therefore whenever you are constrained to make use of such drink, expose it first to the warm sun for better concoction, infusing sheep, pigeon, or the dung of oxen, to give it body. But though spring water be so bad, slow-running river is often very good, and pond water excellent, so it be sweet; but all stinking pools, mineral and bituminous waters, are not for our use; and often good air is as needful as good water; worms, mouldinefs, cankers, consumptions, and other diseases, being the usual and fatal consequences of these vices.

If you be to plant in fresh and new broken-up earth, and that the season or mould be too dry, it is to be watered; but then give a competent sprinkling, or sifting of dry and fine mould upon what you have refreshed, and then beating it a little close with the back of your spade, plant it successfully; for this you will find to be much better than to water it after you have planted, (as the custom is) and as you may observe in setting violets, auriculas, primroses, and other capillaries, planted in beds or borders, and then dashed with a flood of water, which, so soon as the

sun has looked upon, resign and lose their tinctures, scorch and shrivel up: Here therefore let gardeners be cautious how they expose their exotics and choicer case-plants, which many times having borne the winter bravely in the conservatory, dwindle away, and are lost on the sudden, by being too suddenly placed in the eye of the sun in March, (or later) when they most of all require the protection of a thin hedge, or canvas curtain, to break his scorching darts, as well as defend them from our then too constant and rigorous *Etesians*. Lastly,

For the season likewise of this work, let it be towards the evening in hot and summer days, for the reason immediately assigned; for the moisture being in a short time drunk up, deserts the plant to the burning planet; and hence it is that summer mists and meridian waterings are so noxious; and therefore the best expedient is, upon such exigencies, to pour your refreshings rather all over the area on which your cases of choice and rare shrubs are placed, and among the alleys and paths between your beds of flowers, for the raising artificial dews, (by which is unfolded no common secret) or water them *per lingulam*, and *guttatim*, than either with the pot or bucket: And after this manner, if at other seasons they stand in need of heat and comfort of warmth, by strewing sand or cinders on the same intervals, the reflection will recreate them upon all emissions of the sun-beams.

As for grosser plantations, and trees of old orchard fruits, moderation in watering is also to be observed, and not to dash on such a quantity near the stem and body; but first with the spade to loosen the earth about them, especially towards the extremities of the tenderest roots, which generally sprout at the ends of the most woody, whose mouths are shut with tougher bark. These therefore may be cut sloping to quicken them a little, and make them strike fresh fibres, especially if some rich and tempting mould be seasonably applied: For trees will (as we showed) with very little earth to cover them, take fast root (provided you establish them against impetuous winds, shocks, and accidents of force) and thrive exceedingly with this refreshment.

Some make pretty large holes with an iron crow, or (which is better) a pointed stake, and pour the liquor in at those apertures; but by this

means they wound the roots, (which gangrenes, and sometimes kills the tree) and if the holes be not filled, the air and moisture occasion mouldinefs: fo that when all is summed together, there is nothing comparable to frequent stirring the ground, opening the dry clod, and watering upon that; and if you lay about them any fern-brakes, or other trash, capped with a little earth to entertain the moisture and skreen it from the heat, let it not be wadded so close, or suffered to lie so long as to contract any mustinefs, but rather loose and easy, for the free intercourse of the air, and to break the more intense ardours of the sun-beams.

Thus I have exercised your Lordships' and these noble Gentlemen's patience with a dull discourse of Earth, Mould, and Soil; but I trust not altogether without some fruit, as the subject has relation to what has so lately been produced, and with happy event made out by those learned persons who have entertained this illustrious Society with the Anatomy of plants.

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