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$$\begin{array}{r}
 \text{K O, Length 24 Feet, Mean girt } 9 \text{ in.} \quad \frac{H}{13:2} \\
 \text{K L, 8 Feet Mean girt 15 inches quantity.} \quad 12:\frac{1}{2} \\
 \text{L N, 8 Feet Mean girt 9 Inches quan.} \quad 4:\frac{1}{2} \\
 \text{N O, 8 Feet Mean girt } 4 \frac{1}{2} \text{ Inches quan.} \quad 1:\frac{1}{10} \\
 \text{Sum of K L, L N, \& N O,} \quad 18:\frac{1}{10} \\
 \text{Sum of K O,} \quad 13:\frac{1}{2} \\
 \text{Difference} \quad 4:\frac{6}{10}
 \end{array}$$

Then as 4 is to 5 so is 18 to $22\frac{1}{2}$ the true Solidity of K O.

A SURE
METHOD
OF

Improving ESTATES,

BY

Plantations of OAK, ELM, ASH,
BEECH, and other TIMBER-TREES,
COPPICE-WOODS. &c. Wherein is
demonstrated, the Necessity and Advan-
tages thereof; their Manner of raising,
cultivating, felling, &c. in all Kinds of
SOILS, whereby ESTATES may be
greatly improv'd.

*Offered to the Consideration of the Nobility
and Gentry of GREAT-BRITAIN.*

By BATTY LANGLEY, of
TWICKENHAM.

L O N D O N :

Printed for FRANCIS CLAY, at the Bible, and
DANIEL BROWNE, at the Black-Swan, with-
out Temple-Bar. MDCCXXVIII.

M. B. 2. 110. 1

1891

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To the Right Honourable, the
LORD VISCOUNT
TORRINGTON,
And to the rest of the
Lords Commissioners
[OF THE
ADMIRALTY.

My LORDS,

O *whom could I more justly inscribe this Treatise of the Manner of Improving Lands in general by Plantations of Timber, in Great-Britain and Ireland, than to those who are by his most Gracious Majesty entrusted with*

DEDICATION.

the Care and Direction of his Royal Navy ; the BULWARK and GLORY of Great-Britain.

The British Nation having been so renowned in all Ages, for its Naval and Maritime Affairs ; should it happen to a Supine Neglect in the present Generation of the Eftated Gentlemen and Land-holders, that its Power and Commerce should decay by Want of careful Plantations of Timber for our Naval Defence and Trade ; What ill Consequences must ensue to the Benefit of the People, the Glory of his Majesty's Navy, and the Interest and Trade of this Country ?

These Considerations, make me humbly presume, My Lords, to Dedicate the following Papers to your
Lord-

DEDICATION.

Lordships *Patronage and Protection*, which are intended for the *Service of my Country, and the Interest and Glory of GREAT-BRITAIN and IRELAND.*

I am your Lordships

Most Obedient

Humble Servant

Batty Langley.

A 3

TO

Advertisement.

To the NOBILITY and GENTRY of Great-Britain.

WHEREAS the Success of Plantations wholly depends upon the well preparing of Soils, and adapting the several Kinds of Timber-Trees to their various Natures :

THESE are to give Notice, that the Author's Advice may be commanded to any Part of *Great Britain or Ireland*.

As also, for the laying out, and planting of Gardens in general, after a *rural* and more *grand Manner*, than has been done before. And *Noblemens Estates* most accurately *survey'd* and *mapp'd*, with curious *Prospects* thereof: Also,

Grottoes, Baths, Cascades, Fountains, Canals made, and *Engines* for raising Water to any Height required.

TIMBER measured and valued, either growing or fell'd.

AND in Consideration that the just Mensuration of Timber being most expeditiously perform'd by the *Line of Numbers*, on the two Feet, or sliding Rules; this is to inform the Curious, that the most accurate Rules for these Purposes, as well as all other *mathematical Instruments*, in *Silver, Brass, Ivory or Wood*, are most exactly made and sold, at very reasonable Rates, by *Benjamin Scott*, at the *Mariner and Globe*, against *Exeter Change* in the *Strand, London*.

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INTRO.

INTRODUCTION.

Having duly consider'd the vast Quantities of Timber that have been felled, and employ'd in our Civil, as well as Naval Structures, in this present Age; and the small Quantities propagated, for a Succession; find that, if Plantations thereof are not speedily made, our Nation will be entirely exhausted of building Timber, before sixty Years are ended.

INDEED, at this very Juncture, we have very little building Timber in our Woods and Forests to boast of, and are already much oblig'd to Foreigners, for great Quantities, for our Civil Uses: But should we ever happen (which God forbid) to be obliged to purchase of them Timber for our Shipping, (by want thereof at Home) 'tis to be feared, that this glorious, and now powerful flourishing Nation, that governs the Seas, must submit to every Invasion
that's

that's made, for want of its wooden Walls of Defence.

MR. *Evelyn*, above fifty Years ago, wrote a Treatise on the Propagation of Forest Trees : Wherein he Reports in his 33 *Chapter*, Page 207. " That in the great Expedition of *Eighty Eight*, it was expressly " enjoin'd 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.*

BUT, besides this Necessity of national Security, the Advantages and Pleasures thereof are so very great, that in my humble Opinion, there's not one single Gentleman, but will pursue the Pleasures and Profits thereof ; altho' 'tis true, that some may say, That to make Plantations of Timber Trees now, that will not be
fale-

saleable under thirty or forty Years hence, when they may be in their Graves, will be no Advantage to them; yet, I must beg leave to inform all such (who make no Provision for Posterity) that every Year after such Plantations are made, their Lands are always encreasing their Value, as the Trees advance in Growth. So that even at the End of the first Year after Planting, were their Estates to be sold, they are of a much more considerable Value, than when naked thereof. Besides, the Expence therein at the first is very inconsiderable, and the Pleasures thereof very great. Which will plainly appear in the following Sheets.

BEFORE that I proceed to the Culture of the following Vegetables, There are two Operations of Nature, that I must explain, for the right understanding thereof, *viz.* The Force with which Nature imbibes Nourishment for their Support; and the Power with which she discharges the crude Part thereof by Perspiration, to permit a Succession.

THAT Vegetables imbibe Nourishment at their Roots, I need not give my self the Trouble to explain, it being known to many, and believ'd by every one; but that

Vege-

Vegetables do also imbibe Nourishment at their Leaves, as well as perspire it away there also; there's but few that are acquainted therewith. And since that the Success of our Labours do's wholly depend upon the Knowledge thereof, I will illustrate the same by Experiments.

EXPERIMENT I.

To prove that the Branches of Trees will imbibe Water at their extream Parts, when cut, at Pruning, Lopping, &c.

I Made choice of the Branch of an Elm Tree, that grew almost perpendicularly, whose End I cut off, where its Thickness was about an Inch Diameter. On the extream of the remaining Part of the Branch I cemented a Glass Tube, which I filled with Water, that was imbibed by the Branch with such Velocity, that in 12 Hours, (*July 20*) it imbibed one *Winchester* Quart.

To the like Stem of an Oak, I cemented on another Tube, which imbib'd in the same Time near one Pint. But the Branch of an Ash, of the same Diameter, in the same Time imbib'd near three Pints.

THIS

THIS Experiment explains to us ; that Timber Trees imbibe great Quantities of Wet, (when unskillfully pruned or lopp'd,) which causes their Arms and Bodies to decay and grow rotten, to the great Prejudice of their Proprietors.

EXPERIMENT II.

To prove that Vegetables imbibe Nourishment at their Leaves, viz. Dews, Rains, &c.

IN April 1727, I cover'd with Sail-cloth, divers Lime, Elm, Oak, Apple, Cherry and Pear-Trees ; so that their Branches were totally depriv'd of the Benefits of Rains, Dews, &c. But their Roots I kept supply'd with sufficient Quantities of Moisture. In this State I continu'd them until the End of July, at which Time their Leaves in general were turn'd yellow, and the Shoots that they had made, were also yellow and very weak. The same kind of Trees planted close to the aforesaid, that had enjoy'd a free open Air, were very healthy and green, and, during the same Time, produc'd very strong Branches.

AT

AT the same Time, I made Choice of particular Branches of several Trees, which I cover'd as aforesaid; which Branches grew very little, and their Leaves turned yellow; whilst the others that possess'd the free open Air were green, in a healthy State; and greatly advanced in Growth.

THIS Experiment proves, that altho' their Roots were plentifully supply'd with Moisture; yet, for want of a free Air, their Health was impaired, and consequently their Growths retarded. The Reasons whereof I will hereafter declare in Experiment III.

WE are by this shewn, that when Trees are planted close to each other, their lower Branches that are shaded by the upper ones, must perish in the like Manner.

I planted divers Forest Trees in large Flower Pots, and in *June* I suffer'd them to grow very dry for want of Water. In the Evenings, when the Dews began to fall, I weigh'd divers of them very exactly, and cover'd the Surfaces of their Pots with Coverings, to prevent the Dew or Rain from falling on the Earth. Then the next Morning, at Sun rising, I took away their Coverings, and weighed them again,

again, and found that they had encreas'd many Ounces in their Weights, which Encrease of Weights were the Quantities of Moisture imbibed by their Leaves ; and when little or any Dews fell, then was their Encrease very small ; and on the contrary, when great Dews or Rains fell, then their Encrease was much greater. In like Manner I cover'd Pots, wherein other like Trees, of the same Kinds, were planted, whose Leaves I pull'd entirely off: But their Weights were never augmented any Thing considerable ; even when Rains fell for 24 Hours together.

THESE nocturnal Augmentations are plain Proofs that Vegetables imbibe great Quantities of Moisture at their Leaves as well as Roots, that in great Measure supports them in very hot and dry Seasons ; and therefore it follows, that we should always take Care to plant them at such Distances, that they may enjoy a free open Air in all their Parts, so as to receive the full Benefits of those great Blessings, the Rains and Dews of Heaven.

EXPERIMENT III.

To prove that the crude Part of the Nourishment, imbibed by Vegetables, is perspired away at their Leaves, and the ill Consequences attending when their Perspirations are retarded.

IT having been a general received Opinion, that the whole Moisture imbibed by Vegetables was always contained in them, and converted to the Formation of Sap, Buds, Leaves, Shoots, &c. may make this Account of the Perspiration of Vegetables seem something strange, until Experience make it familiar.

THE redundant watry Fluid, in the Sap of Vegetables, is perspired away at their Buds, Blossoms, Leaves, and Fruits. But the greatest Part is at their Leaves, wherein are their main excretory Ducts, that separate and carry it off, leaving the most nutritive Parts in the Plant to coalesce.

To prove the Perspiration of Vegetables, I proceeded as follows.

First, **I** Provided a large earthen Flower-Pot, that was well glazed within, without any Holes in its Bottom, as is usual for Flower-Pots to have; which I fill'd with good Loam, and therein planted an Apple Tree. This Work I perform'd in *October*, that the Plant might have got good Roots by the *May* following, when I began my Experiment.

My Tree being thus planted, and the Spring come on, it then began to advance in its Growth, and therefore I did then provide my self with a thin Plate of mill'd Lead, made fit to the Mouth of the Pot, leaving a Hole or Gap for the Stem, and therewith cover'd all the Surface of the Earth in the Pot, and with soft Cement, secured the Edges as well at the Hole as at the Stem.

WHEN the Earth was thus cover'd, the Sun could not exhale away any of the Moisture of the Earth contain'd in the Pot.

AND as the Plant, in the Experiment, would require Moisture; and 'twas necessa-

ry that the external Air should have a free Communication with the Air, under the Plate of Lead: Therefore I provided two Glass Tubes, the one about three Quarters of an Inch Diameter, and three Inches long, and the other one Fourth of an Inch Diameter, and about a Foot in Length; which I cemented over Holes, cut in the Plate of the same Diameters: The small Tube I left open, for a free Communication of the Air, and the great one I kept stoppt with a Cork. The use of this large Tube was, to give the Plant Water at; which, when done, I carefully stoppt, to prevent any Vapour passing thro' the same.

My Plant being thus prepared, I put it into a Scale, and took an exact Account of its Weight, Morning, Noon, and Night, which I noted down; as also the Weight of Water, when I gave it any. From whence I could discover the Quantities imbib'd and perspired every Day and Night, as well as the Times of Morning, Afternoon, and Night. I also plac'd a Thermometer by my Plant, which discover'd at every Degree of Heat and Cold, the different Powers of imbibing, (when 'twas in an imbibing State,

State, as at Night) and perspiring (in hot and dry Days).

THIS Experiment discover'd to me the Demands that Plants make for Moisture in hot and dry Seasons, by the Quantity perspired away in a hot Day, whose Weight was deficient upon weighing at Night, and also, that they are nourish'd, by imbibing the Dews at their Leaves and Branches, which appear'd by their extraordinary Weight, gain'd since the Night preceding, when last weigh'd.

By observing the Quantities perspired away in hot and dry Seasons, I found, by comparing the Quantities of Water given, therewith the Necessity of Waterings at those Times, as well as the little Occasion for it, in wet and cold Seasons, when Plants perspire very little.

IT has been prov'd by the Reverend Mr. *Hales*, (to whom I am much obliged) in his vegetable Staticks, that a small annual Sun-Flower, not quite four Feet high, imbibed and perspired in twelve Hours Day, one Pound and fourteen Ounces, Averdupois Weight, when the Weather was very warm and dry; and in more moderate Weather one Pound four Ounces.

IN order to discover the Power of Perspiration, I cut off from divers Fruit Trees, several thriving Branches, that were at their transverse cut, something more than half an Inch Diameter.

THEN being provided with Cement, and Glass Tubes something larger in their Diameters, than the Branches; I cemented them to their Ends, as before in the preceding Experiments.

WHICH being done, I fill'd the several Tubes with Water, and hung them with their Branches in the open Air; I also fix'd Tubes to other Branches of the same Kinds and Sizes, which I also fill'd with Water, but their Branches I immersed in Vessels of Water.

THOSE Branches that were exposed to the free Air, imbibed the Water plentifully, whilst the others immersed in the Water did not imbibe one twelfth Part the Quantity. Then I took them out of the Water, and exposed them to the free Air, and they imbib'd the Water in the Tubes with much greater Force.

I continued these Experiments for many Days, during which Time the Weather altering from hot and dry, to cool and wet,
I could

I could daily discover their different Perspirations, and observ'd, that in very hot and dry Days they would imbibe and perspire very great Quantities, and in wet and cool Weather, very little.

IF I let any of those Branches immersed remain in the Water, for four or five Days; those small Quantities that they would imbibe the first Day, did always grow lesser and lesser every Day after; so that generally about the fifth Day, they were saturate, and would not imbibe any more. But when I took them out of the Water, and hung them with their Tubes fill'd with Water in the open Air, they would, after an Hour's Time, or thereabouts, begin to imbibe and perspire, as those that had not been immersed.

I fix'd in the same Manner other Branches, that were some of them wholly disleaved, and others but in Part, as $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$, $\frac{3}{5}$, &c. and found, that they all imbib'd the Water, with a Force proportionable to their Quantity of Leaves.

THUS those without any Leaves imbib'd but very little, those with half their Leaves, with half the Force that the others did, that

had all their Leaves, and the others proportionably.

Now, seeing that the Branches immersed in Water could imbibe nothing near the Quantities of Water, that the others did in the open Air, we may see from thence the great Benefit thereof, in perspiring it away to make Room for a Succession. This Experiment proves the Reason of the yellow Leaves in Experiment II. and why Fruits are insipid and crude, in very wet and cold Summers; for Want of a due Mixture of dry Weather, to enable the Air to carry off the very great Quantities of Moisture in a kindly Manner, whereby Plants would be kept in a healthy State. And by this Experiment 'tis demonstrable, that Fruit Trees being planted too near unto one another, when the Air cannot have a free Circulation, as in Orchards planted like Thickets; they cannot discharge the confin'd Vapour in their shady Parts by a free Perspiration; and therefore their Fruits are insipid, ill colour'd, and of little Value.

AND 'tis always seen, that our best Winter Apples and Pears that are produc'd in a very wet Summer, are of a flashy Constitution, and rot soon after being gather'd
(nay,

(nay, oftentimes upon the Trees) for the crude watry Vapour remaining in them, that should by Heat have been perspired away, Nature cannot give them their true Taste and Colour, after its own Manner and are therefore immature, and 'tis that Immaturity that causes their insipid watry Tasts, and immediate Decay.

THE only Help in this Case, is, to plant the Trees at sufficient Distances from each other, and keep them pruned thin of Wood, that what Heat does happen in very wet and cold Summers, may have free Access to the Fruits, whereby that crude Vapour may, in Part, or wholly, be perspired away; which cannot be performed, when trees are close planted, and full of Wood, for Want of Care and skilful Pruning.

AND besides this Advantage, there is another very great one, that arises from it, which is having the Fruit produced in much greater Perfection; for when Fruit Trees are planted at proper Distances, that they have a free Perspiration, and Nature charg'd with no greater a Burden, than she can easily support; 'tis from them that we receive our finest and best tasted Fruits: But this will be fully demonstrated in my *Pomona*,

na, in that Part which exhibits the Manner and Distance of planting Fruit Trees in general.

It is upon these Principles preceding, that Forest Trees in their natural Growth form a parabolical Figure ; for as the Plant advances in Height, from its Kernel, Layer, &c. to its utmost Altitude, Nature pushes out divers lateral Branches by the Dilatation of the Sap ; which being placed in Order above each other, do thereby receive it in such Quantity, as the Situations and Magnitudes of the several Branches are to each other. Thus the first Branches being inserted in the largest Parts of the Stem or Body, and nearest the Roots, do receive the Sap in greater Quantities than those that are immediately above them ; and so on throughout the whole, to the very Top, or leading Shoot of the Tree. And since that the lowermost Branches do thus receive the greatest Part of the Sap, 'tis therefore that they exceed the Growths of those next above them ; which being furnish'd less and less, as they are farther and farther from the Roots, so doth their several Growths diminish upwards, from whence
is

is caused, those beautiful parabolical Figures that Forest Trees appear in.

As the Plants advance in their Growths, the Leaves of their upper Branches become too powerful for those that are next below them; so that their lateral Branches perish, for Want of the warm Sun, and free drying Air, to perspire off their crude Sap, with which they are saturate. So that afterwards all the ascending Sap is drawn to the extreme Parts of the Branches, that are exposed to the free drying Air, where they perspire it freely, and expand very much.

WHEN Trees are planted very near together, their lower lateral Branches are overshadowed by their upper ones, as noted before in the last Paragraph. This over and above Shade, hinders the Perspiration of the lower Branches, whereby they are saturate with Sap, and therefore cannot receive fresh Nourishment, whilst those at the Top enjoy the free Air, and perspire plentifully.

THIS plentiful Perspiration draws the Sap to the Top with great Force, whereby Trees advance greatly in their Heights, and not by an Emulation, as Mr. *Bradley* says they have, to overtop the rest. *Vide* his
new

new Improvements on Planting and Gardening, Part 3, Page 224, on the raising of seedling Orange Trees.

Now, seeing that the Height of Trees is much accelerated, by their being nearly planted to each other, we are hereby taught how to raise Walks, Avenues, Blinds, &c. in much shorter Spaces of Time, than when planted at such Distances, as to have a free circulating Air about them; but I don't recommend the Practice hereof, where Posterity is to be provided for, because that Plantations of this Kind are of a very short Duration.

To better understand, that the close Planting of Trees is the real Cause of their aspiring Heights, and Decay of their lower Branches, I will farther explain it.

It is always seen, that when Woods or Groves of tall Trees, that stood very near together, are cut down, there be left here and there a single Tree; that those single Trees do immediately throw out vigorous Shoots in their lower Parts, which before perish'd for want of a free Air, and their Top Branches, which before thriv'd only, then are deprived of the Sap, by the new produced Branches at the Bottom,

tom, whereby they are in a languishing State, and at length die. This is an undeniable Proof, that wants no corroborating Evidence.

THE Want of a free Air, circulating about Trees that are thick planted, shews the Necessity of pruning their Branches and Limbs, to give the Air a free Access: Which Pruning must be discretionally performed, or otherwise we may by Chance kill the Top of your Trees, by letting in the Air so freely at their lower Parts, as before observed: For when the lateral Branches of Trees are vigorous, and make very strong Shoots, they do attract Nourishment with such great Force, that their aspiring Growths are check'd; and it is therefore, that the Side Buds of young Trees that break out in the Spring, should be rubb'd off, at their first Appearance; for when they are suffer'd to grow all the Summer, as is customary, they greatly check the Growth of the Plants.

THEREFORE when Layers, or Seedlings of any Sort of Tree are planted out in Nurseries, that are design'd to make standard Trees, those lateral Buds should be
dis-

displaced, when they first appear in the Spring. And particularly Forest Trees, that are design'd for Timber; for when their lateral Buds are so displaced, their Bodies are clear from Knots, and become streight and clear Timber.

C H A P. I.

81

Of the O A K.

*Its Manner of raising for Timber in
Parks, Woods, Forests, Coppices, &c.*

H A T noble Tree the Oak is found to extend its Herculean Arms much farther, when its Soil is a deep strong Loam, than in shallow light Lands. There are two Kinds of Oaks that are worth our Notice.

T H E one is called *Quercus Sylvestris*, whose Grain is hard and black, producing a very small Acorn ; extending its lower Branches very far from the Trunk, as also its Roots, and those very near to the Surface of the Ground.

THE other Kind is called *Quercus urbana*, which grows much straighter and higher than the former, making very straight clear Timber, extending its Roots very deep in the Ground. The nearest Distance in this last Kind, must not be less than thirty five Feet, when planted in Walks and Avenues, and the former, fifty Feet. But when they are planted out for Timber in Parks, &c. the first should be at sixty or seventy, and the last about fifty or sixty Feet Distance.

THE Statute made in the 35 *Hen.* 8. for the Preservation of Oak Trees, enacts, That on every Acre of Coppice Wood, that shall be felled at twenty four Years Growth, or under, there shall be twelve Standils of Oak left unfelled, &c.

Now, imagine that such a Number of Oaks were equally disposed throughout the whole Acre; then each Tree would have a square Space of thirteen square Rods, and one third to it self. To avoid Fractions, the square Root of thirteen, one third, is almost three and three Fourths, which is the Distance of each Tree, when equally disposed on an Acre.

THREE Rod, and three Fourths, being nearly equal to sixty two Feet, comes much to the same Distance, that I have before directed.

THE Distance of thirty three Feet, assigned for Oak Trees, intended for Timber by Mr. *Bradley*, in his new Improvements, Part I. Page 42. is in my humble Opinion, much too near, more especially where Underwoods are to be sown or planted between them. The ill Effects of close planting, being already proved by many Instances, doth sufficiently support the Truth hereof: Nor is the Timber near so good, when Trees are very close, as not to have a free Air, to perspire away the Crudities of their Sap. Of this *Pliny* takes Notice, that the Timber of those Trees, which grow in moist and shady Places, is not so good, as that which comes from a more exposed Situation: Nor is it so close, substantial and durable. 39 *Cap. Lib. 16.*

BUT however, it may be, that Mr. *Bradley* might consider the Distance of the Oak, when planted, or raised in very rough stony Grounds, and strong Clays, wherein they are very long, before they arrive to

any considerable Magnitude ; but at length the best of Timber.

OAKS that are produced in light sandy Lands, have a very smooth Grain, and those in a moist Soil, grow and brittle.

THE Growth of Oaks being much slower than most other Forest Trees, are therefore to be planted in Lines by themselves, that they may rise up together, and not be dripp'd by other Trees of a quicker Growth.

THE best Oaks are raised from the Acorn, and especially those that grow in stony Lands, provided, that the Acorns were perfectly mature, and gather'd from Trees of a good Kind, which should be carefully observed, or otherwise after many Years are past, we may fail of our desired Success.

FOR the Manner of raising Oaks in a Nursery, I refer you to the third Part of my new Principles of Gardening, Page 120. And for the several Uses of its Timber, to the many Structures, both civil, naval and military, that are built therewith.

Observe its Praise, as given by Rapin.

*Si quando armanda naves & bella paranda,
Det quercus nautis tabulata, det arma furori
Bellantum; det ligna foco, det aratra colono,
Aut aliis porro sumatur in usus.*

*When Ships for bloody Combat we prepare,
Oak affords Plank, and arms our Men of War,
Maintains our Fires, makes Ploughs to till the
Ground;
For Use no Timber like the Oak is found.*

THE best Time to furnish ourselves with the Seed of this noble Vegetable, is at the End of *October*, or Beginning of *November*, when they naturally fall from their Cups; wherein observe, that the best Acorns are those that grow upon the extreme Parts of the Tree, where they have always enjoyed a free Air, and natural Perspiration, which renders them mature, ponderous, and sound.

THE Season for sowing them, we are told by Nature herself, if we do but observe her Methods of Working. For as she has no other Preservatory than the Earth it self, she therefore commits them to it, as soon as

ripe ; so that the Season to sow or plant the Acorn, is, as soon as perfectly ripe.

Observe, Lucret. l. 5.

*Nam specimen sationis, & insitionis origo
Ipsa fuit rerum primum natura creatrix :
Arboribus quoniam baccæ, glandesque caducæ
Tempestiva dabant pullorum examina subter, &c.*

*Nature herself who all created first
Invented sowing, and the wild Plants nurs'd :
When Mast and Berries from the Trees did drop,
Succeeded under by a numerous Crop.*

IF we would propagate the Oak in Lands that are very wet and cold ; such as low Clays, &c. 'tis best to preserve the Acorns in very dry Sand, until the Spring ; otherwise they will shoot out their Radicles before the Season of planting, and be in danger of being spoiled.

THERE can be no certain Time, in the Spring, assigned for this Work, because that Seasons differ very much ; some Years the Spring is later by a Month, than 'tis of other Years ; therefore when it appears, that the Frosts and extream Cold of the Winter are over, and the Spring advances,
which

which is always in *February* or *March*; then is the Time to sow or plant your Acorns, and other such like Seeds so preserved.

AFTER sowing, 'tis the Nature of all Kinds of Seeds, to push their Radicles perpendicularly into the Earth, to search after, and imbibe Nourishment for the Support of their tender Plumes, or first leading Shoots. And 'tis therefore that we are obliged to draw the young Seedlings of many Sorts of Plants after one or two Years growth, to prune their Radicles or perpendicular Roots, (called, by Gardeners and Nursery-men, *Tap-Roots*;) which cause their lateral Roots to extend themselves horizontally. Thus Hollies, Yews, Pear-Trees, &c. are caused to have great Quantities of horizontal Roots, by pruning away their leading Tap-Roots, which causes them to grow very shallow, and consequently imbibe the richest Juices of the Earth that always lie near to the Surface.

AND it is from this, that the often transplanting of Trees in Nurseries causes them to be much better rooted, and more likely to grow, than those that have been very seldom or ever removed, since

their first transplanting from the Seed Bed. And since that the Success of Plantations does in great Measure depend upon the Goodness of Roots, we should therefore be careful, how we buy Trees from Nurseries, where they have grown without being transplanted every third or fourth Year at longest.

BUT for Oaks, and other Timber Trees, I advise that you plant the Acorns, &c. in the Places where they are designed to remain; for they not only produce the straightest Timber, but much sooner than those that are checked by often transplanting. Nor is there that trouble in their ordering, for when they are raised from Acorns, &c. they need no watering, staking, &c. which transplanted Trees of large Statures do.

IT is the Opinion of many, who have observed young Seedlings, which Nature had sow'd in the Woods, to grow scraggy, and eaten up (as it were) by Moss: That to let Seedling Oaks remain in the Places where they are sown, is not so advantageous as to raise them in, and transplant them from Nurseries: But as the Acorns, which we propose to plant, are always to enjoy a free
and

and open Air, free from the Drip and Over-shade of their Mother Trees, they will therefore thrive as desired, and become stately Trees ; which those cannot do that have not a free Perspiration, which renders them immature, as has been before proved by many other Instances.

Of this *Virgil* takes Notice, *Georg.* 2.

Crescentique adimunt foetus uruntque ferentem.

Thus English'd.

*Which checks their Growth, and makes their Bodies
pine.*

THESE Reasons are sufficient to inform us, that 'tis much better to plant the Acorn in its intended Situation, than to sow it in a Seed-Bed, and afterwards transplant it as other Trees. But hear what the learned *Rapin* , who well understood the vegetable World, says thereof,

— *Quam-*

— *Quamvis ipsa de stirpe parentis
 Pullulet, & tenues tollat se quercus in auras,
 Aut mutata solo, ramis exultet opacis;
 Forma tamen nemoris non sit mihi gratior ulla,
 Quam quod per campos, posito de semine, crevit;
 Et quanquam sit agro prælongum tempus inertì
 Ducendum, ac tardæ surgant de semine quercus;
 His tamen, his longe veniunt felicius umbræ.
 Nam certum est de glande satas radicibus imis
 Altius in terram per se descendere plantas,
 Majoresque adeo in cælum profundere ramos.
 Seu quod dediscant mutatam semina matrem,
 Degeneremque ferant alieno ex ubere prolem:
 Sive quod ipsa bicognatæ inolescere terræ
 Glans primo melius paulatim assuevit ab ortu.*

Rapinus Hort. l. 2.

— *Tho' Suckers which the Stock repair,
 Will with thick Branches crowd the empty Air,
 Or the Ground Oak transplanted Boughs may shoot;
 Yet no such Groves do's with my Fancy suit,
 As what from Acorns, set on even Rows
 In open Fields, at their due Distance grows.
 What tho' your Ground long Time must fallow lie,
 And seedling Oaks yield but a slow Supply?
 No Walks else can be for like Beauty prais'd,
 For certain 'tis, that plants from Acorns rais'd,
 As to the Centre deeper Fibres spread,
 So to the Zenith more advance their Head;*

Be

*Be it that Plants for natural Moisture pine,
And as expos'd, at Change of Soil decline;
Or that the Acorn, with its native Mold,
Does thrive, and spread, and firm Alliance hold.*

WHEN the Season for sowing of the Acorns is near at hand, the Land must be well prepared for them; for thereon depends the whole Success. For when Lands are not prepared, to receive the Seed, 'tis impossible that the young Plants can thrive: Therefore we are to proceed therein as follows.

HAVING made Choice of the Land, (which is supposed to be clear of Bushes, Furze, Broom, &c.) set out their several Distances, and at every of them, dig Holes about two or three Feet deep, and about four Feet Diameter, laying the Earth, that comes out, in small Hills or Ridges, of such a Thickness, that the Winters Frosts may thoroughly freeze and meliorate the same. Which Work therefore should be performed early in the Winter, or rather in the End of the Autumn.

THIS early exposing of the Earth to the open Air, causes it to be by the Spring (when 'tis the Season for planting your Acorns)

corns) finely sweeten'd, and fit for their Reception.

IN the Spring, when the Frosts are over, fill up all the Holes, laying the Turf (if 'tis a green Sward) at the Bottom, and the Remainder at Top; forming the Surface thereof something concave, the better to retain the Spring and Summer Rains, and in the Centre of each, plant five or six Acorns, at about eight Inches apart, and four or five Inches deep; and the next Year following, draw from each, all that are unnecessary for Use, leaving the most healthy one of every Hole to continue.

THAT our young Plantation may make all the Progress that is possible, we must be careful to keep them houghed clean in the Summer from Weeds, and to dig the Earth about them at the End of every Autumn; not only to meliorate the Surface of the Earth, but for the kindly receiving the Winters Rains, wherein is contained much Salt and Sulphur, that contributes to the speedy Growth of Vegetables.

Observe

Observe the Advice of *Rapin* hereon.

*Proinde nemus sparsa cures de glande parandum :
Sed tamen ante tuo mandes quam semina campo,
Ipse tibi duro robustus vomere fossor
Omne solum subigat late, explanetque subactum :
Cumque novus fissò primum de germine ramus
Findit humum rursus ferro versanda bicorni,
Consita vere novo tellus, cultuque frequenti
Exercenda, herbæ circum ne forte nocentes
Proveniant, germenque ipsum radicibus urant.
Nec cultu campum cunctantem urgere frequenti,
Et saturare fimo pudeat, si forte resistat :
Culture nam tristis humus superanda colendo est.*

Lib. 2.

*Then see your hopeful Groves with Acorns sown,
But e'er your Seed into the Field be thrown,
With crooked Plow first let the lusty Swain
Break up, and stubborn Clods with Harrow plain.
Then when the Stem appears, to make it bear,
And lighten the hard Earth with Hough, prepare,
Hough in the Spring; nor frequent Culture fail,
Lest noxious Weeds o'er the young Wood prevail :
To barren Ground with Toil large Manure add,
Good Husbandry will force a Ground that's bad.*

WHERE we intend a perfect Wood of Oaks, they may be planted, at about forty Feet

Feet Square of one another, but not nearer; for when they are cloſer planted, they have not a ſufficient Quantity of Air for Perſpiration.

'Tis a Cuſtom to ſow aſhen Keys amongſt Plantations of Oak, but I cannot recommend that Work to be done, when we plant our Acorns; for tho' their Keys will not come up, until the ſecond Year after ſowing, yet their Growths are ſo quick to that of the Oaks, that, by over-growing and dripping them, they are greatly injur'd thereby. And the Profit which ariſes from an Acre of Aſhen Poles, in five or ſix Years, is ſo inconſiderable, that none, for ſo ſmall a Gain, would injure the Growth of our moſt valuable Plantation. Therefore I adviſe, that Plantations of Oak be kept free, until they have ſeen ſix or ſeven Years paſſ'd; after which aſhen Keys, or the Seeds of any other Underwoods, may be ſown amongſt them, without the leaſt Prejudice. And as I have now explained the Manner and Diſtances, at which theſe noble Trees ſhould be planted, in both Park and Coppice, I ſhall therefore conclude with the following Admonitions, *viz.* That they are carefully preſerved, whilſt young, from Cattle; for
when

when ever they lose their leading Shoots by being cropt, our Hopes, are over; for as soon as they lose the leading Shoots, they instantly become Pollards, which never make good Timber.

YOU must also with Care and Diligence displace all the lateral Buds in the Spring; for the fewer are suffer'd to grow, the more the Trees will advance in Height, and produce the cleanest Timber, as before noted.

YOUR Plantations being thus order'd, you'll find that your Trees will be always in perfect Health, free from all the common Obstructions, that are daily seen (for Want of good Care in their Management,) that so much retards their Goodness and Growth.

THE Season for felling this stately Tree, when 'tis arriv'd to be goodly Timber, is in *April*; and by 1 *Jacobi*. Oaks for Tan-ners Bark may be fell'd from *April* to the End of *June*.

'TIS a great Pity, that this stately Tree should be fell'd, before 'tis fully arriv'd to its utmost Maturity, as is too commonly done by many.

To prevent which, the aforementioned Statute 35 *Hen.* 8. enacts, that the twelve Standils of Oak to be left upon an Acre, shall

shall not be cut down, until they are ten Inches square, within three Feet of the Ground, on Forfeiture of three Shillings and four Pence for every Standil so cut, to be divided between the King and the Prosecutor ; but 'tis a pity that they should be cut down, until they are two Feet Diameter, at twelve Feet from the Ground.

ONE Acre of Oaks planted at forty Feet Distance from each other, will contain twenty seven Trees, which in twenty Years Time, will be worth as many Pounds Sterling at least, besides the Value of the Underwood that may be raised, in the last twelve Years of the twenty.

IN *England*, there are many thousand Acres of good Land which lie waste, and great Quantities let for five or six Shillings an Acre *per Annum* ; which were they thus planted, what vast Improvements would an Age or two produce ?

THUS by laying out at the first Preparation of the Holes, about as many Shillings, with a little Care afterwards, in keeping them free from Weeds, &c. we may receive above twenty *per Cent.* more than at present. There are many Gentlemen in *England*, that possess upwards of a thousand

Acres of Land to each Share, that does not bring them in yearly more than five Shillings *per* Acre, and some not half so much, so that one thousand of such Acres are worth but two hundred Pound *per Annum*, and twenty Years Rents produce but four thousand Pounds, the compound Interest excepted. But the Truth hereof is manifested by the following Account.

See the Calculation.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
The Rent of one thousand } Acres of Land at 5 <i>s.</i> <i>per</i> } Acre for the first Year	200	0	0
For the second Year	200	0	0
The Interest of the first } Year's Rent at 5 <i>l.</i> <i>per</i> } <i>Cent.</i>	10	0	0
Sum	410	0	0
The third Year's Rent	200	0	0
The Interest of 410 <i>l.</i> at 5 <i>l.</i> } <i>per Cent.</i>	20	10	0
Sum	630	10	0
The fourth Year's Rent	200	0	0
The Interest of 630 <i>l.</i> one } Year at Ditto	31	10	0
Sum	862	0	0

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	862	0	0
The fifth Year's Rent	200	0	0
The Interest of 862 <i>l.</i> one } Year }	43	2	0
Sum	1105	2	0
The sixth Year's Rent	200	0	0
The Interest of 1105 <i>l.</i> 2 <i>s.</i> } one Year }	55	5	0
Sum	1360	7	0
The seventh Year's Rent	200	0	0
The Interest of 1360 <i>l.</i> 7 <i>s.</i> } one Year }	68	0	3½
Sum	1628	7	3½
The eighth Year's Rent	200	0	0
The Interest of 1628 <i>l.</i> 7 <i>s.</i>	81	8	4
Sum	1909	15	7½
The ninth Year's Rent	200	0	0
The Interest of 1909 <i>l.</i> 15 <i>s.</i> } one Year }	95	9	9
Sum	2205	5	4½
The tenth Year's Rent	200	0	0
The Interest of 2205 <i>l.</i> 5 <i>s.</i> } one Year }	110	5	3
Sum	2515	10	7½
The Eleventh Year's Rent	200	0	0
The Interest of 2515 <i>l.</i> 10 <i>s.</i> } 7 <i>d.</i> one Year }	125	15	5½
Sum	2841	6	2½
The			

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	2841	6	2 $\frac{1}{2}$
The twelfth Year's Rent	200	0	0
The Interest of 2841 <i>l.</i> 6 <i>s.</i> } one Year	142	1	2 $\frac{1}{4}$
Sum	3183	7	5 $\frac{1}{4}$
The thirteenth Year's Rent	200	0	0
The Interest of 3183 <i>l.</i> 7 <i>s.</i> } one Year	159	3	2 $\frac{3}{4}$
Sum	3542	10	8 $\frac{1}{2}$
The fourteenth Year's Rent	200	0	0
The Interest of 3542 <i>l.</i> 10 <i>s.</i> } one Year	177	2	6
Sum	3919	13	2 $\frac{1}{2}$
The fifteenth Year's Rent	200	0	0
The Interest of 3919 <i>l.</i> 13 <i>s.</i> } one Year	195	19	7 $\frac{1}{2}$
Sum	4315	12	10
The sixteenth Year's Rent	200	0	0
The Interest of 4315 <i>l.</i> 12 <i>s.</i> } one Year	215	15	7
Sum	4731	7	2
The seventeenth Year's Rent	200	0	0
The Interest of 4731 <i>l.</i> 7 <i>s.</i> } one Year	236	11	4
Sum	5167	18	9

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	5167	18	9
The eighteenth Year's Rent	200	0	0
The Interest of 5167 <i>l.</i> 18 <i>s.</i> } one Year	258	7	10
Sum	5626	6	7
The nineteenth Year's Rent	200	0	0
The Interest of 5626 <i>l.</i> 6 <i>s.</i> } one Year	281	6	0
Sum	6107	12	7
The twentieth Year's Rent	200	0	0
The Interest of 6107 <i>l.</i> 12 <i>s.</i> } one Year	305	7	0
Sum	6612	19	7

HENCE it appears that 200 *l. per Annum*, with its compound Interest, will, in twelve Years Time, amount to six thousand, six hundred and twelve Pounds, nineteen Shillings and seven Pence. Now let us calculate the Advantages that will amount from one thousand Acres of Oaks, planted at 40 Feet Distance, as aforesaid.

IT was before shewn, that one Acre contain'd 27 Oaks.

THEREFORE multiply 27 the Oaks on one Acre by 1000 the Number of Acres proposed. —

THE Product is 27000 Trees, which, in 20 Years Growth, will be worth, at

at least, 10 *s. per* Tree; so that the whole Plantation will be worth, to the Estate, 13500 Pounds exclusive of the Underwood or Pasture, which will in that Time be produced.

WE may by this Computation, and the following Account, discover how easily we may improve our Lands, at a very small Expence, to the great Advantage of the Nation in general.

THE Expences of making such Plantations have not, as yet, been stated by any. Our modern Authors direct, that Ditches, to enclose such Plantations, should be six Feet wide; whereas, the customary Width is but four Feet, from the first Chest or Row of Quick-set or Heithorns, with one Foot only beyond the Edge of the Ditch, for the Workman to lay his Bill and Gloves on. This Breadth is what most People use between Neighbour and Neighbour, and what has the desired End of a Ditch; nor do we plant our Quick-sets treble, as they direct; for when they are so very thick planted, they not only starve one another, but the middle Row being enclosed on each Side with the outer ones, has not a free Perspiration, and therefore never makes so

good a Fence, nor so soon, as when we plant two Rows only. Besides, the Rates of Quick-sets, that they make Mention of, at two Shillings *per* Hundred, is a much greater Price than I ever knew to be paid for them, out of a Nursery, where they are usually sold for Sixpence *per* Hundred, and very often much less. And again, as to Labouring Mens Wages, at one Shilling *per Diem*, performing about nine Feet in length, in cutting Stakes and Bushes, and making about five Rod of dry Hedge; there's no Certainty in it; for some will do more in one Day, than others will do in a Week: And 'tis therefore in my humble Opinion, that if one of the most indifferent deserves one Shilling *per* Day, that Man, that can and does perform, four or five Times the Labour of the other, ought to have his Wages as often doubled.

The Computations that modern Authors have made, of digging and ploughing Lands for sowing Acorns, are contrary to what I ever found in Practice. Those Lands that they make Mention of, that are full of Bushes, Whinns, &c. if grubbed and digged only, may here, within ten Miles of London, where Mens Wages are the greatest,

est, be performed for four Pence *per* Rod; and in Countries, more remote, where Wages are cheaper, at two or three Pence, instead of Sixpence *per* Rod; as by them computed.

AND where Lands are capable of being made fit for the Reception of Acorns, &c. by Ploughing, it may be perform'd at a much cheaper rate than twelve Shillings *per* Acre, for every Time of Plowing, as rated in their Computations.

BUT as I have had the Experience of both these Cases, in all sorts of Lands, I always found such Lands that were very full of Roots, to be unfit for the Reception of Seeds, when they were only digg'd; and therefore, when such Lands will allow of being trenched two Spit and the Crumb in Depth, 'tis always to be preferr'd before digging; which Trenching may be perform'd for Sixpence or Eight-pence the Rod, according to the more or less Roots therein, and Nature of the Land in working; for a stiff and strong Land deserves a Price one third more than a light Loam or Sand.

THIS Work should always be performed early in *October* or *November*, when the bottom Spit should be laid in Ridges, (in-

stead of being levell'd, and laid smooth, as is usual) for the Winter's Frosts and Rains to mellow and make fit for the Reception of Seeds; and in the Spring to be levell'd down at the Time of sowing.

BUT when Lands are fresh and clean, and can be plow'd, there may be much Money saved thereby. The Rate of ploughing an Acre, according to Mr. *Bradley's*, and other Authors Computations, is twelve Shillings; yet whether they mean once, twice, or three Times ploughing the Acre, they make no mention; but the Truth thereof is as following, *viz.* The customary Price of ploughing Lands, about *Twickenham, Isleworth, Brentford, &c.* is eight Shillings *per Diem*, for a Team of four Horses, whose stated Day's Work, if in green-sward Ground, (that has lain Pasture for many Years) one Acre; but in arable, or garden Ground, that is annually till'd, one Acre and half.

THOSE Lands that are intended for Plantations of Wood, should be ploughed three Times before the Seeds are sown, *viz.* about Midsummer, at Michaelmas and in Spring, just before planting; at which several Times, the Furrows of the second
and

and third ploughing should intersect the preceding; that is, if the first ploughing was perform'd the Length-ways of the Ground, the second should be the Breadth-ways, and the last the same as the former.

THESE contrary ways of ploughing, at those several Seasons, do thoroughly work the Land, and prepare it fit for Use, provided that 'tis ploughed about ten Inches, or a Foot deep, every Ploughing. When Lands are thus ploughed in small Furrows, one Acre is a good Day's Work, so that from this 'tis evident, that one Acre, well prepared, as aforesaid, will amount to one Pound and four Shillings, at the Rates aforesaid; but farther from *London*, where Labour is cheap, it may be performed, perhaps, for twelve Shillings *per* Acre, thrice ploughed, according to the Computations of some Authors, that have lately wrote thereon, by hearsay only.

THE Miscalculations made by these and such Authors, does many Times make Gentlemen believe, when the Expences amount to more than they are told they will; that their Servants Negligence is the Cause thereof; taking for granted, that what an Author writes, is what he has
proved

proved by Experience, which very rarely happens, if he was not bred a Gardener, and continually practising therein.

BUT however, the real Charges of these Works are very inconsiderable, to the great Advantages that are daily arising from them; and therefore, I am in hopes, that Gentlemen will, with the utmost Expedition, make large Plantations of all such kinds of Timber which are most agreeable to the Nature of their several Lands, and advantageous to their Countries.

AND as I am now enter'd into the young Seminary, or Plantation, I will, before I proceed any farther, explain the manner of raising Heithorns, Crab-stocks, Furzes, &c. for the enclosing of our young Plantations, and the real Expences thereof, as paid for at *Twickenham, Isleworth, Brentford, &c.* where Day Labourers are paid one Shilling and Six-pence *per Diem*, for such Works, and then afterwards lay down an accurate Account, of the Expences in the first twenty Years Growth, and the real Advantages that arise therefrom in that Time.

C H A P. II.

Of the Manner of raising Heithorns, Crab-stocks, and Furzes, for enclosing of Woods, Coppices, Pastures, Corn-lands, Gardens, &c. and the great Advantages that arise from Plantations of OAKS.

THE best Plants, for Fences against Cattle, &c. are the Heithorn, commonly called Quickset, or Haw-thorn, the Crab-stock, and the Furze-bush.

QUICKSETS or *Heithorns* are raised from their *Heis* or *Haws*, gather'd at the Fall of the Leaf, in *October* or *November*, and then sown in Beds of light Loam ; or they may be preserved in Sand from the Time of their gathering, until the *February* after, and then sown as aforesaid ; but they will not come up until the next Spring.

N. B. THAT when Heithorn Berries are gather'd, and laid in a Heap together, without Sand, &c. until the second Spring after gathering ; they very often heat and spoil one another ; and therefore, tho' some may grow, being so kept, as mention'd by Mr. *Edward Lawrence*, in his Duty of a Steward

28 *Of the Heithorn, &c.*

ard to his Lord, *pag.* 47. yet, 'tis by no means to be practised, since we are sure that Sand will preserve them, and the trouble therein very inconsiderable.

CRAB-STOCKS are raised from their Kernels, sown in Seed-beds, as the Heithorns, and come up the first Year.

FURZES are raised from Seed, and are best when sown, where they are to remain; for when they are transplanted, they do not thrive so well.

THESE two last are sown in the Spring, about the middle of *February*, and make an extraordinary Fence very soon.

THE Heithorn and Crab Seedlings should remain in the Seed-beds, before they are planted out for Fences three Years, for in that Time they will be greatly advanced in their Growth; but if they are transplanted from the Seed-bed, the second Year into a small Nursery, in Rows, about six or eight Inches apart, keeping them clean from Weeds; by the next Season of planting, they will be finely rooted, largely grown, and more certain of Success: For 'tis a great Mistake to plant Sets that are very small.

THE

THE Furze delight in light Lands, the Heithorn in loamy Lands, either light, midling, or strong, and the Crab, in strong Lands and Clay.

THE Distances that they should be planted at in the Rows, must not be less than ten Inches or one Foot, nor the Number of Rows more than two, for the Reasons before observed on their free Perspirations.

THE Rows should be about one Foot distance from each other, wherein the Plants of the upper Row should be planted against the intermediate Spaces of the lower. And the first or lowermost Row should be planted; exactly level with the Surface for 'tis from the lowermost Row, that the Breadth of Ditches are accounted.

THE usual Method of planting *Heithorns* and *Crabs* is to place the first Row upon the bare Surface, and thereon lay the Earth, that comes out of the Ditch to raise the Bank, without first digging the Surface, whereon the first Row of Plants are placed; but tho' this Practice does do well, where the Land is good, yet I cannot but recommend the digging of the Surface, one single Spit, before we place our Sets thereon. For 'tis unquestionable, that the Earth
thus

thus broken up, is more natural for their tender Fibres to strike in, than when laid upon an undisturbed hard Surface of Grass, &c. that for a long Time resists their free Access therein.

WHEN the first Row of Sets are thus placed, then we proceed to the raising of the Bank, with the Earth out of the Ditch, until 'tis raised one Foot perpendicular ; at which Time it being made nearly level, the last Row is placed as aforesaid ; after which the remaining Earth in the Ditch is laid thereon.

THE Ditch being thus dug, and the young Sets planted, we place a dead Hedge upon the upper Part of the Bank, for a Fence, until the young planted Sets spring up ; which if kept clear from Weeds, will in three or four Years, make an impenetrable Fence against Cattle in general.

IF Lands are not very light and dry, or very cold and wet, 'twill be best to plant the first and lowermost Row with Crabs, and the uppermost with Heithorn, which together make the best of Fences ; which, as they advance, should once a Year be clipt with Shears, as well at their Heads,

as

as Sides; which will cause them in the succeeding Year to thicken very much.

YOUNG Sets thus planted and order'd, will in three or four Years, make very substantial Fences against all Kinds of Cattle, Swine, &c. and endure for many Years.

BUT by the Way, I should have took Notice that at the Time of planting Enclosures, we should not forget to place at equal Distances, in the upper Row of Quicksets, at about forty Foot Distance, three or four Acrons, or instead thereof, one thriving seedling Oak, of three or four Years Growth, or at ten, fifteen or twenty Feet distance, young Layers, or other Plants of *English* Elms, that are about two or three Years Growth, which in Time will not only become an Ornament, and Grace to the Enclosures, but make good Shelter for Cattle, and Timber also, to their great Improvement. Which Plants should every Year be carefully disbudded of their lateral Buds, as they appear, and preserved from the Shears, at the Time of clipping the Thorns.

THE customary Price paid for Enclosures, thus planted with Ditches, four Feet wide
at

32 *Of the Heithorn, &c.*

at their Tops, one at their Bottoms, and three Feet deep, is one Shilling *per* Rod, and find the young Sets into the Bargain ; but when the Plants are provided ready to the Workman's Hand, the usual Price is, eight or nine Pence *per* Rod.

THE Price of the Workmanship of Hedging, Ditching, and planting two Rows of Quicksets, at three Pence *per* Rod, as mention'd by Mr. *Lawrence*, pag. 163, is less than half the Price, paid about *Twickenham, Isleworth, Brentford, &c.* But in more remote Parts, 'tis possible that poor Mens Labour may be at that very low and mean Rate ; but I must beg leave to take Notice, that the Quantity of Quicksets, recommended by him to be planted in a Rod running Measure, are abundantly too many ; for if one Rod is allowed to be 21 Feet, and 'tis planted double, with 150 Plants, their Distances will be but $3\frac{1}{2}$ Inches, which is full 6 Inches too little ; for when Heithorns, or indeed any other Vegetables, are planted too thick, they not only rob or starve each other of the necessary Juices, but for want of Air, cannot perspire freely, and thereby their Growths are hinder'd.

N. B. As to Fences for Lands which are very wet, 'tis best to raise up very high Banks by larger Ditches, and on the Surfaces plant the Heithorns or Crab-Stocks as before directed.

IT is customary in many Parts of *England*, to graft (at twenty or thirty Foot distance) some of the thriving Crabs with Cyder Apples, from whence they often receive great Plenty.

WHEN our Hedges of Heithorns and Crabs have seen five or six Years, they should be plash'd by a skilful Workman, which causes them to grow very thick. This Work should be done in *September*, *October*, or *November*: As also the first planting of Sets for Fences.

I need not give myself the Trouble of directing or shewing the Country Labourer and Hedger, by Words, or Copperplates, how that Operation of Hedges is to be performed; since I am assured, that great Numbers of them understand it much better than any Author, that has hitherto wrote thereon, can direct them.

WHEN plashed Hedges of this Nature are by Time worn thin, and their Branches become very large; then we must cut them

D

entire-

34 *Of the Heithorn, &c.*

entirely down, close to the Surface of the Bank, leaving some of the small Wood to form a Fence above; whilst the old Stumps push out fresh Shoots, which, in two or three Years, will make a very good Fence again, being order'd as when first planted.

IN the making of Ditches, care should be taken to make the Banks with such an easy Reclination, as to stand without calving, or colting down, by the Winter's Rains and Frosts; and steep enough to prevent Swine or Cattle from easily ascending the same.

WHEN we make Fences of the Furze, we should make use of the *French* Kind, which rises much higher than our *English* Kind. Furze must be sown in shallow Drills, upon the Summit of the Banks, very thinly, at one Foot distance, each Drill from the other.

Two Drills on a Bank are sufficient, and when the young Seedlings come above Ground, they should be kept clear from Weeds, and singled out to about one Foot distance in the Rows.

EVERY *Autumn*, they should be clipped, which causes them to thicken very much, and gives a pleasant Aspect.

I cannot help recommending the planting of these Sorts of Hedges, in our Wildernesses, and other Parts of the Garden; for during the Season that they are in Blossom, which is a long Time, there's no Plant makes a finer Appearance. And besides, they are an admirable Covert for Game, as well as to draw plenty of Birds, (such as Linnets, Bullfinches, &c.) which build their Nests therein.

THE black Thorn, or Slow-bush, does also make a good Fence, when mix'd with Crabs, or Heithorns; but the Stones thereof lie two Years in the Ground before they spring up. The Manner of planting Fences herewith is the same, as in the Heithorn and Crab-stocks.

YOUNG *English* Elms, being planted in double Rows, at two Feet apart, and plashed by a skilful Hand; after three or four Years Growth, make an excellent Fence, being kept clipt; and there's no Plant makes a more beautiful Hedge in the Garden, when skilfully order'd. Of which hereafter, in its Place.

THUS have I given an exact Account, of the Manner of raising, planting and ordering Fences, for the Preservation of young

36 *Of the Heithorn, &c.*

Plantations, as well as Corn, Pastures, &c. after the best Manner ; the Necessity whereof has been long Time known. For *Virg.* in *Geo.* 2. thus advises,

*Texendæ sepes etiam, & pecus omne tenendum est :
Præcipue, dum frons tenera, imprudensque laborum ;
Cui, super indignas hyemes, Solemque potentem,
Sylvestres uri assiduè, capræque sequaces
Illudunt : pascuntur Oves, avidæque juvencæ.
Frigora nec tantum cana concreta pruina,
Aut gravis incumbens scopulis arentibus æstas,
Quantum illi nocuere greges, durique venenum
Dentis, & admorso signata in stirpe cicatrix.*

Georg. 2. 371.

*Plash Fences, thy Plantation, round about,
And whilst yet young, be sure keep Cattle out ;
Severest Winters, scorching Sun infest,
And Sheep, Goats, Bullocks, all young Plants
molest :*

*Yet neither Cold, nor the hoar rigid Frost,
Nor Heat, reflecting from the rocky Coast,
Like Cattle, Trees and tender Shoots confound,
When, with envenom'd Teeth, the Twigs they
wound.*

I had almost forgot the plain or green Holly, that makes an admirable good Fence (but slowly) in very dry and poor Lands, where the others will not grow ; so also
doth

doth Alder and Willow, in Lands that are very wet and cold.

N. B. THOSE Timber Trees, which I advised to be planted in the young Hedges of Heithorn, &c. must be kept yearly, or every two Years, dress'd, and pruned up close to their Bodies; whereby they will not only permit the Thorns to thrive under them, much better than when shaded and dript, but become Timber many Years sooner, free from Knots, &c. which makes them the more valuable for many Uses.

C H A P. III.

Of the real Expences, incident to the preceding Plantations of OAK, and the great Advantages that arise to Estates therefrom.

I Will suppose, that the Works were to be performed within ten Miles of *London*, where Workmens Wages are at the highest Rate of any in *England*. It has been proved, that in one Acre of Land, there may be planted 27 Oaks, which require as many Holes to be dug, of three

Feet Diameter and Depth ; the Quantity of Earth to be taken out of each is, $21 \frac{1}{4}$ cubical Feet. A cubical Yard is 27 cubical Feet, which, in Gardening, is accounted a Load, and the customary Price, *per* Load, for such Digging, is four Pence ; so that each Hole is worth two Pence half Penny, and $\frac{1}{2}$ of a half Penny.

See the Calculation.

The Diameter of one Hole 3 Feet
Multiply'd by 3

The Product is 9 the Diameter squared
Which multiply'd by 11, produces 99,

And divided by 14) 99 ($7 \frac{1}{4}$ gives the Area of one Hole
98

1. Remains.

This Area being multiplied by the Depth of the Hole, 3 gives $21 \frac{1}{4}$ the Solidity of the Earth in each Hole

The

The Area 27. $\frac{3}{4}$
 The Depth 3

The quantity of Earth } 21. $\frac{3}{4}$ cubical Feet
 in one Hole

Which multiply by } 27
 the Number of holes }
 in an Acre.

147
 42
 17. $\frac{5}{14}$

The solid Feet contain- } 584. $\frac{1}{4}$
 ed in an Acre's Holes }

Now divide 584, by 27, the solid Feet in one Load, and the Quotient is the Number of Loads in an Acre.

27) 584 (21 $\frac{17}{27}$ Loads required.
 54.

17. remains, which is something less than $\frac{2}{3}$ of a Load. Now 21 $\frac{2}{3}$ Loads at 4*d* per Load, is 7*s.* 2*d.* $\frac{1}{2}$ the whole Expence of digging the Holes in one Acre.

If 7*s.* 2*d.* $\frac{1}{2}$ is multiply'd by one thousand, the Quantity of Acres, the Product is the whole Expence of Digging.

See the Calculation.

FIRST, 7000 Shillings is 350 Pounds
The Quantity of Acres 1000
multiplied by the Shill. 7 the Product is 7000 Shillings.

Which divide by 20) 7000 (350 *l.*

SECONDLY, a thousand two Pences is eight Pounds, six Shillings, and eight Pence.

The Quantity of Acres 1000

Multiply'd by 2 Pence, the
Product is 2000 *d.*

Which divide by 12 }
the Pence in a Shil- } 12) 2000 (166
ling. } 12

$$\begin{array}{r}
 80 \\
 72 \\
 \hline
 80 \\
 72 \\
 \hline
 8
 \end{array}$$

Now divide 166 Shil- } Shill.
lings by the Shillings } 20) 166 (8
in a Pound. } 160

6

Remains, equal to $\frac{1}{2}$ s., or six Shillings.

THIRD-

THIRDLY, a thousand Half-pence, is equal to 500*d.* equal to two Pounds, one Shilling and eight Pence, and the whole Expence of Digging, is as follows.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Seven thousand Shillings	350	00	00
One thousand Two-pences	008	16	08
One thousand Half-pence	002	01	04
	<hr/>		
Sum Total	360	18	00
	<hr/>		

THE next Expence is, filling the Holes in the Spring, and planting the Acorns, which may justly be set at half the preceding Expence. Then will the second and last Expence at planting be

180*l.* 9*s.* *d.*

To which add the Expence }
preceding

360. 18. 0.

And the Total Expence of }
planting one thousand }
Acres of Oaks, is

541. 07. 0.

NOW let's compute the annual Expence of keeping them houghed clean of Weeds, and digging about them early in the Winter, to let in the Winter's Rains.

IT

It has been already proved, that the Surface of one Hole is $7\frac{1}{4}$ square Feet. Therefore multiply the Number of Holes, 27000

By the Area of one, $7. \frac{1}{4}$

189000

1928, $\frac{3}{14}$

And the Product is 190928. $\frac{3}{1+}$ Feet.

Now $272\frac{1}{4}$ square Feet being one square Pole, therefore divide $190928\frac{8}{14}$ by $272\frac{1}{4}$. But for the more easy working, we'll leave the Fractions out. Quotient.

272) 190928 (701 square Rods
1904

1904

528

272

256 remains, which is

very near one Rod; so that we may compute the whole at 702 Rods.

Now 160 square Rods, being one Acre, therefore divide 702 by 160.

160) 702 (4 } Quotient, the Acres
contain'd therein.

contain'd therein.

640

62 remains, which are Rods, and

and something more than $\frac{2}{3}$ of an Acre; but we'll set it at 5 Acres.

THE Quantity being thus obtained, the annual Expence may be easily accounted for, as follows.

First, THE houghing and stirring the Earth about them moderately deep with the Hough, in the Summer, may be very well performed for Ten Shillings *per* Acre, once doing; and the digging about them one single Spit deep, at the beginning of the Winter, at forty Shillings *per* Acre, which is three Pence *per* Rod.

l. s. d.

THE several Holes shou'd be houghed four times in the Summer, the Expence whereof is,

To which add the digging 5 Acres, at 2 *l.* *per* Acre

12 10 00

5 { 10 00 00

And the total Charge of keeping one thousand Acres, *per Annum*, will be

22 10 00

OUR usual Price to Day-Labourers, is nine Shillings *per* Week, which is twenty three Pounds, eight Shillings *per Annum*, and but eighteen Shillings more than the preced-

preceding Account: So it appears, very plainly, that one Man can very well govern and manage one thousand Acres of Oaks, so planted; and the greatest annual Expence, but twenty three Pounds at most. Now the whole Charge, (the Fencing excepted, which has been already accounted for) is as follows.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
For digging and planting } 27000 Holes of Acorns }	54 ^l	07	00
The simple Interest there- } of, for twenty Years }	54 ^l	07	00
The compound Interest ex- } traordinary }	250	00	00
For twenty Years keeping, } at 23 <i>l.</i> 8 <i>s.</i> <i>per Annum</i> }	468	00	00
The simple and compound } Interest thereof paid }	302	06	00
yearly for twenty Years }			
Sum	2103	00	00

WHICH is the Expence of planting and keeping 1000 Acres for twenty Years.

IT was before shewn, that the Rent of 1000 Acres at 5 *s.* *per Acre*, with the simple and compound Interest, is

To which add the above

And the whole Expence is,

BUT

BUT 'tis to be noted, that the Value of the under Crops are not accounted for, to prove the great Advantages exclusive thereof.

Now, every Tree, in twenty Years Time, is, at the very least, worth ten Shillings each, and consequently, the whole 27000, will be worth 13500 Pounds.

From which subtract the	}	8715 Pounds,
Expences preceding,		
and the next profit, in twenty Years, will be	}	4785 Pounds.

BUT as I said before, the Lands may be annually employed for Pasture, Corn, &c. as usually, whereby the annual Rent of two hundred Pounds, and its Interest, may in great part, or wholly, be preserved; so that the real Advantage of a Plantation of one thousand Acres of Oaks, will be, at the least, ten thousand Pounds, in the first twenty Years Growth: And if their lateral Buds have been carefully displaced, as they appear'd, they will have no farther need of houghing and digging about their Roots as before; so that for the next twenty Years after, there will be no Expence in their keeping; at the end of which Time, they will have more than doubled their Value,
and

and be worth upwards of 20000 Pounds, exclusive of their Bark and Lop.

MR. *Evelyn*, in his discourse on Forest Trees, *Page* 53. speaking of Walnut Trees, says, That in several Places, between *Hannaw* and *Frankfort*, in *Germany*, no young Farmer, whatsoever, is permitted to marry a Wife, till he brings Proof, that he hath planted, and is a Father of such a stated Number of Walnut Trees ; and the Law is inviolably observed to this Day, for the extraordinary Benefit which this Tree affords the Inhabitants : And 'tis hoped, that our wise Legislators will provide some such Law, for the planting and improving Timber Trees in general, throughout the whole Kingdom. I will not assign what Laws should be made for this purpose, but I wish they were such, that if the Heir of every Estate did not, within five Years after Possession, cause all his Meadow, and other Lands (those for Corn excepted) to be planted with Oaks, and other proper Timber Trees, at fit Distances, and his Hedge-rows also, he should forfeit every Acre then found unplanted ; which Trees he should be obliged to preserve from Cattle, until grown out of their Powers to injure, by
crop-

cropping, &c. and not to be fell'd under thirty five or forty Years Growth, unless for Repairs of the Premisses, as for Gates, Stiles, Posts, &c. on Forfeiture of twenty Pounds to the King, for every Tree cut down before that Age: But all this I submit to the Consideration of the Senate.

THUS have I given an Account of the real Advantages that will arise from Plantations of Oaks, when made within ten Miles of *London*; therefore, where poor Mens Labour is much cheaper than there, the Expence will be much lesser, and consequently the Advantages greater.

N. B. That the young planted Oaks must be preserved from the cropping of Sheep, Goats, Cows, &c. by Hurdles, or Stakes, interwoven with Bushes, as a small stak'd Hedge, well known to every Husband-man, and therefore needless to be mention'd here.

C H A P. IV.

On the Perspiration of the several Kinds of Elms, their Manner of raising and ordering for Timber in Woods, Parks, Forests, Coppices, Hedge-rows, &c. And the Advantages that arise from such Plantations.

THE several Kinds of Elms in *England* are three, *viz.* The Mountain Elm, vulgarly called the *English* Elm, the *Dutch* Elm, and the *French* Elm, call'd vulgarly the witch Elm; of which, the Mountain or *English* Elm is best for Timber, and the others to plant in Gardens for Hedges, Avenues, Walks, &c. and to thicken the Quarters of Wildernesſes for covert to Game. And indeed the Mountain, or *English* Elm, is of great Use and Ornament in the Garden also, for the ſame Uſes as the others preceding; and if I may be permitted to ſpeak my real Opinion thereof, I can't ſay, but that it makes as beautiful an Appearance, as any Tree whatever, and more eſpecially when Hedges, Groves, Walks, Avenues, &c. are planted therewith; for its Leaves

are not only very beautiful in their Forms and Magnitudes, but of a pleasant Green, and one of the very last that falls in the Autumn; but the different Nature of Soils does alter this last very much, for light and warm Lands will push out their Leaves in the Spring much sooner than stiff and cold Lands; but then they have this Evil attending them, they drop something sooner in the Autumn.

THESE several Kinds of Elms are increas'd by Layers, or Suckers, and some say by Seed also; but I never made the Experiment. Mr. *Evelyn*, in his *Sylva*, or Discourse on Forest Trees, says they will, especially the *French Elm*, which, he says, comes well from the *Samera* or Seed. So doth our curious Botanist Mr. *Bradley* say the same, in the first Part of his new Improvements, *Page 44*. "It may be propagated from the Seed or *Samera*."

I must confess, that no two Men did ever agree better in their Opinions, than these two Gentlemen do in their Writings, for if we trace them throughout, there's very little Difference to be found between them, their Language excepted.

BUT however, they say, we may raise Elms from their Seeds, which ripen and fall in *April*, or the Beginning of *May*, being sown in fine sifted Earth, in a shady Exposition, and water'd from Time to Time, as the Earth grows dry; but the common and most expeditious Ways, that we propagate them, is by Suckers or Layers.

THE Suckers are got out of Hedge-rows, Woods, &c. soon after *Michaelmas*, when the Season will permit them to be drawn, or (much better) taken up with a Spade.

THE best Kinds of Soils, out of which we should draw our Suckers, are those that are light, such as sandy Loams, or moderate Sands. When we gather Suckers of Elm, we should observe to dig them up with a Spade, without drawing, if possible; (for if by drawing their Roots, they are strained, they will not grow) to carefully preserve them in a Sack from the Wind and drying Air, to immediately plant them after taking up, being first pruned with a very sharp Knife, that cuts clean, and that all the bruised Parts of their Roots be carefully pruned away.

THAT their Roots are preserv'd in as great Quantity as possible, provided they
are

are found, and free from Bruises, &c. And that their Heads be reduc'd within two or three Buds, which generally is about three or four Inches clear off the Roots.

WHEN they are well rooted, then they may be planted in Rows about one Foot apart, and two Feet asunder. Yet if they are but indifferently rooted, then plant them in Beds, at about five or six Inches apart, where they should remain to get well rooted, at least two Years. In the Spring, when they are shooting out the several Branches from their Buds, we should make Choice of the strongest of each, and displace all the others, by pruning or rubbing them off. But this Work must not be done, until the Branches to be preserv'd are about six or seven Inches in Length, and capable of drawing Nourishment from their Roots, as well, as to perspire away the crude Part thereof, as 'tis drawn from their Roots.

BY this Means, the first Year's Growth will be equal to those of three or four, that has had all their Branches suffer'd to grow together.

FOR without Dispute, the Roots of any Vegetable can support one single Branch

much stronger, than when there are three or four to be supported with the same Nourishment.

WHEN the first Year's Growth is over, we should determine the Quantity intended for Standards, that is, Timber Trees, to transplant out in Avenues, Walks, Parks, Hedge-rows, &c. And those for Hedge-Plants in Wilderesses, Walks, &c. Those design'd to make Timber Trees must in the second Spring have their lateral Buds carefully displac'd, some few excepted near the Top, as directed for the Oaks: But those for Espalier, or Hedge-Plants, must have their forward Buds only displaced, leaving those that are in the Line of the Rows, to break out into Branches, to form an Espalier; and it will not be improper, if in the middle of *May* we nip or pinch off the extream leading Buds of their lateral Shoots, which will occasion those Branches to throw out others, that will cause the young Plants to be well thicken'd at their Bottoms.

WHEN our Trees have been thus order'd, the second Year we should transplant them into our Nursery, if our Places, intended for them to grow in for good and all, are not ready,

ready, as directed in my new Principles of Gardening, *Page 118*: But if our Lands are ready, where they are to remain, 'tis much the better and surer Way, to plant them at their next Removal, which should be in *October* or *November*, of the second Year, where they should have the same Management as before directed.

WHEN we would raise Elms by Layers, we should provide a Piece of good mellow fresh Land, which, to produce good Layers, should be well dunged the Year before we begin to use it for this Purpose. Then being provided with a sufficient Number of well rooted Plants well grown, the larger the better, we should trench out Ground in *October*, and therein plant our Trees, at eight or ten Feet distance from one another, their Heads being cut off within eight Inches of the Ground; and in the planting of them, we should be sure to place the Stools or Plants of the second Row against the intermediate Spaces of the first; for thereby, they will have a much more open Air, than when planted directly opposite to each other.

EACH Plant (which Gardeners call Stools, when thus planted for these Purposes) will

produce ten, fifteen, or twenty Layers, and sometimes thirty, when very large, which are to be laid down in *November* or *February*; and by *October* following will be well rooted, fit to transplant, either into the Nursery or Hedge-rows.

IN the Performance of this Work, Care should be taken, not to place the Layers too near one another, so as to hinder each other's free Perspirations, whereby many, for want of a free Air circulating about them, either perish entirely, or being saturate with Sap, cannot draw up more, and thereby are render'd incapable of drawing Roots. For the Manner of performing this Work, I refer you to my new Principles of Gardening, *Page 117*.

WHEN your Layers have taken Root, which they'll have done by the Beginning of the succeeding Winter, we should cut them from the Mother-Plant, and with a Spade lift them out of the Ground; and having carefully pruned their Roots, head them down to about five or six Inches, and plant them in the Nursery, as directed in the following Page of my new Principles 118, where they are to remain as directed for those raised from Suckers; in the following

lowing Springs, their lateral Buds are to be displaced, as before directed, accordingly as you intended them, either for Espalier or Hedge-Plants, or standard Trees for Timber, &c.

BUT if we are determin'd to purchase Trees from a Nursery, being not willing to wait for their raising, we are to note, that the larger they are, the better, provided that they have not stood long in their Places, and are badly rooted; but have been transplanted every third or fourth Year, which furnishes them with plenty of Roots. I have transplanted Elms forty Feet high, and sixteen Inches Diameter, that have thrived very well, being well rooted; but as Trees of such a Size are not always to be had, we must therefore content ourselves with what the Country produces. The best Size is, those that have handsome Heads, about ten or twelve Feet high, and four Inches Diameter at their Bottoms; which being planted carefully in *October*, and protected from the Injuries of Wind, Cattle, &c. by being well staked, will soon become fine Trees, to the entire Satisfaction of their Proprietors.

THE Soil most natural to this Plant is, a fresh, moist, sandy Loam, not but it will thrive very well in a Loam mix'd with Gravel, in chalky and flinty Lands that are moist, in moist rich Sands, and indeed any Soil; a cold wet Clay, and hot hungry Gravel, excepted.

THE proper Distances that the Plants should be planted at, when they are planted to make Hedges, Walks, Avenues, &c. are about two Feet and a half, or three Feet apart, placing a small one between two higher ones, to fill the Bottoms thereof. When we plant them as standard Trees, to fill up the Quarters of a Wilderness, where we require a Thicket as soon as possible, then we plant them at seven or eight Feet apart, and the like Distance in Groves, to cause an immediate Shade; so also in Espaliers, before a House, or on a Terrace Walk; but I cannot say that I approve of this very thick planting, if the Trees are not every third or fourth Year thin'd in their Heads, by skilful pruning, to let in a free Air, wherein they perspire freely and expand much; by this pruning, I don't mean cutting them so very much as to destroy their Shade entirely, but to prevent their Branch-

es from too much shading one another, whereby they become naked of Leaves, for want of a free Perspiration.

THE Standards of shady Walks should be planted at a like Distance, but those in Vista's, Avenues, &c. may be at greater Distances, as thirty, thirty five or forty Feet, accordingly as the Magnitude of the Avenue, &c. requires.

WHEN we plant them on purpose for Timber, in the Park, Coppice, Hedge-rows, &c. we may place them abundantly thicker, at twelve, sixteen, or twenty Feet apart, being kept disbudded every Spring, as before directed. 'Tis a Tree that is sociable, (as Mr. *Evelyn* terms them) delighting to grow in Confort, as well as single, and even very close, as to almost touch one another, and therefore we may plant them very thick in our Hedge-rows.

IF we would propagate this Tree in Soils that are very wet and cold, we should first, in *October*, dig up the Surface of the Earth, where we intend to plant them in the manner of single digging, each Place, where the Trees are to be placed, to be about six Feet Diameter,

THEN

THEN in *February* take up your Trees, which being pruned fit for planting ; place them on the Surface, and raise the Earth about their Roots, (with fresh Earth brought to them) a sufficient Depth, *viz.* something more than they were when growing in the Nursery, which being well closed to their Roots, and made good at that Height about six Feet round the Stem of the Tree, will undoubtedly prosper well. For the shallower we plant in wet and cold Lands, the better.

AND as this Manner of Planting is perform'd in the Spring, when 'tis often very dry, especially in *March* ; we should, to save our selves what Expences we reasonably may, and withal serviceable to our new planted Trees, lay some Litter, Dung, or Mowings of Grass, about the Roots of each Tree, to preserve the Moisture from being too hastily evaporated from them. But if the Land is very wet, then there will be no Occasion for this Defence, but they will be rather better without it : For if by Covering we should confine the over and above Moisture from having a free Evaporation ; 'tis probable that their Roots may become very soon saturated therewith, and then for want of
the

the kindly Influence of the Sun, to exhale it away, will perish. So that the defending of Moisture from the Sun, in these Cases is to be done discretionally, and not at all times in every Kind of Soil.

THIS lovely Tree, when planted as afore-said, should be protected from the Insults of Cattle, and Winds, by being securely stak'd and bush'd. Wherein we are to observe, that the common Method of defending Trees from Cattle, by three Oaken Stakes drove into the Ground about them triangular, and closed on their Sides at Top and Bottom with small Rails, is oftentimes of more Prejudice to the Plant, than the Winds and Cattle are. For when Trees are thus encompass'd, the Carpenter being ignorant of the Matter, contracts them so very close at the Top, that upon every Blast of Wind, the Tree is gauled against the upper Rails, whereby its Growth is greatly retarded, and Body rendered disagreeable to the Eye; if it does not soon after totally perish, which frequently happens.

OF all the Forest Trees growing in *England*, there's none so inoffensive and agreeable to Cattle as the Elm, under whose Shade in the Heat of Summer they much delight;

delight ; nor are its Roots of such a ravenous Nature, as to wholly deprive Arable and Pasture Lands of their Nourishment, in all those Parts where they extend ; as the Ash will do, whereby Corn and Grass do soon perish.

WHEN Avenues, or other Walks of this Tree are very old and decay'd at their Tops, 'tis best to lop off all their lateral Branches, or Arms, close to their Bodies, and their decay'd Heads also, leaving nothing but the naked sound Body. And that our Work may be the more graceful, we should strain a level Line along their Heads very tight, which will direct us how to head them level, which is much handsomer, than when some are higher than others. The best Season for this Work is *February*, when the Heat of the Spring is advancing, and the Winter's Wet and Cold over, which their Wounds will imbibe freely, to their great Prejudice. But to prevent their receiving such Injuries at their Wounds, I advise that a Salve of Bees-wax and Mutton-suet be prepared ; with which let all their several Wounds be covered, to preserve them from the Injuries thereof,

THE

THE common Method of lopping the Arms of Elm Trees, at a Foot or two Distance from their Body, is entirely wrong ; for those remaining Parts do imbibe and communicate Wet to their Bodies in much greater abundance, than when cut close, as before directed.

OF this Error Mr. *Evelyn* takes Notice, in his *Sylva*, pag. 32, (where says he) “ I have noted many Elms so disbranched, that the remaining Stubs grew immediately hollow, and were, as so many Conduits or Pipes, to hold and convey the Rain, to the very Body and Heart of the Tree.”

THE Season for felling this Tree for Timber, is in *November*, *December*, and *January*, at which Time great Care should be taken, to securely cut their Kerfes before their Fall is made, lest their But-ends are greatly injured thereby. And in Oaks, the same Care should be taken, lest the Butts are split in their Fall, which frequently happens, to the great Loss of the Proprietor. This I do not mention to an experienced *Woodman*, whose Judgment in disbranching the proper Parts of a Tree, and cutting its Kerfe close to the Ground, is not to be doubt-

doubted: But to caution those that are not so well acquainted therewith.

THE great Uses that this noble Tree is of, for the Rimbs and Floats of Water-wheels, for Engine-trees, Mud-fills, and other Uses in Mill and Water-works, as Pumps, Pipes, &c. for Wheel-wrights, Turners and Carvers uses ; besides many others in civil, naval, and military Structures, are sufficient Proofs of the great Benefit it is to the Publick ; wherefore it should undoubtedly be propagated in as great an abundance as possible.

THE great Advantages that arise from Plantations of this Tree, has of late been fully declared, to the entire Satisfaction of those that furnished the Timber for the Pipes lately laid in the Water-works of *Chelsea, York-buildings, New-river, Westminster, Shadwell, Rotherith* and *Deptford* ; in which last Work, I my self, in one Year, laid upwards of one thousand Loads bored into Pipes.

BUT excluding all these many Advantages that arise from the Timber, its beautiful Verdure, and delightful Shade, is Encouragement sufficient for us to propagate it as much as possible. But observe here
the

the sweet Description of this majestic Plant,
and Advice for its Propagation, by *Rapin*.

*Ut viror est ulmo lætus, ramique comantes,
Arduus, alta petens & levi cortice truncus,
Ulmum adhibe ordinibus, quoties fundenda per
hortum.*

*Sunt serie spatia ingenti, texendaque totis,
Æstivos contra soles umbracula campis :
Una alios inter texendis aptior ulmus
Marginibus spatiorum, exornandoque vireto.
Seque adeo series, plano super æquore, tendat
Ulmorum tractu longo ; quantum ipsa tuentum
Lumina, vel gressus valeant lustrare sequentum.*

*An Elm for graceful Verdure, bushy bough,
A lofty Top, and a firm Rind allow.
Plant Elm in Borders on the grassy List,
Branches of Elm into thick Arbours twist ;
A Gallery of Elm draw to the End
That Eyes can reach, or a breath'd Race extend.*

Dutch Elms are raised as the preceding
Mountain or *English* Elm, and are of a
much quicker Growth, and therefore planted
in Gardens for speedy Shade ; but they ne-
ver make good Timber, nor very large
Trees, that I ever saw. Their Barks are
very tough, and nothing near so agreeable
to

to the Eye, as the preceding; nor are their Leaves so beautiful, being of a darker unpleasanter green, and much larger.

BUT however, they are not despicable, for they cause an agreeable Variety, and Shade.

IT was propos'd some Time ago, by Mr. *Thomas Green*, Nursery-man, at *Brentford-end, Middlesex*, to have obtain'd a Patent from his late most Gracious Majesty King *George I.* for grafting and inoculating the *English* upon the *Dutch Elm*, which does greatly improve their Heads, for Walks, Espaliers, and other Uses in the Garden; but for Timber, this Practice is destructive. For as I before observ'd, the *Dutch Elm* does never arrive to a large Stature, altho' 'tis of a quick Growth when young.

Virgil relates, that they will join with the Oak, (who undoubtedly made Experiments thereof) as also, upon one another.

THE learned Mr. *Evelyn* reports, that the grafting Elms is an Improvement to their Heads. Which Report of his being upwards of sixty Years old, makes it appear that 'twas not a new Discovery of Mr. *Green's*; for we may assure ourselves, that

Mr. *Evelyn* would not have related it, had it been fabulous or Conjecture only. Besides, it has been practised by many eminent Gardeners, for many Years past, and particularly in several Parts of *Yorkshire*, and is still to this Day. And nearer at Home, no farther off than *Kensington*, I am inform'd, that Mr. *Furber*, an ingenious and well experienc'd Nursery-man of that Place, has many Times grafted the *English* upon the *Dutch* Elm.

Now, these Things being consider'd, 'tis very surprizing, that any Person could attempt the obtaining of a Patent for an old Practice, under Pretence of a new Discovery; since most Gardeners and Nursery-men in *England*, had practised the same many Years ago. But to the Matter in Hand, I advise every one that plants Elms, with Hopes of having them large and stately Trees, to plant the true Mountain or *English* Elm, raised from Suckers or Layers; which last is the most expeditious Way of the two.

AND indeed, if we rightly consider the Matter, we have no Sort of Occasion for grafting the *English* upon the *Dutch* Elm, to hasten and augment the Growth of their
F Heads;

Heads; since by raising Elms from Layers, we obtain fine stately proportion'd Headed Plants, in five or six Years Time; that we are certain will afterwards afford both Pleasure and Profit.

HAVING thus, for the Sake of Posterity, caution'd the planting of grafted Elms, I will, for the Encouragement of Gentlemen, demonstrate the great Advantages that arise from Plantations of this stately Tree, and the best Manner of performing and ordering them, after planting, until they become good Timber, fit for the Uses before mention'd.

THE first Thing to be done, is to make Choice of a proper Soil, as before mention'd, which we will here suppose to contain twenty Acres only; by which, we may account for a greater or lesser Quantity.

BEING provided with Land, fitted for our Purpose, we must cause the same to be well trenched with small Spits, in *October* or *November*, and therein plant at 20 Feet Distance, young Layers, or Suckers of three or four Years Growth, that have been disbudded in the Nursery, in order for making Standards, as before directed, which plant
with

with all the Roots possible, and carefully preserve their leading Shoots.

IN the Spring following, *viz.* in *March*, and *April*; when the Weeds begin to grow, cause them to be carefully houghed, and plac'd about their Stems, to prevent the Sun from drawing away such Moisture, as is necessary for their Support.

AND if Water happens to be near at Hand, it will be well worth our While to keep them well water'd throughout the first Summer; and therefore at planting, or rather, at first houghing in *March*, they should have Concaves made about their Stems, (which by Gardeners are called Cups) to contain the Water, at the Times of watering.

A Plantation thus encouraged the first Year, will become Timber, at least ten Years sooner than those that have the Spring and Summer's Rains only, excepting when those Seasons are very wet and warm, which no Man can insure or depend on: And since that there is no Gentleman, but can imploy his Servants, when such new Plantations are plentifully supplied with Moisture from the Heavens; we may at those Times decline our artificial Waterings;

but when they are long absent, and Seasons become hot and dry, we must then begin our Waterings again.

IF Ponds or Rivers are far distant from our Plantations, it will be best to sink one or more Wells, if the Springs don't exceed thirty two Feet, or thereabouts in Depth; and therein place Elm Pumps, by whose Help a Water-Cart is soon filled, that with a leathern Pipe fix'd to its Bottom, will very expeditiously water the several Plants. But where Water is inaccessible, the only Means that we can use, is to plant very early, at the End of the Autumn, that they may strike Root before the Spring, and have the Benefit of the Winter's Rains, that are very great Supports to them, if the succeeding Spring and Summer happens to be dry.

EVERY Tree being planted at twenty Feet Distance, each Tree will have 400 square Feet to extend its Roots in, and an Acre will contain one Hundred and eight Trees; for in an Acre of Land there is contain'd, one Hundred and eight Times four Hundred Feet, and 360 remaining. Observe the Calculation.

An Acre contains 160 Poles
And each Pole 272 $\frac{1}{4}$

320

1120

320

40

The Feet in an Acre, div. by 400) 43560 (108. The Number of Trees in one Acre.

400

3560

3200

360 remains.

IF we multiply 108 by 20, the Number of Acres, the Product will be 2160. The total Number of Trees to be planted in twenty Acres.

108

20

Product 2160 as required.

THE Expences of trenching may be computed as following.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
FOR trenching of twenty Acres of Land two Spit and a Crumb at 6 <i>d.</i> <i>per.</i> Rod	80	00	00
FOR taking up, pruning, and planting the Trees, at 3 <i>s.</i> <i>per</i> Hundred.	3	3	6
FOR one Man, five Months to watering, (the Horse, Cart, &c. supposed to be already provided for other Uses) at 9 <i>s.</i> <i>per</i> Week.	9	0	0
FOR houghing four Times the 2160 Trees, <i>viz.</i> about 18 Inches about each, (the whole Quantity being less than 60 Rods,) at 10 <i>s.</i> <i>per</i> Acre, every Houghing. Therefore,	0	15	0
THE Whole Expence of planting and first Year's keeping, is,	92	18	6

N. B. The Value of the Land wherein our Nursery is made that raised 2160 Trees being very inconsiderable, is not worth our while to account it any more than the now and then a Day, for one Man, to dig and hough them, lay them down in the Spring, and transplant them out at *Michaelmas* after.

THIS new Plantation } l. s. d.
 being thus managed the
 first Year, at the *Mi-*
chaelmas following their
 planting, they must be
 digged about their Roots,
 as before directed for the
 Oaks; the Expence of
 which will amount to, at
 3 *d. per* Rod, about } 0 15 0

AND if to this we add }
 for the next Summer's
 Houghing. } 0 15 0 more

The Sum 1 10 0 will
 be the Expence of the second Year's Keep-
 ing, and the like for eighteen Years after;
 at which Time they will require no more
 such Care in keeping.

Now let us pass through the whole Ex-
 pence as it arises, with its Interest for
 twenty Years, supposing that the Land were
 of no Use, than for the Support of the
 Trees, which it need not be, for as they
 are to be yearly disbudded of their lateral
 Buds, their Top-branches will shade very
 little: So that for the first ten or twelve
 we may be sure of good Crops of Corn from
 among them, and afterwards Pasture for
 Sheep, Cows, &c. But notwithstanding that

the Land is capable of producing these Crops; yet I will in this Calculation suppose that no such Crops were to be produced, and that the Land is wholly employ'd to the Use of the Timber Trees.

I will suppose the annual Rent of the Land at 5 *s.* *per* Acre, as before in the Oaks.

BEING thus prepared, we will now proceed to the Calculation.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
The Expence of Planting, and the first Year's keeping.	92	18	6
The Rent of 20 Acres the first Year.	5	0	0
<hr/>			
The Expence at the first Year's End.	97	18	6
The second Year's Keeping, as above.	1	10	0
The Interest of 97 <i>l.</i> 18 <i>s.</i> 6 <i>d.</i> for one Year.	4	17	11
<hr/>			
The Expence at the second Year's End.	104	6	5
The third Year's keeping.	1	10	0
The Interest of 104 <i>l.</i> 6 <i>s.</i> one Year.	5	4	3
<hr/>			
The Expence at the third Year's End.	111	0	8

The

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	111	0	8
The fourth Year's keeping.	1	10	0
The Interest of 111 <i>l.</i> 8 <i>d.</i>	5	11	0

The Expence at the fourth Year's End. } 118 1 8

The fifth Year's keeping.	1	10	0
The Interest of 118 <i>l.</i>	5	18	0

The Expence at the fifth Year's End. } 125 9 8

The sixth Year's keeping.	1	10	0
The Interest of 125 <i>l.</i> 9 <i>s.</i> 8 <i>d.</i> almost }	6	05	0

The Expence at the sixth Year's End. } 133 5 2

The seventh Year's Expence.	1	10	0
The Interest of 133 <i>l.</i> 5 <i>s.</i>	6	13	3

The Expence at the seventh Year's End. } 141 8 5

The eighth Year's Expence	1	10	0
The Interest of 141 <i>l.</i> 8 <i>s.</i> 5 <i>d.</i>	7	1	5

The Expence at the eighth Year's End. } 149 19 10

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	149	19	10
The ninth Years' Expence.	1	10	0
The Interest of 149 <i>l.</i> 19 <i>s.</i> 10 <i>d.</i>	7	10	0
almost			
The Expence at the ninth Year's End.	158	19	10
The tenth Year's Expence	1	10	0
The Interest of 158 <i>l.</i> 19 <i>s.</i> 10 <i>d.</i>	7	19	0
almost			
The Expence at the tenth Year's End	168	8	10
The Eleventh Year's Expence	1	10	0
The Interest of 168 <i>l.</i> 8 <i>s.</i> 10 <i>d.</i>	8	8	5
The Expence at the eleventh Year's End	178	7	3
The twelfth Year's Expence	1	10	0
The Interest of 178 <i>l.</i> 7 <i>s.</i> 3 <i>d.</i>	8	18	4
The Expence at the twelfth Year's End	188	15	7
The thirteenth Year's Expence	1	10	0
The Interest of 188 <i>l.</i> 15 <i>s.</i>	9	8	9
The Expence at thirteen Year's End	199	14	4

The

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	199	14	4
The fourteenth Year's Expence	1	10	0
The Interest of 199 <i>l.</i> 14 <i>s.</i> 4 <i>d.</i> } almost	9	19	9
<hr/>			
The Expence at fourteen Year's } End	211	4	1
The fifteenth Year's Expence	1	10	0
The Interest of 211 <i>l.</i> 4 <i>s.</i> 1 <i>d.</i>	10	11	2
<hr/>			
The Expence at fifteen Year's } End	223	5	3
The sixteenth Year's Expence	1	10	0
The Interest of 223 <i>l.</i> 5 <i>s.</i> 3 <i>d.</i>	11	3	3
<hr/>			
The Expence at sixteen Year's } End	235	18	6
The seventeenth Year's Expence	1	10	0
The Interest of 235 <i>l.</i> 18 <i>s.</i> 6 <i>d.</i>	11	15	10
<hr/>			
The Expences at seventeen } Year's End	249	4	4
The eighteenth Year's Expence	1	10	0
The Interest of 249 <i>l.</i> 4 <i>s.</i> 4 <i>d.</i>	12	9	2
<hr/>			
The Expence at eighteen Years } End	263	3	6
The nineteenth Year's Expence	1	10	0
The Interest of 263 <i>l.</i> 3 <i>s.</i> 6 <i>d.</i>	13	3	0
<hr/>			
The Expence at nineteen Year's } End	277	16	6
<hr/>			
The			

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Brought over	277	16	6
The twentieth Year's Expence	1	10	0
The Interest of 277 <i>l.</i> 16 <i>s.</i>	13	17	9
	<hr/>		
The total Charge in 20 Years	293	4	3
	<hr/>		

'Tis well known to every Farmer, that an Elm of 20 Years Growth, is worth upwards of 20 *s.* But there I will state their Value. Now the Quantity before supposed to grow on 20 Acres, were 2160, which at 20 *s.* *per* Tree, comes to 2160 *l.*

The annual Rent accounted for in the preceding Calculation being but for the first Year, we must therefore add	}	95	0	0
For the nineteen Years after, and for the simple and compound Interest thereof		83	0	0
		<hr/>		

Sum 178 0 0

To which add the preceding Sum	293	4	3
	<hr/>		

Sum 471 4 3

Which being substracted from 2160 *l.* leaves the neat Profit

2160 0 0

471 4 3

l. 1688 15 9

The

The neat Profit clear of all Outgoings ; besides the Advantages of the under Crop, as before noted.

Now, as 20 Acres is to	1688	15	9
So is 100 Acres to	8443	18	9
And 1000 Acres to	84439	7	6

Neat Profit, clear from all Expences whatever, Felling excepted, which the Top will over pay.

AGAIN, as the Expence of } 20 Acres is to	471	4	3
So is the Expence of 100 A- } cres to	2352	13	0
And the Expence of 1000 A- } cres to	23526	10	0

Now by comparing these Advantages, and Expences together, we may see what vast Improvements may be made in the small Space of twenty Years. Thus in the largest Account it evidently appears, that by the gradual advance of 23526 Pounds in twenty Years Time, which is but 1176 *l.* 6 *s.* 0 *d.* *per Annum*, we gain 84439 *l.* 7 *s.* 6 *d.* which at 5 *per Cent.* is worth four thousand, two hundred, and twenty one Pounds, nineteen Shillings *per Annum*.

BUT as Elm is generally at its Maturity, at 40 Years, we should with Patience wait
until

until then, at which Time it will be worth three times the Money it was 20 Years before. But if we suppose it double the Value, *viz.* 168878 Pounds, it will be found to have very well answered our Labour and Expence.

NOR is here any Danger, or need of Insurance, as in Building, Trading abroad, &c. or any extraordinary Taxes, Duties, Customs, &c. but all free, and in continual Safety, under our own Eyes at all Times: Which to a noble Mind must be very entertaining.

BESIDES the aforesaid Method of Planting entire Woods of Elm, we may reap very great Advantages from the Hedge-rows of our Enclosures; if we are but careful enough to plant them therein at 15 or 20 Feet Distance, when we plant our Quicksets, and keep them carefully disbudded from their lateral Buds, as they appear in the Spring. And even in old planted Hedges, we should plant them in like Manner, first preparing their Holes before they are planted with good fresh Earth, which will enable them, till they have acquired Strength, to shift for themselves.

EVERY

EVERY hundred Rod of Hedging thus planted, will, in forty Years Time, be worth near two hundred Pounds.

IN brief, if the Timber-trees of Oak and Elm, in Hedge-rows, are manag'd with good Husbandry, in many Countries, they will in twenty Years Time be worth all the Land they enclose, provided that each Enclosure does not exceed 6 or 8 Acres, which are Fields of a very good Size for the Farmer.

HAVING thus demonstrated the great Advantages that may arise from Plantations of Oak and Elm, I can't believe, but that every Gentleman will be induced to make large Plantations thereof with convenient Speed, and more especially, since the Interest, Commerce, and Safety of this most powerful and glorious Nation, wholly depends on its Shipping, and they on continued Plantations of Timber; which if neglected, what ill Consequences must ensue. And indeed, if I may be permitted to speak the Truth, we are pursuing those unhappy Consequences with all the Vigor imaginable. For as the annual Consumption of Timber is, and has been for many Years past very large, our Woods are nearly exhausted; and where
there's

there's one Acorn planted for a Succession; there's a hundred Oaks felled, and no Provision made for Posterity.

WHAT a pity would it be, should this glorious and powerful Nation, who is blessed with an illustrious Family, become a Sacrifice to its Enemies for Want of Timber to build Ships (or rather floating Castles) of Defence; wherein its Power and Commerce wholly consists. But such unhappy Days, I hope, will never happen; nor is there any Reason to fear it, since their most Sacred Majesties, and the Nobility of *Great Britain*, are greatly delighted with the rural Pleasures of Planting and Gardening.

C H A P. V.

Of the Perspiration of the ASH, its Manner of raising and ordering for Timber, and Underwood, in Parks, Woods, Forests, Coppices, &c. And the Advantages that arise from such Plantations.

THERE are several Kinds of Ash growing in *England*, but those for Timber are but two, which are distinguished

ed by the Names of Male and Female : The one bearing Keys in great Plenty, and the other few, if any:

THESE Kinds of Ash delight in different Soils and Situations, *viz.* the one on Hills, Mountains, &c. and the other in Valleys, low Grounds, &c. whereby their Growths are different.

THE Female Ash delights in the low Grounds, and hath its Wood much whiter than that on the Hills, and grows to a larger Stature in equal Times; and that very soon. The learned Mr. *Evelyn* reports in his *Sylva*, Chap. 6. Pag. 38. That the Female Ash hath many times risen to such prodigious Statures, so as in forty Years Growth from the Key, an Ash hath been sold for thirty Pounds Sterling. And Mr. *Bradley*, in his new Improvements of Planting and Gardening, Part I. Page 43. tells us, that he has heard of Ash Trees of forty Years Growth from the Key, that have been sold for twenty five Pounds *per* Tree.

THE Uses that this kind of Timber is apply'd to, is the making of Oars, Shevers, Boat-Staves, Masts for Boats, Barges, Spreets, Blocks, &c. To the Gun-smith for

G

Gun-

Gun-stocks; to Wheel-wrights for Ploughs, Harrows, Waggon, &c. and in brief, to so many other Uses, that they are almost endless to enumerate—And indeed, were these Trees not very useful, it had been impossible for one Person to have had a Plantation of his own raising, worth fifty thousand Pounds, to be sold, which Mr. *Evelyn* makes mention of in his *Sylva*.

THE Price that is usually paid *per* Load for this Sort of Timber, is more or less, as it is in Length and Girt, some being worth 3 *l.* 10 *s.* *per* Load, and some but 3 *l.* 50 *s.* 40 *s.* &c.

THE best Ash is always produced in the best Lands, which it soon impoverishes; and therefore, since 'tis of such a ravenous Nature, 'tis best when mix'd with Tap-rooted Trees, at large Distances.

I cannot recommend the planting of this Tree in the Hedges of our Enclosures of Meadow or Corn, for their Roots extending themselves far from their Bodies, and very shallow withal, do greatly impoverish the Grass, or Corn, growing near them: Nor can the Heithorns have any Share with them, that grow under their Drip; so that

if we intend to have good Fences, we must not plant the Ash therein.

THE Ash is raised from Seed, (called Keys) which are to be gathered when they begin to fall, about the end of *November*, or beginning of *December*, at which Time you must be careful not to bury them too deep: About two Inches deep is fully sufficient; but they will not come up, until the second Spring after Sowing; during which time, they must be carefully kept clean from Weeds, and moist in very dry and hot Weather.

WHEN they come up, you must keep them water'd during the Spring and Summer, (if the Weather is dry) and free from Weeds. And in the beginning of the Winter following, take them out of the Seed-Bed with a Trowel, that their Roots may not be strained in drawing; which causes them to perish after transplanting.

N. B. You must prune off their downright or tap Roots; but not any of their lateral Roots. You must also preserve their Tops from the Knife and Bill at all times, excepting the second Year after transplanting, when you must cut off their Heads, within an Inch or two of the Ground,

which will cause them the next Spring to shoot away with an abundance of Vigour, so as in few Years to become large Trees.

N. B. THAT if they are very small at the end of the second Year, 'twill be best to let them remain in the Seed-beds a Year or two longer, until they are large enough to transplant ; which is when they are about the Bigness of a Tobacco-pipe, or Goose-quill.

THE Distances that they should be planted at, are about one Foot Square, in straight Lines, after the Manner of Beds, leaving between every fourth and fifth Row, an Alley of two Feet and half in Breadth, wherein they may remain for the Space of two or three Years at most ; after which they should be transplanted in the Places where they are design'd to remain ; or into a Nursery, as directed in my new Principles of Gardening.

THE proper Distances to plant the Ash at, when 'tis planted out for good and all, are fifteen or twenty Feet, provided that we carefully displace all the lateral Buds every Spring, as they appear.

I observe, that Mr. *Evelyn*, in his Discourse on Forest Trees, *Page 39.* directs,

when we make Plantations of Coppices, consisting of several Kinds of Trees, every third at least should be an Ash. For as the Ash is known to be a very great Impoverisher of Land, by its great imbibing Power, which is superior to all other Timber Trees; it therefore follows, that they must be greatly injured thereby; and especially the Elm, whose Roots run very shallow also. But for Oaks, whose Roots penetrates the Earth for their Nourishment much deeper, they may be out of their Power of being prejudiced by them. But however, I cannot recommend the Ash for a Companion with Trees, whose Roots run shallow as theirs; and therefore I would always chuse to plant them with tap rooted Trees, as Oaks, &c. rather than Elms, or other shallow rooted Trees.

ASHES planted with Oaks, Chesnuts, &c. in Plumps, on the tops of little Hills in Parks, &c. have a very good Effect, and become good Timber very soon, their Soils being very fresh and generally fertile. And as I have before proved, that Trees draw one another up, when planted very near together, for want of a free circulating Air about their lower Parts: I therefore re-

commend their planting something nearer to one another, than the Distances before assigned, that thereby they may be soon drawn up to great Heights, whereby they will have a fine Aspect in a short Time.

'Tis the Opinion of some, that to propagate the Ash from their Keys, as here deliver'd, requires more time, than to gather Suckers out of the Woods, and plant them ; because say they, whilst their Keys lie preparing themselves a full Year in the Ground, those Suckers will have struck Root, and made a Shoot, and after them others, in the succeeding Years, much stronger than those from the Keys : But 'tis a great Mistake, for tho' they will make a Shoot in the first Year, whilst the Keys are preparing themselves in the Earth, yet 'tis so very inconsiderable, as of no Value ; for the Suckers of Ash drawn out of the Woods are very rarely well rooted ; and therefore they are as long (and oftentimes much longer) a getting good Roots, as the Keys are Germinating ; which when they strike Root, being naturaliz'd to the Ground, are always stronger, and shoot with much greater Vigour than the Suckers, whose Roots are at first planting, unacquainted with the Soil :

In

In brief, I must take the Liberty of advising against the planting of Suckers ; for I having seen the Experience thereof, and know that they will never answer the desired End of making good Timber in a short Space of Time, as those Trees raised from Keys never fail of doing ; I must also caution the planting of another Sort of Ash, that is a low Grower, and very knotty, not worth our while to plant for Underwood, or any other Use whatever, known to most Husbandmen.

HAVING thus declared the raising of Ashes for Timber, I will now proceed to explain the Propagation of the Ash for Coppice-wood, which is very advantageous also.

To have fine Coppices of Ash, we must make Choice of the best Land we have, which should be well ploughed in the Summer Season to mellow. This being done in the Spring, when 'tis the Season for sowing Barley, it must be plough'd again, and then sow'd with Ashen-keys, and Barley also ; for as the Keys will not come up until the Spring after sowing, you may very well have the Benefit of the Barley the first Year. In the end of the following Autumn, after sowing, cause the Barley-stubble to be thin-

ly hough'd over, which will mellow the Surface of the Earth, and permit the Rains to pass freely therein. About the middle of *January* following, (if the Frosts are over) give your Land a second thin houghing again, which will loosen and mellow the Surface, so that the tender *Plumes* of the Keys may with ease rise through the same.

WHEN the young Seedlings have risen high enough to stand the Hough, you must then hough them out, at about five Feet apart; and the oftner your Seedlings have the Earth stirr'd about them with houghing, the better they will thrive. And in the beginning of the Winter following, the Surface of the Ground should be turned, (that is, lightly digg'd) about half a Spit deep, which will mellow the Surface, for the tender Fibres to easily strike therein. And afterwards in the Spring, when the Weeds begin to rise, then hough them down; and so in like Manner you must continue to do, until the Shade of your Nursery prevents their longer Growth.

THE Quantity of Plants that one Acre will produce at five Feet square of one another,

ther, is seventeen Hundred and sixteen, which I thus prove.

REDUCE the Length of an Acre into Feet, and divide them by five; the Quotient is the Quantity in an Acre's Length. Thus 40 Poles multiplied by $16\frac{1}{2}$, produces 660; which being divided by 5, the Quotient is 132.

An Acre's Length	40	Poles.	
Feet in a Rod or Pole	16 $\frac{1}{2}$		
	240		
	40		
	20		
	660		
Divided by 5	5	(132.	The Num- ber of Plants in an Acre's Length.
	16		
	15		
	10		
	10		
	00		
		Remains.	

Now, an Acre's Breadth being 4 Poles, multiply and divide as before.

An

An Acre's Breadth 4 Poles.

Multiply by 16 $\frac{1}{2}$

Divide by 5) 66 Feet (13. The Number of Plants in an Acre's Breadth.

65

1 Remains.

IF you multiply 132, the Number in the Length, by 13, the Number in the Breadth, the Product will be 1716, the Quantity required.

Trees in an Acre's } 132
Length.

Trees in an Acre's } 13
Breadth.

—]

396

132

Product 1716

WHEN we are to raise Coppices of Ash mix'd with Oak, Chesnut, &c. we must prepare our Lands by often and early ploughing, as before directed; and in *February* sow your Ashen-Keys (being gather'd a Year before, and kept in Sand, as directed

directed for the Acorns of the Oak) with the Acorns, Chesnuts, Hazelnuts, &c. (which also should be kept in moist Sand, from their Gathering to the Season for sowing, or otherwise they will shrivel and perish); and when they are all come up, (which will be by the End of *April*, &c.) they should be hough'd out at the Distances of five Feet, leaving an Oak, Chesnut, and Hazel at equal Distances, (or near thereto) between every two Ashes, whereby their several Roots of every Kind will be at competent Distances from each other, and will be much better nourished, than when several Plants of one Kind are near together.

THIS Rule being observ'd, the several Kinds will be at twenty Feet apart from one another, (being accounted forward in a right Line) for they having between every two of them an Oak, a Chesnut, and a Hazel, each at five Feet Distance in the Line, their Distances must be twenty Feet, and the like of all the others. Now, the second Line being but five Feet from the first, you must observe to leave the Ashen Plants therein, as nearly against the Midst of the Intervals of the first as can be;

be; which being well observ'd, will place all the other Kinds in the same Positions. The Space that each Kind of Plant has to extend its Roots, before they meet any of their own Kind, (supposing all their Growths are equal) is one Hundred square Feet, *viz.* at twenty Feet Distance in the Rows, and five Feet Distance one Row from the other. Now, suppose that the Roots of any one Kind of the several Trees were forty Years extending themselves all over the Hundred Feet, and in that Time wholly impoverish'd that Space of all the Nourishment natural to that Plant: Why then 'tis reasonable to suppose, that if the other Trees of Oak, Chesnut, and Hazel were Ashes also, (as I suppose the other to be) that Space of Land would be equally impoverish'd in the Space of ten Years, it having there four Times the Demand of Nourishment to the same Kind of Tree. Therefore, to have Coppices endure many Years, we must intermix several Kinds together, and not entirely of any one Kind.

OAKS, Hazel, and Chesnut imbibe the Juices of the Earth with as great a Force as the Ash, but not the same; for that

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Nourishment or Juice that is imbib'd by the Oak, is of a quite different Nature from that which nourishes the Ash, and the like of all other Plants ; for the Earth contains as great a Variety of Juices, necessary to the Support of Plants, as its Plants differ among themselves.

TAKE up a very old Tree of any Kind 'tis no Matter what, and in its Place plant a young one of the same Kind, and mark the Consequence ; or rather take up two of the same Kind, on the same Piece of Land, as near to one another as possible ; in the Place of any one, plant another of the same Kind, and in the Stead of the other, plant another Tree of a quite different Nature ; which last will thrive very well, whilst the other will but keep its self alive, and not thrive at all, the necessary Juices being by the former Tree nearly or wholly exhausted : And therefore 'tis a general Rule, never to plant the same Sort of Plant, where one of the same Kind grew before, in the same Earth. This is well supported by Reason, for were all Sorts of Plants to imbibe one and the same Kind of Nourishment, then but one Kind of Land would be necessary for their Nourishment,
or

or all Sorts of Plants would thrive equally in any Kind of Land, which they are by Experience found not to do. These are sufficient Reasons, why 'tis best to plant Coppices with different Kinds; for tho' their Roots may perhaps run over the whole Ground, as soon as when planted entire of one Kind, yet their different Natures imbibing different Juices, do not impoverish the Soil so soon, as when it happens in Avenues of Lime, or Elm-Trees, &c. that one or more die when largely grown.

THE best Way to make good such Plantations, is to dig for every Tree a very large and deep Hole where the former grew, carrying away all the Earth, and instead thereof, bring as much of the first Spit of a fresh Common or Meadow, and therein plant your Trees, which, if well perform'd, will take Root, and grow away strongly.

THE Quantity of old Earth to be taken away from each Tree should be a Circle of ten Feet diameter, and two Feet deep, wherein the Roots will thrive for many Years before they come to stick in the natural Earth, and in that Time be well stored with sufficient Juices, necessary for the Support of their Roots, to strike therein.

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THE Ash being a free Grower, is fit to fell for Coppice-Wood, at nine, ten, or twelve Years Growth, but the longer the better; and for Timber, when it has had about thirty five or forty Year's Growth, during which Time we should observe, that the first four or five Years they be kept clean from Weeds, by often houghing; that the Earth be stirr'd about them, by digging in *October* or *November*; that they be at all Times preserv'd from Cattle, Deer, Goats, &c. that their leading Shoots be preserv'd, and that those intended for Timber have their lateral Buds displaced, as they break out in the Spring; which will add very very much to their Bigness and Heighth, and cause their Timber to be clear from Knots, and consequently of a much greater Value.

THE Season to fell Ash, either in Coppice or Wood, is about the Middle of *December*, when their Sap is most condensed by the Winter's Cold; and in the following Spring they will shoot up again with Vigour, provided that you cut them off about six Inches above Ground, and take Care that the Face of their Cuts are towards the South, that the Sun may the sooner

sooner heal their Wounds, and be less subject to imbibe Wet.

Per damna, per cædes, ab ipso

Ducit opes animumque ferro.

By Havock, Wounds, and Blows,

More lively and luxuriant grows.

N. B. If the Ash is cut down, when its Sap is any thing vigorous, it will, by putrifying, breed a Kind of Worm, that's as very injurious to the Timber.

CHAP. VI.

Of the Beech, its Manner of raising and ordering for Timber, and Underwood, in Woods, Parks, Forrests, Coppices, &c.

THE Kinds of Beech, that we have in our Woods and Forests, are two, the one called the *Mountain Beech*, (where it most delights to grow, and the other, *campestral*, or wild, growing in level and low Lands.

THE Wood of the Mountain Beech is whiter than the other, which is of a blackish Colour, and a longer Duration.

THE Soil wherein the black Kind delights, (that being the best to propagate, with Respect to its Duration) is that in Vallies, or level Lands that are warm, as also in stony and barren, as rich loamy Lands: So also will the Mountain Kind, which last will grow to a stupendous Procerity upon the Tops, and Declivities of chalky Hills, where few or any other Kinds of Trees will keep alive; and wherever the Oak thrives, the Beech will, they delighting very much to grow in Consort.

THESE Kinds of Beeches are raised from their Seeds, called *Mast*, which should be gathered in *October*, and may then be sown, or otherwise put into Sand as the Acorns, and sow'd in the Middle of *February* following, being afterwards ordered in every Respect, as the Oak, or Ash: You may also gather young Seedlings out of Woods, from under large fruitful Trees, that have shed their Mast, which will become good Trees also, provided that you preserve all their Roots that's possible, and prune their Tops to about five or six Inches in Length.

THE best Size for to get those Seedlings, is about the Bigness of a Tobacco Pipe, or hardly quite so large, for it is not the very large Seedlings of a long Standing, that make the best Trees.

THE Distances that they should be planted at, when so little, is one Foot in the Rows, and each Row two Feet apart.

THE best Season for this Work, is about the Middle of *October*, or Beginning of *November*; after which, in the Spring, we should displace their Buds, as directed for those of young Elms.

BUT if we would plant them out where they are to remain, when they are so very young, we should allow them fifty Feet Distance, excepting that we want Plantations thereof to grow very high in a short Time, and then we may plant them at ten, twelve, fifteen, twenty, &c. Feet Distance, which near standing together, will cause their lower Branches to be saturated with Sap, and their Tops advance greatly in Height, by having a free Perspiration in the dry open Air.

'TIS a great Pity, that the Propagation of this Kind of Tree has been (and is) so little regarded; its Use being so very great,
that

that not only for Fuel, (which 'tis one of the very best, and well known to the City of *London*, which every Year consumes many Thousand Stacks thereof); but for many important Uses in Architecture, particularly in building Water-Works, all Sorts of Mills, for Rimbs of Wheels, Staves, Coggs, &c. exclusive of the several Uses of the Household.

*Hinc olim juvenis mundi melioribus annis,
Fortunatarum domuum non magna supellex:
Tota petebatur; sellas, armaria, lectos,
Et mensas dabat, & lances, & pocula Fagus, &c.*
Couleii Pl. L. 6.

*Hence in the World's best Years the humble Shed,
Was happily, and fully furnish'd:
Beech made their Chests, their Beds, and the join'd
Stools.
Beech made the Board, the Platters, and the
Bowls.*

*An happy Age it seems —
—— No Wars did Men molest,
When only Beechen Bowls were in Request.*

FROM the Mast, is extracted an Oil, that would be very advantageous to this Kingdom

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dom, had we but plenty of Trees to produce Mast in abundance. 'Tis an excellent Food for Deer, Swine and Fowls, and the Leaves make very agreeable Mattraffes.

NAY, Mr. *Evelyn* says, the very best and easiest of any in the World, being gathered somewhat before the Frost takes them at their Fall. And further adds, that by their Tendernefs, and loose lying together, they continue sweet for seven or eight Years; and that he himself has sometimes lain on them (when in *Switzerland*) to his very great Refreshment; so (says he) of this Tree it may properly be said,

—*Sylva domus, cubilia frondes.*

Juvenal.

The Woods a House, the Leaves a Bed.

THE Season to fell this stately Tree is *November* or *December*; and the Mast is eatable (for Swine) in *August*. These noble Trees make beautiful Figures in the Garden, when trained up in Hedges, to enclose Walks, Quarters of Wilderesses, &c.

THEIR Manner of planting therein, is as before, only we must plant them at fif-

teen or eighteen Inches apart, instead of a Foot. And in the Spring, when they break into Buds, rub off all the forward ones, and thereby the others will be strengthened very much. And since that the thickening of Hedges depends upon the Quantity of side Branches, it would be very commendable in us, to observe how we place the side Buds of every Plant, that when they break out in the Spring, their greatest Quantity may lie flush with the Line of the Hedge, whereby 'twill soon be thickened. And in the Spring, when we observe any Plants to push away with one strong Shoot only, then to pinch off the extrem Part thereof, which will cause several other Branches to break out, that become thick and regular; whereby our Hedges will rise equally in all their Parts.

ABOUT the middle of *September*, we may clip the Sides of our Hedges, but never their leading Shoots; and in four or five Years, they will become very thick and handsome.

N. B. THAT it is the Practice of many, to plant double (and sometimes treble) Rows of these young Plants, to cause a thick Hedge; but I cannot commend it;

for by their being planted so near together, they cannot have a free Perspiration ; and 'tis therefore that they do not thrive.

IN this Manner there are many beautiful Hedges of Hornbeam planted, of which in its Place, that are graceful to Gardens; and when Beech and Hornbeam are discretionally mixt together in a Hedge, they make a very beautiful Mixture and Variety.

C H A P. VII.

Of the Birch-Tree, its Manner of raising in Coppices, Gardens, &c.

BECAUSE that this Tree does not produce good Timber for building, therefore few or any cares to propagate it : But were the Proprietors of poor barren Lands as well acquainted with its Nature as I am, they would greatly improve such Lands, by making Plantations thereof: For the Nature of this Tree is such, that let the Soil be dry, wet, gravelly, clayey, sandy, marsh or boggy, 'twill thrive very well ; nay, in the uliginous Parts of Forests, Parks, &c. where scarcely any Grass or Weeds live,

live, they do spontaneously grow in abundance, to very great Statures.

AND altho' its Wood is not fit to be used in Buildings, yet 'tis of great Service to the Cooper for Hoops, as well as to the Turner, for making divers Household Utensils, and to the Husbandman, for Withes, Brooms, &c. so that we may assure our selves of a Market for it, when saleable, to the very great Improvement of such barren Lands, that before were useless.

THESE Trees are propagated from the Suckers as the Elm, and become Trees very soon, provided that the Land is not so rich; for as I said before, they delight and thrive best in barren Lands.

THE best time to plant them is *October*, that they may strike Root by the Spring, when it often happens to be attended with much Drowth. The Manner of planting them in Coppices, is the same as of the Ash, &c.

N. B. THOSE who desire to know the making of Wine with the Sap of these Trees, I refer them to my new Principles of Gardening, *Page 138*.

C H A P. VIII.

Of the Perspiration of the Platanus, or old Roman Plane-Tree: Its Manner of raising and planting in Avenues, Walks, Groves, Espaliers, &c.

THE *Romans* were the first that brought this noble Plant from the *Levant*, sparing neither Cost or Pains in its Cultivation; insomuch, that *Cicero* and *Hortensius* would oftentimes pour Wine to their Roots, instead of Water, their Value for them being so great; and indeed, they are in my Eye, one of the most beautiful Trees that we have in our Wilderesses or Groves; and 'tis therefore that I am surpriz'd to see them so little regarded.

BESIDES the old *Roman* Platanus, there are two other Kinds, which have some difference in their Leaves; but their Growth is much the same. They are in general increas'd by Layers, as the *Elm*, *Lime*, &c. or from their Seed. They delight in a fresh, rich, and moist Loam, and as their Wood is something hard, their Layers should be laid down in *October*, wherein 'tis to be

be observ'd, that as their Leaves are very large, they therefore require to have their Layers laid at a much greater Distance, than *Elms* or *Lime*, whose Leaves are less; for if they have not a free Perspiration, 'tis impossible they can live.

By the next Autumn, after laying down, they will be well rooted, and then they must be taken from the Stools, and planted out in a Nursery, as directed for the *Elm*, but at somewhat greater distance.

It has been the Practice of many, to plant this Tree with *Lime* Trees, which is entirely wrong; because these Trees do not come into Leaf so early as the *Lime*, and are then something disagreeable.

THE Wood of these Trees, (as I before observed) is very tough and hard, and therefore resists the Violence of the Winds.

THEY are free Growers, and oftentimes arrive to vast Magnitudes, as appears by the 21st. Chapter hereof. In short, their Beauty is so very great, that I can't but recommend the planting of some Avenues, Walks, Groves, &c. in every Gentleman's Garden, whose Soil is natural to them.

C H A P. IX.

Of the Portugal Chesnut, commonly called the English, or eatable Chesnut; its manner of raising for Timber, Underwood, &c.

THE eatable Chesnut, that is now propagated in *England*, was originally brought from *Portugal*, altho' Gardeners call it the *English* Chesnut; but that proceeds from their want of being better inform'd, or otherwise to distinguish it from the Horse-chesnut, tho' a very improper Way: But such Mistakes in Gardeners, I hope, will be excused by the more learned.

THE difference between the *Portugal*, and Horse-chesnut is very much; for the Leaves of the *Portugal* are long and narrow, set on their Edges, with small Thorn-like Substances: And those of the Horse-chesnut are very large, divided into five (and sometimes more) Sections, producing a very fine Shade, and agreeable Figure. Their Fruits are also different; but not so much as their Leaves, except in Taste; the

Portugal

Portugal being very sweet and crisp, and the other hard, rough in the Mouth, and very disagreeable.

THE *Portugal* Chestnut is rais'd from its Nuts, which being gathered when ripe, about the end of *September*, or beginning of *October*, must, after they have laid some time to sweat, as a Week or ten Days, be put into Sand, and therein kept, until the following Spring, at which Time they are to be planted in the places where they are to remain, (if possible, for they don't love to be often transplanted) or otherwise in Beds, as directed for the Acorns.

THE best Manner of planting them, is in the Bottom of deep Drills, at about one Foot apart, and not with Dibbers, as is usual, which oftentimes causes their Mis-carriage: For when a Hole is made with a Dibber, and the Nut put in with the lower Part, from whence its Radicles shoot downwards: How is it possible for them to live, when there is a Hole beneath the Nut, of so great a Depth, as to be beyond the Reach of the tender Radicles, when they are endeavouring to strike therein.

THEREFORE in planting them, Care must be taken to set the Point of each Kernel upright,

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upright, and to press their lower Parts into the Earth; thereby to settle and fix it well about them.

THE Time that they should remain in the Seed-bed, is one or two Years at most, according to their Strength and Size; after which Time, when you take them up, preserve all their Roots with Abundance of Care, their tap Roots excepted, which are ever to be cut away; and if your Trees are designed for Walks, Avenues, &c. their often removing will be serviceable to them; but if you intend them for Timber, 'tis much the better Way to plant the Kernels where they are to remain, until fell'd for Timber.

THEY will thrive very well in most Kinds of Soils that are not over hot, or wet; but best of all in a fresh Sandy Loam, wherein they will, in a few Years, arrive to prodigious Magnitudes. They no more, than other Forest Trees, delight in being dunged, or anywise help by Compost, than what their own Leaves produce.

Mr. *Evelyn* advises, that if any Desire to set them in Autumn or Winter, to plant them with their Husks on, to protect them from the Mice, during the Winter; but
since

since we may preserve them with Safety, throughout the whole Winter in Sand, I can't see why we need run the Hazard of losing our Kernels, by early planting. Indeed I must confess, that if we can by Traps secure our Seeds from Vermine throughout the Winter; 'tis much the better Way to plant them as soon as they are ripe, but not in their Husks: For if we do but observe *Nature herself*, we may see, that as soon as ever she has ripen'd her Seeds, she opens the Seed Vessels, and commits them to the Earth, from whence they all arise at their natural Seasons.

WHEN Seeds of Trees are thus sown, in their proper Beds, they are continually imbibing and naturalizing themselves to the Juices of the Earth, whereby their Germination is perform'd more gradually, and with greater Strength, than when sown out of a Bed of Sand in the Spring, whose Juices are contrary to the Soil that they are then planted in, which must undoubtedly be a very great Check to the putting forth of their Plumes and Radicles into the Air and Earth.

THE best Season to transplant the young Seedlings, is, in *October*, if the Weather is

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is moist enough, or as soon after as possible.

IN which observe, that you carefully preserve their Leading Shoots, to prune away all their lateral Shoots close to the Stem, and to preserve and prune their Roots, as before directed.

WHEN we are to plant them out in a Nursery, to be afterwards transplanted into Walks, Avenues, &c. they must be planted, as directed in my *new Principles of Gardening*, but if we are to plant them out for good, in *Avenues*, &c. they should be planted at twenty or thirty Feet asunder, or rather forty or fifty, if their Planters could but have Patience; for the more Air circulates about a Plant, the better it thrives, by having a free Perspiration, which Plants cannot have, when planted too near together.

I know a Chesnut-tree now growing on the Lands of the late *Thomas Vernon*, Esq; at *Twickenham* Park in *Middlesex*, whose Arms extend full fourscore Feet, whereby we may easily know, at what Distances they should be planted for such rural Embellishments.

N. B.

Of the Portugal Chesnut. III

N. B. The Chesnut is an improper Tree to plant for Shade, in Meadows, to shelter Cattle from the Heat of the Summer, &c. For 'tis seldom that any Grass will grow under its Shade.

The most agreeable Trees for this Purpose are the *English Elms*, whose Arms extending far from their Bodies, cause very agreeable Shades; and their Leaves being very small, their Drip is moderate, so that the Grass can grow very well underneath.

I shall now proceed to direct the raising and ordering this Tree, in the Coppice for Underwood, it being very advantageous, when so planted. In *February*, or rather *October*, when you sow *Ashen-keys*, *Acorns*, and *Hazel Nuts*, you must also set your *Chesnuts* three or four together in Clusters, at six or eight Inches a Part: Which Clusters must be placed at twenty Feet distance in Rows, if you take the Pains to set them; or dropt in Parcels, at such Distances, on the Land, when 'tis ploughed, before harrowing; and between them, in like Clusters, as many *Acorns*, *Ashen-keys*, and *Hazel Nuts*, at equal Distances, as before directed, in the Chapter on the *Ash* for Under-

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Underwood; or if between the first and second Furrow you first drop half a Dozen Acorns, then at about five Feet forward, half a Dozen Chesnuts, after them, at the same Distance forward, half a Dozen Hazel Nuts, then half a Dozen Ashen-keys; then begin again with the Acorns, then the Chesnuts, afterwards the Hazel Nuts, and lastly the Ashen-keys; and so in like Manner drop the several Seeds, the whole Length of your Furrow. The first Furrow next the outside of our new intended Coppice being thus sown, measure off five Feet, and in a Furrow at that Distance, begin to drop the second Row, observing to begin it with a Kind that differs from the first; as for Example, if the first Row ended with an Ash, begin the next with an Oak, and so in like Manner continue, until the whole is ended; at which Time you must harrow the Ground the contrary Way that it was ploughed, which will bury the Seeds much better than to harrow it lengthways with the Furrows.

Thus would I advise the sowing of Coppices, rather than to sow them at Random, as I mention'd before in my Chapter on the Ash. For by this Method there will be

no Uncertainty of having them at their proper Distances, when they come to be houghed, which must happen (let Workmen be as careful as possible) when they are sowed at Random, and afterwards singled out with the Hough: Besides, 'tis soon done, and we are certain of a full Crop.

BUT when they are got about three or four Inches high, they must be thinn'd, leaving but one in a Place, which should be those that appear to be the strongest and most healthy Plants.

N. B. If they are kept clean from Weeds, by Houghings, and the Earth stir'd about them by light Diggings, at the Beginning of every Winter, their extraordinary Growths will pay the Expence a Hundred Fold; for nothing adds so much to the Growth of Plants, as being kept clean, and the Earth often stir'd about them. A Copse thus managed, will be fit to fell within eight or ten Years at longest, after sowing, and yield great Plenty of Wood, fit for many Uses.

When we fell Copse Wood, we should preserve as many of the Oaks as possible, viz. at about forty Feet Distance from

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one another, which being kept pruned close to their Bodies when young, will shade the Under-wood but very little; and in Time produce fine Timber, of great Value.

IF by any Accident our Plants should fail, or by often cutting should grow thin, we must thicken them, by laying down the last Year's Shoots of either Chesnut, or Hazel; but of this more at large, when I come to speak of the Management of Copses.

THE Time for the felling this Tree, either when 'tis become Timber, or Copse-wood, is the same as for the Ash or Elm. The Timber of this Tree has been formerly in very great Esteem among Builders, for Girders, Joists and Rafters; and were it now as plenty in *England* as it has been, we need not be put to such great Expences for Timber from *Norway* as we now are, but might finish our Buildings at as cheap Rates as our Forefathers did, when *England* gloried in its almost boundless Woods, of stately Timber Trees.

IT mayn't be amiss, if I speak a Word or two in Relation to their Fruits, which are gather'd about the End of *September*,

when they begin to ripen, at which Time we should gather, or rather beat them some small Time before they naturally drop of themselves ; whereby they'll keep much longer, than when fully ripen'd upon the Tree.

THIS Fruit was formerly given to Swine, altho' it was then esteem'd by Foreigners at a very high Rate : But now a-Days, we seem to have a greater Value for them, which is witness'd by the great Quantities roasted every Winter in the Streets of *London*, and eaten by the Populace thereof. Mr. *Evelyn* tells us, in his Discourse on this Tree, in Page 43 of his *Sylva*, that in *Italy* they boil them with Bacon, and eat them, as we do Beans ; and also boil them in Wine, and then parch them a little. And in *France* and *Italy*, he further adds, that they roast them in Embers, (or rather parch them, I suppose, as our People do in *London*) and eat them with Salt and Wine, or Juice of Lemons and Sugar. And in *Virgil's* Time, they eat them with Milk and Cheese.

THIS ingenious Gentleman does also recommend them for a very hearty Food for Country Husbandmen, being boil'd and

I 2 eaten

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eaten with Bacon, instead of Cole, (I suppose Cabbage, or Coleworts): But in *England*, we value them for 'eating when parch'd or roasted, as also with stew'd Meats, Pyes, &c. well known to our *English* and *French* Cooks.

THE best Method of preserving them after gathering, is in dry earthen Vessels, close stop'd down from the Air, and kept in a dry, cool Place.

THERE'S no Plant growing so fit, to plant in cold, open Lands, as this Chesnut; for 'tis so prevalent against Cold, that where they stand, they defend other Plantations from the Injuries of the severest Winds and Frosts. And I am perswaded, that if Plantations of this Kind were made along many of our Sea-Coasts, where few or any Shrubs will live, there might be vast Improvements made thereby.

WHEN we make Plantations of Fruits in *England*, we should at the same Time make Plantations of this Kind of Chesnut, at some Distance from the West, North, and East Parts thereof, to skreen them from the Cold, and Injuries of those several Winds; and indeed, even every House should in the like Manner be defended from
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those Infults : But before I conclude this Chapter, I must inform you, that if your Soil is very wet, so that the Roots strike into Water, it gives the Fruits an insipid watery Taste, and renders the Timber unfit for Buildings.

N. B. That altho' the Timber hereof is very serviceable in many Kinds of Building, yet it must never be used in Warehouses, Granaries, &c. where great Weights are laid; for 'tis of a somewhat brittle Nature, and will not support great Weights; and tho' by cracking it will give timely Notice of its breaking, yet it must always be avoided in such Structures.

N. B. Also, that the Ashes, both of the Chesnut and Ash, being made into a Lee, will stain Linen very much. This I thought necessary to mention, to the good old Country House-wife.

C H A P. X.

Of the raising and ordering the Horse-Chesnut-Tree, for Avenues, Walks, Groves, Wilderesses, &c.

THE Horse-Chesnut Tree was brought from *Constantinople* to *Vienna*, thence into *Italy*, and so into *France*; but I think that they were brought to *England* from the *Levant*. They are raised from their Nuts, which ripen and fall in *September*, which is the Season for their sowing; but if your Ground is not then ready, you may keep them in Sand until it is.

THEY are sown in Drills, made about six Inches deep, and a Foot asunder, drop'd, or rather plac'd, as directed for the *Portugal* Chesnut, at about one Foot apart.

THEY must remain in those Drills, before they are transplanted into the Nursery, at least two Years, at which Time their leading Shoots, or Tops, and their lateral or horizontal Roots should be preserved; but their Tap Roots must be prun'd away entirely.

THE best Time to transplant them, is *October* or *November*. If you transplant them into a Nursery, to be afterwards remov'd, you must plant them in Rows, about two Feet apart, and the Rows four Feet asunder.

THE Reason why I advise this thin Planting, is, That as 'tis a Tree of a quick Growth, it therefore follows, that it requires a free circulating Air, to perspire away the crude watry Part of its Sap, of which it is always imbibing great Quantities; for 'tis always seen, when Trees have a sufficient Quantity of open Air, circulating about them, that they are of a much stronger and quicker Growth, than those that are thick and close planted; for Plants are as easily stifled for Want of Air, when too close planted, as human Bodies, when too great a Number are confin'd in a small Room: But I need not to have given myself this Trouble, since I have already by many Instances prov'd the Necessity of a free drying Air, for the Perspiration of Vegetables in general; which are sufficient Proofs of the Necessity of thin Planting.

IN this State they are to remain in the Nursery for three Years, keeping them dis-

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budded every Spring of their lateral Buds, and loughed clean from Weeds, which, if suffer'd to grow, will be a great Hindrance to their Growth; and digged once a Year, soon after the Fall of their Leaves.

AT three Years End, they will be greatly advanc'd, and if your Land is not then ready to transplant them in for good, you must take them up, and replant them again in the same Places, taking Care not to bruise their Roots, as little as possible, and to prune all their Ends with a very sharp Knife.

THIS Removal and Pruning will cause them to strike fresh Roots, whereby they will become very well rooted, and fit to transplant at any Time hereafter; but if your Land is ready to plant them into Avenues, Walks, Groves, &c. Then plant them at forty Feet asunder, or more, as fifty or sixty Feet, if your Avenues are very long and spacious. But Avenues that are of a short Length, may be planted, at thirty or thirty five Feet apart, and single Walks at fifteen, twenty, or twenty five Feet.

GROVES and Wildernesses being parts of a Garden, more for the Pleasure of Shade, than Profit of Timber, may therefore be
planted

planted something thicker, especially where their Shade is required immediately: And in such Cases the Distance of eight, ten, twelve, or fifteen Feet, may be allowed. And when you plant a Grove on Purpose for Shade, you may be allowed to cut off the Heads of your Plants, which will cause them to spread very much; but this Work should be never practised in any other Plantations, as in Avenues, Walks, &c. where the leading Shoot carries on the Height of the Tree, which is both graceful and advantageous.

THE Heads of your Chesnuts so cut, should be cover'd over with Bees-wax and Mutton Suet, to preserve their Bodies from imbibing Rains, &c. that are very often their Destruction. And since I am now got into the Grove, I must give you a Word or two of Advice therein, as to their Manner of planting, which should always be after Nature's own Rule, by placing them in an irregular Manner, and not ranging every Way like Apple or Cherry Trees in an Orchard.

THE Care that is required in the Management of these Trees, after they are planted out in Avenues, Groves, &c. is to
secure

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secure them from being disturb'd in their Roots, by Winds, to keep them moist in the Spring, after planting, as also the Summer afterwards, if they prove dry. And the next Spring following, prune off the leading Shoot of every Branch, just as they are going to break into Leaf, which must be done again, for three Springs next after. The Reason of their being thus stop'd, is to strengthen them, near to their Bodies, whereby they are less liable to be broken by violent Winds, which they are subject to, when permitted to shoot out very long jointed Arms at their first planting: For the oftner a Branch is stop't at its leading Bud, the thicker and closer jointed it grows, and consequently stronger; and therefore the better able (as being very brittle Wood) to resist the Violence of the Winds, which oftentimes for Want of their being so ordered, ruins many a noble Tree.

WHEN this Tree is planted at a sufficient Distance from others, so as to enjoy a free Air, it will produce great Plenty of Beautiful Flowers in the Spring, that make a graceful (or rather as Mr. *Evelyn* says) a glorious Appearance, superior to all other Forest-trees at that Time; therefore that
we

we may not deprive ourselves of this Beauty, let their Distances in Avenues, Groves, &c. be rather thinner than the aforesaid Distance; or otherwise when their Heads begin to meet, cause them to be reduced, both in Length and Number, to let in a free drying Air, which will cause them to shoot afresh, and produce Flowers in great Plenty.

SOMETIMES in large Gardens we make Hedges of this Kind of Plant; And I do assure you, that there is none more beautiful, if they are skilfully order'd.

MOST other Hedge-Plants will bear the Sheers to clip them at any Time, but this will not. These must be pruned with a Knife, cutting them in every Year, to the inward Buds, which the next Spring will shoot forth, and produce great Plenty of Flowers.

THE Season for pruning them, is the Spring, just before they break into Leaf; for then the Sap being in Motion, and the Weather warm, their Wounds are soon healed.

IF you prune them in the Winter, they will imbibe Cold, Rains, &c. that are prejudicial; and since that the Trouble

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ble and Expence are the same, I can't see why they may not be prun'd in the Spring, when all the Frosts and cold Rains are over; but if you had rather prune them at another Season, when your Business is not so much upon your Hands as 'tis in the Spring, and can't so well spare Time, you may perform the same in *September*, when their Nuts are fallen, and have almost done growing; for then their Wounds will be healed before the Winter comes on.

N. B. THAT altho' Hedges of Horse-Chesnuts are very beautiful, both in Leaf, Flowers, and Fruits; yet they are not to be planted in small Gardens; for notwithstanding their annual Prunings, they will gather and cover a great deal of Ground, as four or five Feet in Breadth, which small Gardens can't well spare.

N. B. THAT the aforesaid Breadth of four or five Feet should be allowed for at their Planting, or otherwise the Walks will become too narrow, as they advance in Growth.

THE Distance they should be planted at in the Hedge-lines, is three or four Feet; and as their Branches are produced every Spring, you must nip off the leading Bud of each,
(the

(the upright one excepted) which will cause them to grow thick and handsome in a short time.

THUS have I given you a full Account of the Culture of this noble Tree, which tho' a very quick Grower, and generally of a large Stature, yet is not above the Imploy of an Espalier, to enclose our Orangeries, Fruit Gardens, &c. to protect them from the Insults, and Injuries of Winds, &c.

C H A P. XI.

Of the Perspiration of the Walnut-Tree, its Manner of raising for Timber, &c.

THE Kinds of Walnut Trees that we have in *England* are two, the one a very large Kind called the *French* Walnut, and the other a lesser, called the *English* Walnut.

OF these Kinds, the best for the Table is the *English*, its Kernels being much sweeter, firmer, and fuller, and Shell very thin; whereas the other, tho' very large, yet its Kernel is very small, in Respect to its

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its Size, and of a very watry Flavour ; nay, sometimes a Jelly only, and the Shell of a great Thickness : And indeed, some of the *English* Kinds have very thick Shells, and very small also ; but their Kernels are for the generality very firm and good, tho' difficult to get at. The best Kinds of Walnuts, are those whose Shells are very thin, and easy to crack, of a middling Size, that grow in a dry rich Loam, and enjoy a fresh drying Air in all their Parts.

BUT altho' the *French* Walnut is the least valuable for the Table, yet 'tis excellent for Pickling ; and the Tree produces fine Timber in a few Years, that is of great Value to Cabinet-makers, &c. for inlaying of Tables, Chairs, Looking-glass Frames, &c. This Kind of Walnut is very plenty in *Virginia*, as well as in *France* ; and 'tis a great pity that we don't propagate them in every Estate, where the Soil is natural to them, since they will prosper as well with us, as they do in their own native Country. At *Twickenham* Park in *Middlesex*, are divers planted, by that late Encourager of Planting and Gardening, the honourable *Thomas Vernon*, deceased, that are arriv'd to very great Statures in less than thirty Years from the Nuts.

THESE

THESE Kinds of Trees are propagated from their Nuts, which are to be planted as soon as ripe, or kept in Sand till the *March* following, and then planted out, as directed for the Chesnuts: But plant them when you will, great Care must be taken to preserve them from Mice, and other Vermin, lest they disappoint you of Success.

MR. *Evelyn* advises, that they be planted with their green Husks on, with Strewings of Furze cut small, to prevent their Access thereto; but if several Traps are set, whose making and setting are well known to Gardeners, they may be kept secure from them, without any kind of Danger.

MR. *Evelyn* recommends their being steep'd in Milk before they are planted; but if they are kept from the Air in Sand after gathering, or planted as soon as gather'd, according to Nature's own Method, they will thrive very well, and produce strong and healthy Plants: And here observe, that if 'tis possible, you must plant the Nut where 'tis design'd to remain, rather than to be sown in a Seed-bed, (as before directed) and afterwards transplanted into a Nursery for some Time, before they are planted out for good.

BOTH

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BOTH Kinds of Wallnuts thrive best in moderate, dry, rich Soils ; and Mr. *Evelyn* says, especially if it incline to a feeding Chalk or Marle, where 'tis protected from the Cold, though it affect Cold, rather than extream Heat, as in large Pits, Vallies, &c. nay, even in stony Grounds, and on Hills.

IF we plant entire Woods of them, they should be at fifty or sixty Feet Distance ; but in Meadows, Corn-fields, &c. a hundred Feet is near enough. Mr. *Evelyn* reports, that in *Burgundy*, where they abound, they are planted in their best Wheat Lands, at sixty Feet, and an hundred Feet apart ; nor do they injure their Crops, but rather keep them warm : In short, this Tree is of so great a Value in that Country, that when ever they fell an old or full grown Tree, they always plant another near thereto ; so that their Number is never diminished : And had the People of *England* observed the same Rule, of planting an Acorn when they felled an Oak, we might have had a continual Supply of Timber for our civil and naval Uses, which 'tis to be fear'd, we shall stand in very great need of, before sixty Years more are ended, if a timely Provision is not made, and that very speedily.

And

And since that the Strength and Glory of this Nation depends on our Ships of War and Commerce, what a Condition shall we be in, when our Woods are exhausted of their Timber, and we become oblig'd to other Nations for Timber to build our Ships with?

THIS being well consider'd, is sufficient to induce every *British* Subject to speedy Plantations of Timber Trees in general, and more especially, since that thereby they not only enable themselves with proper Materials for Defence, &c. but their Estates are vastly improv'd, to the great Advantages of themselves, and their Posterity after them.

IN the Management of Walnut Trees, we are to observe, first to preserve their leading Shoots at all Times; secondly, to displace their lateral Buds, as they appear in the Spring; and lastly, to preserve them from being injured by Cattle and Weeds whilst young.

THESE Trees are very proper for Avenues, Walks, &c. being planted at forty or fifty Feet distance in Lines, and the Lines double that distance from each other.

MR. *Evelyn* makes mention in his *Sylva*, Page 54. that the *Bergstas*, (which extends from *Heidelberg* to *Darmstadt*) is all planted with Walnuts, chiefly for their Ornament and Shade ; so as a Man may ride for many Miles about that Country under a continued Shade or Arbour, which in hot Seasons must undoubtedly be very refreshing to the Traveller, as well as diverting, when their Fruits are ripe. Now could we but once entertain such noble Spirits within us, how vastly it would improve the Glory and Wealth of the Nation in general ? That glorious Design (mention'd by Mr. *Evelyn*, in his following Page 55.) in *Henry* the Fourth's Time, of planting all the Highways of *France* with Elms, would have enrich'd and strength'd that Nation to a very great Degree, had not the rude and mischievous *Peasants* destroy'd their first Plantations, which caused the thorough Prosecution of the Design to be stopt, whereby the Roads of *France* continu'd naked. But had that Design been then executed, what a glorious Country would *France* have been by this Time ? Its own Hedge-rows, by the Way-Sides, would have produc'd such immense Quantities of valuable Tim-

ber for building of Ships, Forts, Castles, &c. that would have greatly added to the Strength and Wealth of that Nation. And since that the *British* Soils are as fertile as any in Christendom, we might, were we to plant our Hedge-rows in like Manner, soon arrive to the same, if not a greater Glory therein, and at little or no Expence in the Operation.

THE Smell of these Kinds of Trees is disagreeable to many, and so is the Smell of Violets, Pinks and Roses, which to the general Part of Mankind are delightful: But in *Ireland*, they are chiefly propagated for the agreeable Smell of their Leaves.

INDEED, when their Leaves fall in the Autumn, and putrify on the Ground, they do emit a Steam, which is disagreeable to many; but 'tis soon over, and therefore not worth our Notice. Mr. *Evelyn* reports, that the Juice of the fallen Leaves is obnoxious to their Roots; but for my Part, I cannot say any thing thereof: But this I know, that the Husks and Leaves being infus'd in warm Water, will destroy Worms in Grass-plots and Gravel-walks. And Mr. *Evelyn* says, that the Water of their Husks is sovereign against all pestilential Infecti-

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ons, and that of the Leaves, to cleanse and heal inveterate Ulcers. The green Husks or outward Shells being boil'd, make a very good dark yellow Dye, without any Mixture; and 'tis with this, that those Vagabonds, vulgarly call'd Gypsies, discolour their Skins, in Imitation of *Ægyptians*. 'Tis further added, by the aforesaid Gentleman, that their Leaves being distilled with Honey and Urine, and apply'd, causes Hair to grow in bald Places; which if true, would be very serviceable to Horse Dealers, who have Horses on their Hands, whose Knees are broken and batter'd by Falls, &c. and want Hair, to conceal those Faults from their Chaps.

THEIR Kernels produce a fine Oil, which in *Italy* is drank by the Country People when they are afflicted with Pains in their Sides, and gives them immediate Ease. Mr. *Evelyn* says, that one Bushel of Nuts will produce between seven or eight Pints of Oil, which the sooner 'tis drawn, is the more in Quantity; but the drier the Nut is, the better in Quality.

THE best Method of keeping Wallnuts, is to gather them when they are full ripe, in a dry Day; after which let them lye a Day

Day or two in a dry Place, being clean'd of their Husks, and rub'd very dry. Then put them into leaden Pots cover'd over, and bury them in the Ground, where the Rains or Wet cannot get at them, and they will keep the whole Year about.

WHEN you have not the Conveniency of leaden Pots to preserve them in, or should by Neglect suffer them to be very dry, and their Kernels shrivel'd, you must infuse their Kernels in very warm (but not scalding hot) Water, which will in a short Time cause them to swell as large as when first gathered, and their Taste be nearly the same.

IT is the Opinion of many, that these Sort of Trees thrive much better, when their Nuts are beaten off, than when gathered. But 'tis a Mistake, for instead of thriving better, they thrive less; but they are abundantly more fertile. This Fertility is caused by the several Wounds and Bruises that they receive in their Bark when thrashed, that hinder the Sap's free Passage; whereby 'tis much sooner inspissated into a glutinous Substance, fit for new Productions; then when the Sap Vessels are whole

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and entire, and abounds with a greater Plenty of fresh crude Sap.

IN *Italy*, they drive the Tops of their Poles that they thrash them with full of Nails, and Stubs of Iron, on purpose to gaul and break off the Bark, in thrashing off the Fruits ; which they believe to be an Improvement to their Trees.

MR. *Evelyn*, in his 55th Page of his *Sylva*, says, that a curious Friend of his observed, that the Sap of this Tree ascends and descends with the Sun's diurnal Course, (which it visibly slackens in the Night) and more plentifully at the Root, on the South Side, than on the North Side, notwithstanding that those Roots on the North Side were much larger.

By many of the preceding Experiments, I have proved, that Vegetables perspire most in the Day Time, and that proportionably to the Heat and Moisture of the Weather. I have also proved by the foregoing, that 'tis the Heat of the Morning that rarifies the Sap, and prepares it fit for Perspiration ; and that when the Cool of the Evening advances, the Sap is thereby condensed in its Vessels, whereby it recedes towards the Roots ; and at the same Time, to supply
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the Place of the rarified Sap, the Dews of the Night, and the Air also, are freely imbibed by the Vegetable: So that what Mr. Evelyn's Friend observed, on the rising and falling of the Sap diurnally, was no more than the Beginning and Ending of its diurnal Perspirations, and imbibing Force, when 'twas by the Cool of the Evening changed from a perspiring, to an imbibing State, & *contra*. And the Cause of the Sap's being in a greater Motion on the South Side, than on the North Side, proceeded from the different Degrees of Heat, that the South Side was exposed to, more than the North Side; for the greatest Heat demands the greatest Supply of Moisture to support the Perspiration of that Part of the Plant, and for want thereof, it often perishes. Now seeing that Plants perspire away their Sap, in all their several Parts, with Velocities equal to the several Expositions of their Parts; it therefore follows, that the North Part of Plants that are least exposed to the Sun, imbibe Moisture with a less Velocity than those of the South, which consequently causes their Growths to differ very much. But if the Sap of Vegetables did circulate, as Blood does in Animals, then by its Cir-

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culatation, the South Part of the Vegetable would be assisted by the Sap from the North Side, and consequently the Sap in the South Side would ascend with a Velocity equal to that of the North, &c. which it does not do: But more of this when I come to prove the Non-circulation of Sap.

THE Uses that we might apply this Beautiful Timber too, had we great Penty thereof, are almost endless. 'Tis now of great Use to the Gun-smith, to the Cabinet-maker, to the Joiner, &c. and had we Plenty thereof, we might wainscot our Rooms, after the beautiful Orders of Architecture, which would surpass all other Wainscoting whatever; and more especially, if 'twas judiciously mix'd with Cedar, Ebony, Manshaneel, Mohoggony, &c. its Surface being very beautiful when polish'd.

THE Manner of preparing this Timber for polishing, is to set it in a very dry Place, to be well dry'd before you work it, for it will shrink very much. Some Joiners will put it in an Oven, after the Bread is drawn out, for several Times, one after another, until it become very dry; others will place it in a dry House, and keep it a Year or
two

two before they work it, which I take to be much the best Way. However, use it which Way you will, it must be very well dry'd before 'tis work'd: And when 'tis work'd into its design'd Form, then they polish it over with its own Oil very hot, which gives it a pleasant shining Black, that is very beautiful.

THE most valuable Part of this Tree, is the very Heart or inward Parts thereof, both of Body and Roots; so that when these Trees are fell'd, great Care should be taken to preserve their large Roots, for 'tis oftentimes seen, that their Roots only are of greater Value, than all their Body and Branches together. But when these Trees are suffered to grow very old, as forty or fifty Years, 'tis very rare, that their Bodies ever fail of having a very beautiful Grain in their Hearts, which are the only Parts that are valuable to the Cabinet Maker.

THEIR Sap is useful for making of Gun-Stock, Chairs, Table-Frames, and other like Uses.

THESE Kind of Trees are sold by the Foot solid, as other Timber, but the Price is as uncertain, as the Quantity of Heart happens to be more or less. I have known

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a Walnut Tree, that contain'd about fifty solid Feet of Timber, whose Heart was very good, sold for twenty Pounds to a Timber Merchant, and afterwards to a Cabinet-maker, who undoubtedly had a Profit therein. And I have known others much larger, whose Hearts were very inconsiderable, sold for an eighth Part of the Money, at one Shilling *per* Foot; and at that very low Price they are as valuable to an Estate as Oak, Elm, &c. But when they happen to be of a fine Grain, and have good Store thereof, they are of an unknown Value.

I have seen some Ashen Trees, which have been full of large Knots, that were very beautiful in their Grains, and of great Value to the Cabinet Maker, but they are always accidental.

BEECH is oftentimes very beautiful in its Grain, and therefore is used by Cabinet-Makers for inlaying; and very often, they by washing it over with a Decoction of the green Husks of Walnuts, sell it for Walnut-Tree to those who are unacquainted therewith.

THIS Kind of Wood is of a very brittle Nature, and therefore must not be used
in

in Buildings, for Girders, Joists, Rafters, &c.

THE Season to fell this Tree, is *December*, at which Time they should be carefully grub'd, and not saw'd off at their Butts, as other Timber Trees are, except that the Buyer consents thereto.

C H A P. XII.

Of the Perspiration of the Lime-Tree, its Manner of raising, and planting in Avenues, Walks, Wildernesses, Groves, &c. and in Parks, Woods, &c. for Timber.

THE *Lime-Tree* is also called the *Linden-Tree*, of which there are two Kinds, the Male and the Female; the Male is of a slower Growth than the Female, its Leaves very small, somewhat like an Elm, but a harder Wood, very full of Knots, and a reddish Green. The Female Kind is of a much quicker Growth, producing Leaves of a much larger Size, and odoriferous Blossoms in the Spring, that perfume the Air, and support the industrious Bee with great Plenty of Food. About 70 Years ago

ago we receiv'd this Kind of Tree from *Flanders* and *Holland*, notwithstanding that, at the very same Time, our own Woods produc'd them spontaneously; such has been our Folly, to value the Product of foreign Countries, and to neglect that of our own, which in many Respects is vastly superior to them!

BOTH these Kinds are raised from Seed, or by Layers and Suckers, slipped off from the Roots of the old Trees. The Soil that they delight in, is a rich moist Loam, with a strong holding Bottom; but not a Clay, which is of too cold and wet a Nature, that chills and rots their Roots; and on the contrary, a Sand is of too hot and dry a Nature, which starves their Roots. And some Loams that are of a sandy or gravelly dry Nature, are also too hot, causing them to shoot out very early in the *Spring*, and to drop their Leaves, or turn yellow about *Midsummer*, whereby their Beauty is soon over.

THEIR Seeds are ripe, and fit for gathering about the End of *October* or the Beginning of *November*, at which Time they may be sown in a Seed-Bed as Heithorns, or preserv'd in Sand until the *February* following, and

and then sowed in Beds, as before directed, wherein they must remain two Years; after which transplant them into a Nursery, as directed for the *English Elm*. But if you increase them by Layers, the usual Season to lay them down is *February*; but I must confess, that the Fall of the Leaf is much the better Time; for when their tender Shoots are laid in the Earth so very early, they have a much longer Time to imbibe the Juices thereof, and prepare themselves to strike Roots with much greater Vigour, than when laid down in *February*, and oftentimes attended with dry Weather in the *March* following.

THEIR Distances that they should be planted at, in grand Avenues, Walks, Groves, &c. is from thirty five to forty Feet, but in Avenues, that are less noble, they may be at thirty, twenty five, or twenty Feet. And in single Walks in a Wilderness, at sixteen Feet, in Groves at ten or twelve.

THESE Trees make very beautiful close Hedges, and very soon, being planted at about five or six Feet apart, or nearer, if 'tis required, to make a full Hedge at once. At which Time 'tis best to plant Plants of
two

two Sizes, the one very low, to thicken at the Bottom, and the other something taller. But observe, to reduce their Heads proportionably to their Quantity of Roots, as directed in the preceding Lectures; To cut away all the capillary Roots that they are attended with, which being generally very much matted together, prevent the Earth from closing to their fibrous Roots, and thereby often perish: To close the Earth very carefully about every Root, to prune them with a sharp Knife, to cut away all Parts bruised by the Spade in taking up, and to plant them as soon as possible, after being taken out of the Nursery. The best Sizes are those about two or three Inches Diameter; or if they are larger as four or five Inches, they will do very well, provided that they are well rooted. I have planted Trees of this Kind, and of *English* Elms also, that have been eighteen Inches Diameter at their Butts, that have thriv'd very well.

THE Season to plant this Tree is, at the general Fall of the Leaf, in *October* or *November*, at which Time you must secure them from the Injuries of Winds, Beasts, and worser Creatures, that take Pleasure in de-

destroying young Plantations. Their Bark is easily cut, by Boys in Play; and therefore, as they are our chief Ornaments for Espaliers, or Skreens before our Doors, to protect us from the Sun, Dust, Winds, &c. we should, whilst they are young, defend them, by large Trunks, placed at such Distances, as to admit the Air's free Circulation, and their Bodies to dilate.

THE Shoots of this Tree are of a beautiful Red, and very pliable, so as to cover Arbours, shady Walks, &c. in a short Time, that produce a very pleasant and agreeable Shade. And Mr. *Evelyn* says, That the sweet Odour of their Blossoms, is admirably prevalent against the Epilepsy, that is the falling Sickness; and therefore recommends their being planted before every one's Door, as well in the City as Country; and were the broad Streets of *London*, as the *Hay-market*, *Pell-mell*, *Strand*, *Fleet-street*, *Holbourn*, *Cheapside*, &c. planted with these Trees, at about eight Feet Distance from the Houses, on the inward Edges of the Kennels, and kept neatly cut in Espaliers, or Pyraments, nothing would be more delightful and entertaining; Then might we view a City in a Wood.

Stat

*Stat Philyra ; haud omnes formosior altera surgit
Inter Hamadryades ; Mollissima, candida, laevis,
Et viridante comâ, & bene olenti flore superba,
Spargit odoratam latè atque æqualiter umbram.*

Coulei L. 6. Pl.

*The stately Lime, smooth, gentle, streight, and
fair,*

(With which no other Dryad may compare)

*With verdant Locks, and fragrant Blossoms deckt,
Does a large, ev'n, odorate Shade project.*

THE Timber of this Tree, is vastly useful to the Carver, Cabinet-maker, Heel-maker, &c. and therefore in some proper Part of our Lands, we should make Plantations thereof, exclusive of Avenues, Walks, &c. for felling, when arriv'd to a sufficient Stature, which between thirty and forty Years never fail to produce.

C H A P. XIII.

Of the Perspiration of the Service Tree, its Manner of raising and planting in Avenues, Walks, Groves, Pastures, &c.

WE have two Kinds of *Service* in *England*, the one called *Torminalis*, which is that as is most frequent among us; and the other, that bears its Fruits something like a very small Pear, very plentiful in *France*, where 'tis called *Cormier*: Whose Leaves are narrower, and less indented.

THESE Kinds of Trees are raised from their Seed, or Suckers.

THEIR Seeds are ripe in *October*, at which Time, mixing them with dry Sand, rub off their Pulps; and afterwards being dried in the Sun, keep them in Sand until the Spring following, and then sow them in Seed-beds, as directed for the Beech-Mast in the preceding Lectures. They should remain in the Seed-beds for the Space of two Years, during all which Time, you

L

must

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must be sure to keep them clean from Weeds, and moisten'd in very hot and dry Seasons.

THE Soil that they delight to grow in, is a good strong Loam, rather cold than hot. The Distances that they should be planted at in the Nursery, is the same (and in the same Manner) as directed for the Walnut, and other Trees, in the preceding Chapters.

THESE Trees do oftentimes arrive to great Statures, and therefore may be planted in Avenues, Walks, &c. as the Lime, *Platanus*, &c. or in Woods for their Timber, which is of very great Value to the Joiner, to the Engraver, to the Gunsmith, to the Turner, and even to the Mill-wrights, and Carpenters. 'Tis a Wood of a very great Duration, and being rubb'd over with Linseed Oil, looks very beautiful. 'Tis of a very fine Grain, and with Staining, may be made to counterfeit Ebony, and many other curious Woods.

THE Fruits are ripe in *October*, but they are gathered in the End of *September*, when the Weather is dry, or otherwise they are apt to grow mouldy, before they are eatable, which is when they are (as it were) rotten, like unto Medlars.

THIS

THIS Tree affords a very agreeable Shelter to Cattle, and does very little Hurt to the Grass that grows under its Drip; so that we may plant them in our Pasture Grounds, to their very great Improvement.

THE Distances that they should be planted at in Pasture Grounds, is about fifty or sixty Feet from each other; and if they are planted out when young, and kept clean from Weeds, and moist in very dry Seasons, they will arrive to very large Statures in a few Years Time; for when Trees are planted out young, and have a free circulating Air about them, so as to perspire freely, they never fail of Success, provided that the Soil is natural to them, and they are under the Government of a judicious and careful Guardian.

THESE Fruits may be improved by Budding or Grafting; and indeed 'tis much the best Way; for Nature is as wanton in these Productions, as in others; and 'tis very rarely that we have a Fruit raised from the Seed, so good as the Mother Plant. Indeed 'tis sometimes found, that from Seedlings we have some Kinds that are much better; but 'tis very rarely that it happens so. Therefore that we may not be

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deceived by their degenerating Qualities, 'tis best to bud, or graft all those Trees that we design to propagate for their Fruits, with Kinds that we know to be good; which will cause them to produce Fruits very early, and in great Abundance.

C H A P. XIV.

*Of the Perspiration of the Maple Tree:
Its Manner of raising in Woods, Wild-
dernesses, Avenues, Walks, Hedges, &c.*

THE Kinds of Maple that we have in *England* are many; but the most valuable are the *French* Maple, and the Peacocks Tail Mapple; which last is that Kind so elegantly undulated, and turned into Variety of Curls. These Kinds are very beautiful in their Leaves, and were by the Ancients esteem'd at a very high Rate.

THEY are all propagated from their Keys, in the very same Manner as the Ash, or by Suckers or Layers: And the Soil that they delight in, is a sound and dryish Loam, and therefore they are very proper for deep dry Lands, or Banks.

THEIR

THEIR Keys remain in the Seed-bed, until the second Spring; at which Time, if they are kept clean from Weeds, they will come up very strongly, and become good Plants in a short Time, being transplanted therefrom, at the End of two Years, into a Nursery, as directed for Elms, Limes, &c.

THESE Sorts of Maple make good Hedges in a Garden, Wilderness, &c. where nothing else will live. They also thrive exceedingly under the Drip of any Sort of Tree whatever; and therefore are a very good Furniture for the Quarters and Hedges of a Wilderness. But there are few or any Trees or Shrubs care to grow under their Drip, or rather can live under their Shade; for they being of a very strong, attracting, ravenous Nature, something like the Ash, draw away the greatest Part of the Moisture, and starve the other Plants, especially those, whose Roots run shallow. But Forest Trees, whose Roots are deeper than theirs, are not injured thereby.

IF we plant these Trees in Woods, and keep them dressed to straight Bodies, they will soon become very large, and valuable to their Owners.

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THE Timber of these Trees, is of greater Value than Beech or Elm to Joiners, for the inlayings of Floors, Sounding-boards, Pannelling, &c. And especially when its Knots are delicately diapred.

'Tis also of very great Service for many other Uses, as Knife-Handles, Cups, Musical Instruments, &c.

Pliny seems to value the Maple at a very high Rate, as may be seen by his Report thereof, as following.

Acer Operum elegantia & subtilitate Cedro secundum ; plura ejus genera : Album, quod præcipui candoris vocatur Gallicum.

In Transpadanâ Italiâ, transque Alpes nascens. Alterum genus crispo macularum discursu, qui cum excellentior fuit à similitudine caudæ pavonum nomen accepit.

' THE Maple, for the Elegancy and Finess of the Wood, is next to the Cedar
' it self: There are several Kinds of it, especially the White, which is wonderfully
' beautiful: This is called the *French Maple*, and grows on that Part of *Italy*,
' that is on the other Side of the *Po* beyond the *Alps*: The other has a curled
' Grain, so curiously maculated, that from

‘ a near Resemblance, it was usually called
‘ the Peacock’s Tail, &c.

BESIDES these two Kinds, *Pliny* makes mention of two others, in his sixteenth Book, Chap. xvi. The one he calls the *Bruscum* Maple, and the other the *Molluscum*.

HIS Account thereof is as followeth.

*Pulcherrimum vero est Bruscum multo-
que excellentius, etiamnum Molluscum tu-
ber utrumque arboris ejus Bruscum intor-
tius crispum. Molluscum simplicius spar-
sum; & si Magnitudinem mensarum caperet,
haud dubiè præferreter Cedro, nunc intrà
pugillares, lectorumque filicios aut laminas,
&c. & Brusco fiunt mensæ nigrescentes.*

‘ THE *Bruscum* or *Knur* is wonderful fair,
‘ but the *Molluscum* is accounted more
‘ precious; both of them producing Knobs,
‘ or Swellings out of the Tree. The *Brus-*
‘ *cum* is more intricately crisped; the *Mol-*
‘ *luscum* not so much; and had we Trees
‘ large enough to saw into Planks for Ta-
‘ bles, ’twould be preferred before *Cedar*
‘ or *Citron*, (for so some Copies read it) but
‘ now they use it only for small Table Books,
‘ and with its thin Boards to wainscot Bed-
‘ Testers, &c. The *Bruscum* is of a blackish

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‘ Kind, with which they make Tables.
Thus far our antient *Italian* Author.

MR. *Evelyn* reports, that *Cicero* paid ten thousand Sesterces for one Table of this Wood, and that King *Juba*, fifteen thousand. And that he has read of another that was valued at 14000 H. S. which at about three Pence Sterling each, amounts to 1750 Pounds ; and yet that of the *Mauritanian Ptolomie*, that was four Feet and half Diameter, and three Inches in Thickness, was far richer, which is reported to be sold for its Weight in Gold. ‘ Of that
‘ Value they were, and so madly luxurious
‘ the Age, that when they at any Time reproached their Wives, for their wanton
‘ Expensiveness in Pearl, and other rich Trifles, they were wont to retort, and turn
‘ the Tables upon their Husbands.

THESE Trees will undoubtedly arrive to very large Statures, if they are well managed, as before directed, and not made Pollards, by the loss of their Heads, which spoils Timber Trees in general.

AND if we observe how *Virgil* made Choice of one of these Trees for the Court of his *Evander*, one of the worthiest Princes in the best of Poems, sitting in his Maple

ple Throne; we may from thence assure our selves, that in those Days they were of great Statures.

AND when he brings *Æneas* into the royal Cottage, he makes him this memorable Complement: Greater, says the great *Cowley*, than ever was yet spoken at the *Escorial*, the *Louvre*, or *Whitehall*.

—— *Hæc (inquit) limina Victor
Alcides——*

*This humble Roof, this rustick Court, said he,
Receiv'd Alcides crown'd with Victory:
Scorn not (great Guest) the Steps where he has trod,
But Wealth contemn, and imitate a God.*

N. B. THE Time for cutting, or felling this Tree, is *December* or *January*.

C H A P. XV.

*Of the Sycamore, its Manner of raising for
Timber, in Parks, Woods, &c.*

THE Sycamore, or the *Acer majus*, is encreased by the Layer or Keys, sown and order'd, as the *Acer minus*, or
Maple.

Maple. 'Tis a Tree of a very quick Growth, when the Soil is natural to it, which is a light and dry (rather than a wet and cold) Loam.

THE Timber of this Tree is very serviceable to the Turner, Wheel-wright, Saddlers, &c. and 'tis very beautiful, when mix'd with other Forest Trees, in the Quarters of a Wilderness.

BESIDES this common Kind, there is another, whose Leaves are variegated, that are very beautiful in a Wilderness, as afore-said: But both these Kinds are very much attended by *Flies* in Summer Evenings, which has often occasioned their Removal from the Hedge-lines of Walks, into the middle of large Quarters, where they have a fine Effect, and at a sufficient Distance from being offensive.

MR. *Evelyn* consents to their Banishment from all curious Gardens, because that their Leaves, in very hot and dry Seasons, fall very early, and turn to *Mucilage*, and putrify, with the first Rain that falls, so as they contaminate and spoil our Walks: And indeed, so will the Leaves of a great many other curious Forrest Trees, if they are suffered to remain on the Ground when fallen:

But

But in our curious Gardens, we always take Care to cleanse away all kinds of Leaves as they fall, so that they are never offensive. But when they are planted in the middle of large Quarters, as before directed; their Leaves cannot be offensive, tho' never taken away.

IN most Estates, there are dry hilly Lands, wherein few other Kinds of Forest Trees will live; and this kind will thrive very well, and become good Timber in a few Years Time, whereby those Lands may be greatly improved. The Distances, Time, and Manner of planting is the same as of the Maple.

C H A P. XVI.

Of the Hornbeam-Tree, its Manner of raising for Timber in Coppices, Woods, Parks, &c.

THE Hornbeam is raised from Seed sown in *August* or *September*, which is the Time of its Maturity; but it will not come up, until the second Spring after sowing.

IT is the Practice of many, to keep the Seed the first Year in Sand, and to sow it the second *February* after gathering. But I do not approve thereof so well, as to sow it immediately after gathering, when 'tis always imbibing those Juices that are at its Spring, to be the Support and Nourishment thereof: But this Reason has already been declared more at large in the preceding Chapters.

BUT for those that are desirous to get what Time they possibly can, they may be furnish'd with young Sets of Nature's own Produce from the Woods; by which Means, three or four Years may be gain'd.

THIS Tree, like the preceding, delights to grow in barren Lands; but with this Difference, that they are rather cold and exposed, than hot and dry.

THE Manner of Pruning and Planting this Tree when young, and its ordering in a Nursery, is the same as of the Elm, Lime, &c.

AMONGST all the Forest Trees that are received in the Garden, there's none makes a more beautiful Hedge than the Hornbeam; provided that 'tis not planted too thick, and that it be young and healthy at planting.

The

The best Plants for these Purposes, are those of two or three Years Growth in the Wood, or Seed-bed, being pruned in their Heads, to about six Inches in Length, and the like of their tap Roots.

THE Distance from each other in the Hedge-lines should be never less than nine Inches, nor more than one Foot, and each Hedge to consist but of one single Row only.

IT has been, and is still the Practice of many, to plant Hedges with double, and oftentimes treble Lines, in order to make them thick ; but they do never prosper so well as the single lined Hedges, and therefore not to be practised. The Perspiration of Vegetables being considered, we may from thence very easily account for the Reasons, why single-lin'd Hedges thrive better, and make a Hedge sooner, than those that are double, or treble planted.

IT has been also practised by many, to plant very large Plants from the Woods, for Hedges, and oftentimes from Nurseries, wherein they have stood very close to each other ; and so for want of a free drying Air at their Bottoms, their lower Branches have perished, by being saturated with crude Sap,

Sap, for want of Perspiration, in Hopes of having good Hedges in a short Time, which they never make; for altho' their lower Parts are fully exposed to a free Air, when transplanted out; yet their Bark is of a very hard Nature, and their Growth none of the quickest: 'Tis seldom seen that they thicken at their Bottoms, so as to make a full and handsome Hedge; and therefore it is, that they are, after three or four Years Growth, cut down, within nine Inches, or a Foot from the Ground, to cause them to thicken from the Bottom, as they advance in Height.

Now from hence it appears, that to plant very large Sets from the Woods or Nurseries; that is, such that are five or six Feet high, we must either be contented with imperfect Hedges, or lose three or four Years of our Life, by cutting them down as aforesaid; but if we will have but a little Patience, and plant the young Sets of two or three Years Growth, as before directed, we may assure our selves of having very fine Hedges, in four or five Years Time, that will ever after be very close and beautiful in all their Parts.

IT may be said by some, who have not the Knowledge of the imbibing Natures, and Perspirations of Vegetables, that Hedges of this Nature, that are thin at their Bottoms, may be thicken'd, by planting of lower Plants between them; but 'tis a Mistake, that will not do; for when hot and dry Seasons happen, then those small Plants at the Bottom, being over-cover'd with the tall Plants, cannot perspire freely, and receive Nourishment from the Dews; and again, their Roots being very shallow, and lesser than those of the high Plants, they have not an equal Power to attract Nourishment to them, and thereby soon perish.

IN the Gardens of the Right Honourable the Earl of *Strafford*, at *Twickenham* in *Middlesex*, are many beautiful Hedges of this Plant; some of which are upwards of twenty Feet high, whose uncommon Beauty and Stature is in great Measure due to the extraordinary Skill and Management of that ingenious and well experienc'd Gardener, Mr. *John Wyat*, Gardener to that Honourable and truly Noble Lord.

AND in the adjacent Gardens of the Honourable Mr. Secretary *Johnston*, there
I
are

are likewise some beautiful Hedges of this Plant, whose graceful Aspect does also declare the extraordinary Knowledge of their late Governour Mr. *John Lee* Senior, whom I take the Liberty to recommend for one of the most skilful and universally experienced Gardeners in *England*.

THAT pleasant and most delightful Seat of *Twickenham* Park, hath its beautiful Gardens embellish'd with Hedges of Hornbeam, which I planted but few Years ago, from the Seed-Beds, as before advis'd, which by the indefatigable Care of the ingenious Mr. *Henry Timberlin*, Gardener to the Honourable Mrs. *Vernon* of that Place, are now become very great Ornaments to those Gardens.

AND, besides these aforesaid Gardens, there are many others that are enrich'd with beautiful Hedges of this Kind, which are sufficient Testimonials of their great Use and Beauty: And therefore I need take no further Pains to recommend the Propagation thereof for Shade in Gardens, &c.

*In tractus longos facilis tibi Carpinus ibit,
 Mille per errores, indeprebensosque recessus,
 Et molles tendens secto seu pariete ramos,
 Præbebit viridem diverso è margine scenam.
 Primus honos illi quondam, post aditus ordo est,
 Attonseque comæ, & formis quæsitæ voluptas
 Innumeris, furtoque viæ, obliquoque recessu:
 In tractus acta est longos, & opaca vireta.
 Quinetiam egregiæ tendens umbracula frondis
 Temperat arduos ramis ingentibus æstus.*

Rapin.

*In Walks the Horn-beam stands, or in a Maze,
 Through Thousand self-entangling Labyrinths strays;
 So clasp the Branches copp'd on either Side,
 As though an Alley did two Walks divide:
 This Beauty found, Order did next adorn
 The Boughs into a Thousand Figures shorn;
 Which pleasing Objects Weariness betray'd,
 Your Feet into a Wilderiness convey'd.
 Nor Better Leaf on twining Arbor spread,
 Against the scorching Sun to shield your Head.*

THE Hornbeam is a Tree of middling Growth, but oftentimes arrives to a large Stature; its Timber is of great Use to the Mill-wright, for Coggs to his Wheels, as well as to the Turner, Carpenter and Joiner; and for Fire-Wood there's none bet-

162 *Of the Quick-beam.*

ter. It burns like a Candle, and (as Mr. Evelyn reports) was of old so employed;

Carpinus tædas fissa facesque dabit.

To have Plantations of this Timber come to Maturity in the shortest Time, we must plant them out at twenty or twenty five Feet Distance from the Seed-beds, as before directed for the Hedges, being annually kept clean from Weeds, and defended from Cattle, as before directed for Oaks, Elms, &c.

CHAP. XVII.

Of the Quick-beam, or Witcher Tree.

THE *Quick-beam*, or *Witcher-tree*, is also called wicky and *Spanish Ash*, it being a Species of wild Ash: 'Tis a Tree of a quick Growth, rises to a reasonable Stature, grows very streight and slender, when planted very close together, as all other Trees will do: But if it enjoys a free open Air, it will become very thick, and

3 produce

produce good Timber in twenty five or thirty Years Time.

'TIS a Plant that will grow as well on the Mountains, as in Woods, provided that the Soil be not over strong and cold, for it delights in light mellow Lands.

THE Manner of propagating this Plant, is the same as of the Ash, by sowing its Berries which ripen in the Autumn, as I directed the sowing of Ashen Keys.

THE Timber is of great Service to the Wheeler, (it having but very little Sap in it) as also to the Husband-man for Tools, &c. and 'tis very good Fuel.

THE Leaves of this Tree are very like those of the common Ash, but something smaller; and therefore I believe they are called by the Name of the *Spanish* Ash.

IN the Spring the Trees make a glorious Appearance, with their fine Clusters of Blossoms, which produce a grateful Scent, and afterwards beautiful red Berries, that are tempting Baits for Black-birds, Thrushes, &c. Who are very pleasant Companions in a delightful Wilderness; and 'tis therefore that I recommend their Planting in all such rural Parts of our Gardens.

C H A P. XVIII.

Of the Hazel, its Manner of raising in Coppices, &c.

THE *Hazel*, or *Wild-Nut*, is raised from the Nuts, which may be sown in a light Soil as soon as fully ripe, or they may be kept in Sand until *February* following, and then sown; which I rather recommend, because that sometimes they are destroy'd by hard Frosts.

THEY are also increased by Suckers, as *Virgil* observes.

Plantis & duræ Coryli nascuntur.

Georg. 2.

Hazels from Sets and Suckers take.

THE best Manner of sowing the Nuts, is in a Seed-bed well prepared and made mellow; from whence they may be transplanted, at two or three Years end; but if we would make our Plantations immediately with Suckers, we must make Choice of such as are well rooted, and about the Size of a large Reed.

THE

THE sooner your Suckers are planted after taking up, the better, at which Time their Heads must be prun'd, within five or six Inches of their Roots.

THEY delight in cold, barren, dry and sandy Lands, and the best Time to plant them is in *November* or *December* : Their Distances are the same as Ash, Oak, and other Coppice-Woods.

THE usual Time before the first Felling is ten or twelve Years, and sometimes sooner, according as the Nature of the Land agrees with them.

THE second, and all other Fellings, are generally every six or seven Years.

THIS Wood is very serviceable to the Publick in many Uses, as for Hoops, Hurdles, Poles, &c. and makes a very great Return to the Owner.

C H A P. XIX.

Of Fir, and Pine Trees, their Manner of raising for Timber in Parks, Woods, &c.

THE several Sorts of *Fir* that we have in *England* are the *Scots Fir*, the *Silver Fir*, the *Spruce Fir*, and the

Norway Fir; but the most likely for our Purpose is the *Scots Fir*, which in *Scotland* is very plenty, and of great Statures, fit for many Uses in Buildings, as well for Pipes to convey Water for the Service of Cities, Towns, &c. and in *Devonshire* there are many Firs of this Kind which are very large, raised from their Seed by a Gentleman now living in those Parts, who has assured me, that they are a very great Improvement to his Estate, and may now be felled for the Use of Builders: Therefore, as their Growth is so very quick, as to be fit for Building-Use in twenty five or thirty Years Growth, and their Use so very great, I am in Hopes, that our *English* Gentlemen will speedily make large Plantations thereof, since they thrive with great Celerity, where few or any other Kind of Trees will grow.

THE Soils that they are observed to thrive best in, are moist and barren Gravels, strong Loams, and indeed any other Soil that is not over sandy and dry.

THEY are raised from their Seeds, which ripen in their Cones, which are taken from thence, by soaking them in warm Water, until they open, or by exposing them to a gentle Fire.

THE Season to sow them is *March* ; and best when in a North East Border, that they be but little exposed to the scorching Heat of the Summer.

THE Mould should be very mellow, and the Seeds sown therein, at about three or four Inches apart, should be cover'd about half an Inch thick with fine Mould. When they come up, be careful in preserving them from the Birds ; and when they are about two Inches high, earth them up with fine Mould, within half an Inch of their Tops. This Earthing will very much contribute to their Growth. When they have stood two or three Years in the Seed-bed, you may remove them into the Nursery, (but much better to the Places where they are intended to grow for Timber) for they, no more than the Pine, delight in often transplanting ; and therefore, if they were to be sown in the Places where they are to remain, 'twould be much the better Way, when it can be done. For the first five or six Years, they do not thrive so fast, as they will in two Years after, when they have gotten good Roots in the Earth. It will be necessary to disbud their lateral Buds as

they appear, and to preserve their leading Shoots with all the Care imaginable.

THEIR Distances in single Lines may be ten or twelve Feet, and in Woods, &c. about fifteen or twenty.

THE best Season to transplant these Trees, is in *July* or *August*, as directed in my new Principles, *Page 46*. But beware of Mixtures of Dung or rich Earth.

IF your Land is very stiff, then you may allay the Stiffness, with a moderate Mixture of Sand ; but at all other Times, Sand must be omitted.

N. B. THAT the Pine is ordered in every Respect as the Fir, the sowing of the Seeds excepted, which may be covered an Inch and half, instead of half an Inch, as of the Fir Seed.

Now in Consideration, that the Propagation of these Trees are very easy and pleasant, their Growth very quick, that they affect Soils, where no other Tree will thrive, their very great Use, their perpetual Verdure, and Ornament to an Estate, I am in hopes that our *British* Nobility, will be easily induced to make large Plantations thereof, with all convenient Speed,

whereby their Estates that are now of very little Value, will be greatly improved.

C H A P. XIX.

Of the AQUATICKS, viz.

The Poplar, Aspen, Abeal, Alder, Withy Sallow, Ozier, and Willow.

THERE be several Kinds of Poplars growing in *England*; but the most common is the white Poplar; they are in general propagated from Suckers, which rise in great abundance, as far as their Roots extend. And I have known great Quantities produced by Chips only, where the Trees have been hew'd after felling, and were never known to grow there before. The Soils that they delight in, are those that are moist and boggy, by the Sides of Rivers, &c. and in moist fertile Loams. They may be also encreased by planting large Cuttings or Trunchions, about three or four Feet long, being buried within six or eight Inches of their Tops. The Distances of planting these large Cuttings, or Suckers well rooted,

rooted, may be about three or four Feet, when they are intended for Coppice Wood ; but if we intend them for Timber, their Distances should be twelve or fifteen Feet.

N. B. THAT altho' I have directed the burying of the large Cuttings, within six or eight Inches of their Tops, yet it is to be noted, that they are to be laid sloping into the Earth, and not drive down perpendicularly, as is commonly done by the unskilful. And again, when we are to make Plantations of Suckers, we should take Care to plant them as shallow as possible.

PLANTATIONS thus made, being kept clean from Weeds, and their lateral Buds displaced, as has been hitherto often advised, will in sixteen or eighteen Years Time become good Timber, provided that their leading Shoots have been carefully preserv'd, which must be always done, when we intend to have good Timber.

THE black Poplar, is naturally a stronger and taller Tree than the white, and more scarce ; 'tis propagated as the white ; but seldom permitted to grow any otherwise than Pollards, or seven, eight, or nine Feet high, which are lopp'd every second or third Year. The Soil is the same as for the white.

N. B.

N. B. THAT the white Poplar before described, is not the Abeal, which is a Poplar also, with Leaves that are much larger than the preceding white, as well as its Growth; but the Form of the Leaves are much the same.

THE Abeal is increased as the preceding, and delights in the same Soil; but it arrives to a very large and high Stature in fewer Years.

THE Tulip Tree, so much famed for its beautiful Flowers, that are produc'd in Form like unto a Tulip, is said by Mr. *Evelyn* to be a Poplar, brought from *Virginia*, by an ingenious Lover of Planting and Gardening, Mr. *John Tradescant*; which may be encreased from its Seed, or by Layers. *Vide*, my *New Principles*, Page 168.

THE Aspen is also a white Poplar; but its Leaves are much smaller than the smallest of the preceding, and being more tremulous, are therefore compared to the Tongues of many of the fair Sex. This Kind of Poplar delights best in Soils that are something deep, because its Roots are more pendant than either of the foregoing.

BESIDES the many Services that all these preceding Poplars are of, for Park-pailing,
Household

Household Uses, to the Turner, Wheelwright, &c. They are very hospitable Trees, for any thing grows very well under their Drip, and their Shade is very kindly to Cattle in the Heat of Summer.

BUT their Loppings for Fuel, I cannot any wise recommend, the Quantity of Sulphur contained therein being very little, and their Sap abounding with great Quantities of Water; they therefore moulder away, and cannot maintain solid Heat, as other Woods will do, that have their Principles more stored with Sulphur, and less with Water.

THE very quick Growth of the Abeal, recommends its being planted in naked and unshelter'd Places, where immediate Shade is required, and would, (as Mr. *Evelyn* observes) put a Guise of Antiquity upon any new Inclosure, since its Growth is so very quick, that whilst a Gentleman makes a Voyage of three or four Years, his House and Lands may be so cover'd, as to be scarcely known at his Return.

THE Alder is also a very advantageous Aquatick, and will thrive very well in Lands that are too wet for the Poplars, of which many Estates abound.

THE Manner of increasing this Plant, is by planting large Cuttings or Trunchions thereof in the Spring, as before directed for the Poplars, at about three Feet distance.

BUT 'tis always the best Way to lay the Cuttings in Water, for the Space of two Days before they are planted, and that their Bark is not bruised or stripp'd at planting, by thrusting their Ends in the Earth, which to prevent, 'tis best to let them in with an Iron Crow, and afterwards with fine Earth to close up the Holes very firm about them.

THIS Sort of Wood will lie a great many Years under Water, or Earth being always wet ; and therefore is very useful in Water-works, as Sluces, Mills, &c. 'Tis also of great Use to the Pattin and Clog-maker, Heel-maker, and Turner. Its Coal helps to make Gun-powder, and the Bark is very useful to the Dyers : In brief, its Uses are very many, and therefore well worth our Notice.

MR. *Evelyn* say, that of old, they built their Boats with the largest Parts of these Trees ; and *Noah's* Ark excepted, the first Boats we read of were made of Alder.

Tunc alnos primum fluvii sensere cavatas,

Georg. 1.

When hollow Alders first the Waters try'd,

*Nec non & torrentem undam levis innatat alnus
Missa Pado.—*

Georg. 2.

And down the rapid Poe light Alders glide.

Vitruvius recommends this Tree, to be used in all Sorts of Foundations that are constantly wet, where it becomes as hard as Stone; and says, that the Morasses about *Revanna* in *Italy* were piled with this Timber, to superstruct upon.

AND Mr. *Evelyn* says, that at the famous Bridge at *Venice*, the *Rial* too, which passes over the grand Canal, they used great Quantities of this Wood.

THE small Wood is of great Service in draining of wet boggy Lands, being buried in Trenches; but where good Store of Brick-bats, Tyle-sheds, large Pebbles, &c. can be had, they are much the better of the two.

THE next in Order of these Aquaticks, are the Withy's, of which we have two Kinds, *viz.* the *Greek* or red Withy, which
is

is of a very tough Nature, and therefore very useful in binding; and the hoary or white Withy, which is of a more brittle Nature.

THE red Withy commonly arrives to a very great Stature, and its Roots extend themselves much deeper, than either Salley or Willow; for which Reason, they should be allow'd the Distances of fifteen Feet at the least, and they delight more on the tops of high Banks by River Sides, than in the Water. Their Growths are much flowea than the Salleys, which delight to grow within the reach of the Water, and in very moorish or flat Lands, that are unfit for either Ploughing or Meadow.

BUT we have three Kinds of Salleys, the one called the Hopping Salley, delighting (as aforesaid) in spewy wet Lands, and grows with great Celerity. The second Kind delights in Banks that are more dry (as the Withy) as also does the third Kind, whose Colour is different from both the others, having a reddish Bark, with Leaves of a darker green, of a lesser Length, very brittle when young, but more tough when largely grown.

OF these several Kinds, the first mentioned is the best, as well for quick Return, as Use, to the Husband-man, for Rake-Staves, Fork-Staves, and other Utenfils of like Nature, which they produce at the End of four Years Growth, (being cropped the second and third).

THE Manner of planting all these Kinds, is the same as of the Poplars, excepting their Lengths above Ground, which may be from one, to six, seven, or eight Feet, which great Heights are often used, to avoid the biting of Cattle; but the best Shoots are produced from those Sets, that were about one Foot, or eighteen Inches above Ground, when planted: The Time of planting is *December* and *January*.

THE Distances that these Salleys should be planted from one another, must be according to the Nature of the Soil wherein they are planted. If the Soil is very fat and moist, we may allow them six or seven Feet Distance, but in Lands less furnish'd with Goodness and Moisture, five or six Feet.

AND altho' this Kind of Salley delights in much Moisture, yet 'tis observ'd to thrive better, when at some Distance from
the

the Water, as a Foot or two, than when altogether immerfed therein.

EVERY Plant thus planted, will, at the End of three Years, produce fifteen or twenty Staves, each about eight or nine Feet in Length, that will turn to a very great Account in the Market.

THE Season to cut them for Use is the Autumn, but for Fuel in the Spring. The Coal of Salley being of a foft free Nature, is therefore very useful to Painters, in drawing the Out-lines of their Works, instead of Black-lead Pencils, &c.

OZIERs are distinguish'd from *Salleys*, as *Salleys* are from *Withies*, being proportionably leffer, of a shorter Duration, and requires a more constant Moisture.

THE various Kinds of Oziers are almost endless; but the most known and useful I will describe.

WE have three common Sorts, of which one is very like the Salley, but very brittle; another Kind is that which produces a very slender Leaf, with limber green Shoots, called the *Perch Ozier*, and the third Sort is in its Leaf exactly like the second, but the Shoots are more yellowish and less

N

green,

green, and of a very tough and hardy Nature.

THE Basket-Makers distinguish the several Kinds of Oziers, by the Names of *Hard Gelster*, *Horse Gelster*, *Whyning*, or *Shrivell'd Gelster*, *Black Gelster*; the *hard* and *soft Golston*, the *sharp* and *slender Top'd yellow Golston*, the *fine Golston*: To which may be added the *yellow Ozier*, the *green Ozier*, the *Snake* or *speckled Ozier*, the *Swallow-Tayl*, the *Spaniard*, the *Flanders Willow*, the *white Willow*, and the *Golden Yellow*.

THE Season for planting either of these Kinds, is *December* or *January*. They are encreased by Sets commonly planted at two or three Feet apart, but much better in my humble Opinion, at four or five Feet.

BEFORE we make Plantations hereof, we should prepare the Ground (by early trenching) very mellow, and therein plant our Sets of about five or six Feet high; and when they have grown three Years, then in *February* cut them off, at two Feet and a Half above Ground, and their Heads will break out into great Numbers of Shoots, that by the next Autumn will be fit for use.

IT is the Custom of many, for to turn Sheep into these Plantations, when the young Shoots produced after cutting down, are about six Inches in Length; which being cropp'd by them almost close to the Heads from whence they spring, the new lateral Buds of the Parts left, do then each produce a single Shoot, which are by the Autumn, fit for Use.

THE Improvements that are made by Plantations of Ozier, may be very great, and especially where the Nature of Lands are such, as to produce nothing else.

MR. *Evelyn* reports, That he has heard of twenty Pounds being paid for one Acre of Oziers in his Time, which is above fifty Years since; but at this very Juncture, where the Carriage is reasonable, they are worth ten Pounds *per* Acre, to be bought by the Basket-maker, and be allowed a very great Pennyworth.

IT has been said by a late Theorical Author now well known, that if Plantations hereof were made in greater Abundance, that the Markets would be overstock'd, and consequently their Value lessen'd. But if we consider the great Consumption that is annually made, by Packers, Fruiterers, Garden-

ers, Fishermen, &c. and the great Quantities that have been, and are annually brought from Abroad, we shall find, that we may very surely go to Work, and reap great Benefit thereby, to the very great Improvement of such moist Lands.

WILLOWS are the last that I have to treat of, that are of the Aquatick Tribe, of which there are divers Kinds; but those that I shall recommend, are the White and the Black.

THE White is also of two Sorts, the one having its Bark of yellowish, and the other of a brown Colour.

THESE Sorts of Willows are propagated, by planting very large Branches, that are streight and young, about six or seven Feet in Length, being soaked in Water, before planting, for the Space of two or three Days.

THE Season for this Work is *February*, and the Manner of doing it the same as of the Withy, &c. at the Distances of six, eight, ten, twelve, fifteen, or twenty Feet; in the Operation of which, be careful that, by cutting or otherwise you don't peel or bruise the Bark at the lower Ends of your Sets that with a very sharp Bill
you

you cut off their Ends a little sloping, at the Time of planting, and to fix the Earth very tight about them, and defend them from Cattle, who greatly delight in eating their Leaves either green or dry.

WHEN three Years are pass'd (they having been kept disbudded of their lateral Buds, and sucker'd) you may discretionally prune their Heads, by cutting away the most unpromising Branches, and leave the most hopeful for Use; which, when large enough, may be cut away, and the other small ones left to succeed: And so on in like Manner, you may every four or five Years, continue for twenty or thirty Years, with good Profit, it being a very useful Wood, for many Necessaries in Life.

N. B. THAT most of the Aquaticks may be cut every third or fourth Year, either in the Autumn before the Winter comes on, or in the Spring, when the Winter Colds are over.

CHAP. XXI.

Of the several Soils wherein the preceding Trees delight, of which Estates consist.

IF we consider how wonderfully the *Omnipotent God* has adapted each Plant to its proper Soil, we shall find, that there's no Sort of Lands, but may be cultivated with great Advantages to their Proprietors: For Instance,

THE Oak will thrive in warm and deep Loams, in moist, clayey, Stony, flinty Lands, but not in a hungry Gravel; but the Abeal and Hasel will prosper very well therein. And again, if our Lands are mountainous, chalky, stony and barren, the most proper Trees are Hazle and Beech; if barren and much exposed, the Horn-beam: But if a good Loam, tho' hilly and dry, the Maple and Sycamore, and for light mountainous Lands, the Quick-beam.

THE Birch will thrive very well in any dry, or wet, sandy or stony Lands, Marshes or Bogs.

THE Poplars, Aspen, Abeal, and Alder, in moist and boggy Lands, and the Salley in such, that are by Over-moisture unfit for the Plow or Pasture, and *Scots* Firs in moist and barren Gravel, so it be not oversandy.

THE Withy delights on the Banks of Rivers, and to be rather out of the Water, than in it: As also does the Willow, as by the Brinks of Ditches, &c. and the Ozier in Lands that are constantly moist, but not over and above wet and spewing. Thus may we see how all the most indifferent Kinds of Lands, may with Care and Diligence be greatly improv'd to a very high Degree.

THE several Kinds of Loams, which differ only in their more or less Quantities of Sand and Clay, which are the Principles, or Compound thereof, are the best of Soils, wherein all the preceding Trees will also prosper very well; as likewise the Elm, Ash, Chesnut, Walnut and Service; which last delights in a cold, rather than a hot Loam.

Now, seeing that the different Natures of Soils cause very great Differences in the Growth of Vegetables; I believe it will

not be amiss, if in the next Chapter I should give an Account of the extraordinary Growth and Magnitudes of Trees, that have been produc'd in *England*, as well as of some very remarkable ones Abroad.

C H A P. XXII.

Of the extraordinary Growth and Magnitudes of Trees.

MR. *Evelyn*, in his Discourse on Forest Trees, Chap. 30, Page 148, gives us a very surprizing Account of the Growth and Age of Trees, which must undoubtedly have had a free Perspiration throughout their whole Growth, or otherwise could never have arriv'd to their prodigious Magnitudes.

THE first that he takes Notice of is an old decay'd Horse-chestnut, whose very Stump did yield thirty sizeable Loads of Loggs; and in *Glocestershire* was another, within whose Bowels was contain'd a handsome wainscoted Room, with Windows
to

to illuminate it, furnish'd with Seats, &c. to answer the *Lician* Plantanus; which I shall speak of hereafter.

THE third (that he mentions) is a very large Lime, or Linden Tree, then growing at *Depeham* in *Norfolk*, ten Miles from *Norwich*, whose Circumference at six Feet above Ground, was twenty five Feet and a Half, at eighteen Inches above Ground near thirty six Feet; about the Root nigh the Earth, forty eight Feet, and the Height to the uppermost Boughs about ninety Feet.

The Diameter	{	At Six Feet above Ground, was something more than eight Feet $\frac{1}{10}$.
		At eighteen Inches above Ground, about nine Feet and a Half.
		Close at the Ground, twenty eight Feet nine Inches.

THE Magnitude and Height of this noble Tree must, without Doubt, have a majestick Aspect; as also that Poplar Tree, which he says was not much inferior to it, which lately grew at *Harlingly Thetford*,
at

186 *Of the Growth, and*

at the Gate of Sir *William Gawdies*, blown down by a Hurricane.

THOSE memorable Oak Trees, that were flourishing not many Years ago, in *Dennington Park*, near *Newbury*, were as remarkable; but more particularly three, which were said to be planted by the famous *English Bard*, *Jeoffry Chaucer*, of which one was called the King's, another the Queen's, and the other *Chaucer's Oak*.

THE King's Oak was fifty Foot clear in the Body, before any Knot or Bough appear'd, and held when squared full five Feet Diameter at the Butt-end.

THE Queen's Oak held very streight, full forty Feet, being four Feet Diameter at the Butt, and near three Feet at the Top; so that even the remaining Top was not much less than the common Size of the largest Oaks that are now fell'd for Use, and what are valued at a very high Rate.

AT *Cunsburrow*, (he farther tells us) grew several Trees, of whose Butt-ends, the Proprietor made ten Pounds *per* Yard, for three or four Yards: But those that produced each a Main-Mast for a Man of War, ninety nine Feet high, and bare thirty five Inches Diameter; and the other four
square

square Beams, each four and forty Feet in Length, of a sufficient Bigness as to lie across her, did much exceed them; which Trees grew at *Farmingham* in *Suffolk*, a Country that has produced some of the largest Trees perhaps in the World.

THERE is now, (says Mr. *Evelyn*) at *Wotton* in *Surrey*, a large Table, that was, before being shortened, full ten Feet and half in Length, above five Feet broad, and six Inches thick, all entire and clear, which must be produced by a noble and uncommon sized Tree.

Mersennus tells us, that the great Ship called the Crown, which *Lewis XIII.* caused to be built, had its Keel Timber, one hundred and twenty Feet long, the Main-mast twelve Feet diameter at the bottom, and its Altitude eighty five Feet.

HE also makes mention of a superannuated Yew Tree that was growing about fifty Years ago, in *Braburne* Church-yard, not far from *Scot's Hall* in *Kent*, which was near twenty Feet Diameter, whose Arms produced great Quantities of large Plank and Timber. And at *Sutton* Church-yard, near *Winchester*, he was inform'd, there

there was then growing another of the same Size.

NOW had not Mr. *Evelyn* been known to be a most curious, learned, and judicious Gentleman, we might have much question'd the Truth of these Accounts: For to consider what a Bulk a Tree must make, whose Diameter is twenty Feet, would almost seem incredible.

THE prodigious Growth of Vegetables, is again confirm'd by another Gentleman, who sent the following Account to Mr. *Evelyn*.

‘ IN *Sheffield* Lordship, there grew an
 ‘ Oak in the Hall Park near unto *Rivelin*,
 ‘ whose Body was eighteen Yards in Height,
 ‘ clear from Knot or Branch, and full three
 ‘ Feet and half square at the upper End,
 ‘ and but little bigger at the Butt. This
 ‘ Tree was fell'd about sixty Years ago, and
 ‘ was then sold for eleven Pounds.’ What
 would it be worth now at *London* was it
 there, at the Rate of fifty Shillings *per* Load,
 which is now the customary Price of small
 Timber? We will first measure the Quantity,
 and suppose the Square of the Butt-
 end to be no larger, than the Square
 of

of the Top-end, which was said before, to be three Feet and half.

Feet. Inches.

3 6

3 6

9 0

1 6

1 6

0 3

12

3

The superficial Content of the Butt.

Which multiply by

} 54

The Length.

48

60

13

6

The solid Content.

661

6 which divide by

50, the solid Feet contain'd in a Load of Timber, (leaving out the half Foot).

50) 661 (13 Loads.

50

161

150

(11 Feet.

THIRTEEN Loads of Timber, at two Pound ten Shillings *per* Load, is thirty two Pounds

Pounds ten Shillings : to which add for the eleven Foot, eleven Shillings, and the Sum will be thirty three Pounds, one Shilling, which is two thirds more than 'twas fold for.

BUT Timber of that Size is now worth double the Money, when required for the Shafts of Water-wheels, &c.

IN the upper end of *Rivelin*, grew an Oak, known by the Name of the Lord's Oak, whose Circumference was thirty six Feet, and Top produced one and twenty Chord, or Stack of Wood.

N. B. A Chord or Stack of Wood, is three Feet high, as many wide, and twelve Feet long.

IN *Sheffield* Park, about 58 Years ago, there was cut down a Tree that was thirteen Feet Diameter at the Kerf, where 'twas cut off near the Root.

IN the same Park (saith my Author, Mr. *Evelyn*, who wrote about sixty Years ago) near the *Old Ford*, is an Oak Tree yet standing, of ten Yards Circumference, which is ten Feet Diameter.

IN *Worksope* Park, at the white Gate, grew an Oak, whose opposite Boughs measured from their Extreams, one hundred and eighty Feet.

IF

Magnitude of Trees. 191

If we consider 180 Feet, as the Diameter of a Circle, we may easily find the superficial Content, as following.

Multiply 180
by 180

14400
180

Product 32400
Multiply by 11

32400
32400

Divide by 14) 356400 (25457 $\frac{1}{4}$ square F.
28

76
70

64
56

80
70

100

98

2 Remains, = $\frac{1}{7}$

Divide

192 *Of the Growth, and*

Divide 25457 by 9, the square Feet in a Yard.

9) 25457 (2828 square Yards.

18

—

74

72

—

25

18

—

77

72

—

5 Remains.

THIS 2828 $\frac{1}{2}$ Yards, is the Quantity of Ground that this Tree covers, or perpendicularly drops upon ; which being reduc'd into square Poles, is equal to half an Acre, and fourteen Rods, as following.

	Yards.
One Rod in Length, is	5 $\frac{1}{2}$
Which multiply by	5 $\frac{1}{2}$

25

2

2

$\frac{1}{2}$

$\frac{1}{2}$

$\frac{1}{4}$

—

The square Yards in one Rod

30

$\frac{1}{4}$

—

3

Now

Now divide 2828 by 30, leaving out the $\frac{1}{4}$.

30) 2828 (94 Rods, equal to half an Acre, and 14 Rods:

270

—

128

120

—

8 Remains.

SUPPOSE that a Horse, when standing, takes up the Space of three square Yards, then there may stand nine hundred and forty two Horses under the Drip of that Tree. For 2828 being divided by 3; the Quotient is 942. See the Division:

3) 2828 (942 $\frac{2}{3}$

27

—

12

12

—

08

6

—

2 Remains.

IN *Welbeek-Lane*, there stood an Oak called Grindal Oak, whose Circumference

at $\left\{ \begin{array}{l} 1 \text{ Foot} \\ 2 \text{ Feet} \\ 6 \text{ Feet} \end{array} \right\}$ above the Surface of the Earth. $\left\{ \begin{array}{l} 33 \text{ Feet} \\ 28 \text{ Feet} \\ 25 \text{ Feet} \end{array} \right\}$

O

The

The Height to the top-moſt Bough, 81 Feet. *Vide Evelyn's Sylva*, Page 157.

THESE Accounts of the very great Growth of Trees are ſomewhat more modern, than thoſe that *Pliny* tells us were growing in his Time in the *Hercynian* Foreſt, whoſe Roots had raiſed even Mountains; and where they encounter'd in their Growth, raiſed up, and form'd large Arches, like unto thoſe of the grand Enterances into magnificent Cities.

WE may from the preceding Lectures find, that as Vegetables abound more or leſs with Quantities of Oil, ſo do they ſooner or later arrive to their Maturity, and after that, their Decay.

THE ingenious Mr. *Evelyn* obſerves, that the Age of Timber Trees, eſpecially thoſe whoſe Natures are compact, reſinous or baſſamical, (that is very Oily) are thereby capable of very great Durations: Of which the Yew, Box, Juniper, Cedar, and other Evergreen Trees more abound, than the Oak, Elm, Beech, or Aſh; and thoſe more than Willows, Abeals, &c.

HE further adds, that the Duration of Trees may in ſome Meaſure be adjudg'd by their natural Growth, and Nature of their

Roots. Thus saith he, those Trees that produce the largest Roots, are Trees of the longest Duration, as also those that are what he calls *Gummy* ; that is, abounding very much with oily Particles ; for those that abound greatly with Moisture, are of a much quicker Growth, and consequently of a shorter Duration ; for, as the old Proverb says, *Soon ripe, soon rotten* : And therefore 'tis very reasonable to believe, that Trees which produce Fruit, cannot be of so long a Duration, as those that are barren ; because where much Fruit is produc'd, much Nourishment is required, which must unquestionably reduce the Strength, and consequently the Duration of the Tree also.

THE old *Platanus* planted by *Agamemnon*, mention'd by *Theophrastus*, and the *Herculean Oaks* ; the Laurel near *Hypocren*, the Vatican *Ilex*, and the Vine, which was grown to such a Magnitude, as to make Columns in *Juno's* Temple, have been sufficient Evidences of the great Growths and Duration of Trees. And *Pliny* makes mention of a Vine that was six hundred Years old, which undoubtedly grew in a warm natural Soil ; for as I have before observed, and proved, Vines delight more in Heat than in

Moisture, which contributes very much to their immediate decay.

AT *Eguan*, the old Duke of *Montgomery's* House, is a Table (saith Mr. *Evelyn*) of a very large Dimension, made of the same Plant.

THE old *Lotus* Trees, recorded by *Valerius Maximus*; and the *Quercus mariana*, celebrated by that Prince of Orators. The great *Latrix* of *Pliny*, and those that grew in the fortunate Islands, were also famous for their very great Duration.

AND 'tis affirm'd by St. *Hierome*, that he saw the Sycamore Tree that *Zaccheus* climbed up, to behold our blessed Saviour ride in Triumph to *Jerusalem*: And at this Time in the *Aventine* Mount, they shew us the *Malus Medica*, planted by St. *Dominic*.

'TIS reported, that in *Congo*, there are Trees capable to be excavated in Vessels, that would contain two hundred Men a-piece.

To which may be very justly added, those very old *Tiliae*, now at *Basil* and *Auspurg*, under whose delightful Shade, they so often feast and celebrate their Weddings; not with regard to their Shade only, but
their

their reverend Antiquity ; for to Trees of such Age, they paid divine Honours, as the nearest Emblem of Eternity, & *tanquam sacros ex vetustate*, as *Quintilian* speaks.

To mention every Plant in the World, would run out this Volumn beyond its intended Magnitude, as well as deviate from the Design of the Work; and therefore I shall only some few others, with which *Mr. Evelyn* concludes, referring the more curious Reader to those undoubted Records mentioned by our Naturalist, in his 44 *Chap. Lib. 16.* where he'll be entertain'd with an Account of the Olive Trees of *Scipio Africanus*, *Dianus Lotus*, the ruminal Fig-tree, whose Duration, according to the Calculation of *Tacitus*, was 840 Years. The *Ilex*, or evergreen Oak, of very great Antiquity, imported by the *Hetruscan* Inscription, thereon reported.

Pausanias in his *Arcadies*, is of the Opinion that the *Samian Vitex*, is one of the longest Date; and the *Platanus* planted by *Menelaus*.

THE *Delian* Palm, he further adds, to be coævous with *Apollo*; and the Olive that *Minerva* planted also.

THESE very large Trees were in very great Esteem of the Antients; infomuch that, that hot prudent Consul, *Passienus Crispus*, fell in Love with a beautiful Beech, of a very great Magnitude and Age. And that judicious Prince *Francis* the First, did the same with a huge sturdy Oak, which by his Order was curiously immur'd at *Bituriges*.

THAT most beautiful Tree the *Roman Platanus*, of which I planted many in the Gardens of the late *Thomas Vernon*, Esq; at his Seat of *Twickenham Park, Middlesex*, was antiently in the greatest Esteem, tho' now not so much, in regard to its being late in the Spring before it comes into Leaf, and drops its Leaves very early in the Autumn; which last is caused by being planted in a dry, instead of a moist Soil, wherein it most delights.

Ælian, and several other Authors assure us, that *Xerxes*, coming to a fine, large, and stately Tree of *Platanus*, stopt his Army of seventeen hundred thousand Soldiers for many Days, to admire the Stateliness, and solemn Beauty thereof; and became so much in love therewith, that he adorn'd it, with not only his own Jewels, Gold, &c. but the Necklaces, Scarfs, Bracelets, and infinite other

ther Riches of his Concubines, and others of his great People about him.

THIS beautiful Production of Nature had so great an Effect on him, that for many Days he laid aside all Thoughts of his grand Expedition, Interest, Honour, &c. notwithstanding the necessary Motion of his Portentous Army did endeavour to persuade him from it. His very great Love to this lovely Vegetable, caused him to style it his Mistress, his Minion, and his Goddess: And at his Departure from it, caused *the true Figure thereof* to be stamp'd on a *Medal of Gold*, which he always wore about him, in *Memory* of that good and stately Tree.

THUS may we behold how vastly short we are, in knowing the true Value of the most valuable Plants.

'Tis also recorded, that the *Lician Platanus* had a Room in it of eighty one Feet Circumference, richly furnish'd with stately Seats, and Tables of curious Stone, adorned with pleasant Fountains.

THE vast great Beauty and Magnificence of this Tree, did often invite *Licinius Mutianus* (thrice Consul, and Governor of that Province) to feast his whole Retinue

200 *Of the Growth, and*

within it; delighting more therein, than in his magnificent Palace, whose Roof was cover'd with Gold.

AND of later Date, we have an Account of that vast *Cerrus*, wherein an Hermit built his Cell and Chapel, so much celebrated by the noble *Fracastorius*, in his Poem *Malteide*, *Cant. 8. Stro. 30.*

BUT the most surprising, are what Mr. *Evelyn* further adds, *Page 151.* of which Sir *Francis Drake* measured the Girt of a Mastick Tree, to be one hundred and two Feet. *Now, since that the Ratio of the Circumference of Circles to their Diameters,* is as 355 to 113; or in lesser Numbers, as 22 is to 7; therefore the Diameter thereof was $32 \frac{1}{2}$ Feet. See the Work.

Circ.	Feet.	Circ.	Feet.
As 22	is to 7,	so is 102,	to $32 \frac{1}{2}$ Feet.

$$\begin{array}{r}
 7 \\
 \hline
 22 \overline{) 714} \quad (32 \frac{1}{2} \\
 \underline{66}
 \end{array}$$

$$\begin{array}{r}
 54 \\
 44 \\
 \hline
 \end{array}$$

10 Remains, equal

to $\frac{1}{22}$, equal to $\frac{1}{11}$.

AND

AND those of *Nicaragna* and *Gambra* were vastly great, when seventeen Persons of a common Stature could hardly fathom about the Bodies.

Pliny reports, That in *India*, *Arbores tantæ proceritatis, traduntur, ut sagittis superari nequeant. Hæc facit ubertas soli, temperies cæli, & aquarum abundantia.*

THOSE Trees recorded by *Theophrastus* and others, growing in *Corfica*, and near *Memphis*, were of the like Kind: But the most surprizing Trees for Height, are those unparallel'd Palms Royal, of two and three Hundred Feet perpendicular Altitude, describ'd by Captain *Ligon*, growing in *Barbadoes*. The Relations of *Bembus* and *Cardan* are also as surprizing the first speaking of those twenty Fathom'd antartick Trees, and the latter of those called *Ciba*, whose Nature is to rise at about twenty Feet Distance, in Stems of the like Circumference, and to unite together at fifteen Feet above Ground, constituting grand Arches, something like unto those of the *Gothicks*, from whence they all ascend in one entire Body or Shaft of 37 Feet Diameter, to a prodigious Altitude.

IN the Island of *Cyprus*, (*Matthiolus* reports) grew a Tree that contain'd one Hundred and thirty Feet Altitude of sound Timber: And upon Mount *Ætna* in *Sicily* is a Place called the *Ire Castayne*, from three Chesnut Trees there growing, in one of which that was remaining about sixty Years ago, a considerable Flock of Sheep were usually folded. And *Kercher* having seen them, saith, *Et quod forsân παρὰ δ' οὐρον videri possit, ostendit mihi viæ dux, unius Castaneæ Corticem tantæ amplitudinis, ut inter eam integer pecorum grex à pastori-bus, tanquam in Caula, commodissima noctu includeretur.* China Illust. P. 185.

Now to conclude this strange Account of the Growth of Trees, with some Things still more surprizing, Mr. *Evelyn* further reports, That in the Province of *Chekian*, there grew a Tree that was so stupendously large, that eighty Persons of a common Stature could hardly embrace or fathom about it; and if we account the Fathom of each Person to be but four Feet, one with the other, (which is much too little) the Circumference of the Tree will be three Hundred and twenty Feet.

Magnitude of Trees. 203

80 People

4 Feet each Fathom,

Feet	320	The Girth or Circumference.
Feet.	Feet.	Feet. Feet.

Now, as 22 is to 7, so is 320 to $101 \frac{2}{11}$ the Diam.

7

22) 2240 ($101 \frac{2}{11}$ Feet Diam.

22

0040

22

18 } remains equal to $\frac{12}{22}$
or $\frac{2}{11}$.

Now, to avoid Trouble, we'll omit the Fraction $\frac{2}{11}$ (altho' we might very justly make it an Integer, and reckon the Diameter 102) and account what Quantity of Timber is contain'd in one Foot high at that Girth, allowing the Diameter to be but 101 Feet.

101
101
<hr style="width: 50%; margin: 0;"/>
101
101
<hr style="width: 50%; margin: 0;"/>
10201

The Diameter } squared.

Multiply by 11

10201

10201

$$\begin{array}{r}
 10201 \\
 \hline
 \text{Divide by } 14 \quad 112211 (8015 \cdot \frac{1}{14} \text{ solid Feet} \\
 112 \\
 \hline
 021 \\
 14 \\
 \hline
 71 \\
 70 \\
 \hline
 1 \text{ Remains } \frac{1}{14}.
 \end{array}$$

Now, divide 8015 by 50, the Number of solid Feet in one Load of Timber, and the Quotient will be $160 \frac{15}{50}$ the Number of Loads contain'd in one Foot in Height.

$$50)8015 (160 \text{ Loads } 15 \text{ Feet.}$$

$$50$$

$$\hline$$

$$301$$

$$300$$

$$\hline$$

$$15 \text{ Remains} = \frac{15}{50} = \frac{3}{10}$$

Which is a surprising Quantity; but much more the whole Tree. There was within

a Hundred Years ago, some strange and almost incredible Oaks, growing in *Westphalia*, whereof one was one Hundred and thirty Feet high, and (as reported by some) thirty Feet Diameter; and another so vastly large, as to serve both for a Castle and Fort.

Scamozzi, one of our Celebrated Architects, reports, That he saw a Table made of Walnut Tree, at St. *Nicholas's* in *Lorraine*, that held full twenty five Feet in Breadth, all of one entire Piece, with a Length and Thickness proportionable, and beautifully adorn'd with its natural Colours, which undoubtedly render'd it the most beautiful Table of the World.

C H A P. XXIII.

Of the Government of Timber Trees, and Coppice Wood, after planting and felling.

I. **T**HE first Care required after planting, is to preserve our Plantations from the Injuries of Winds and Cattle; the first

first by staking, and the last by fencing, as directed before.

2. To keep them clean from Weeds in the Spring and Summer, and digg'd early in the Autumn, to let in the Winter's Rains, and mellow the Surface.

3. THAT the Side or collateral Buds of Timber Trees be displaced, when they first appear, for by this Means the whole Nourishment will be imploy'd in the Growth of the Boal, and consequently will make Timber much sooner, than when the greatest Part is spent in unprofitable Branches.

4. THAT the nearest Distance of Coppice Wood be never greater than five Feet at first planting; because every Felling will render them wider, at the Will of the Woodward, as the Timber Trees grow up.

5. THAT young planted Trees, in Orchards, Meadows, or plow'd Lands, be always kept clear of Grass, Corn, &c. a full Yard at least about their Stems; for when 'tis permitted to grow nearer, the Trees are depriv'd of their proper Nourishment, and cannot thrive as desir'd.

6. IT often happens, that from one Root, many Branches arise confusedly, of which you must make Choice of the very best,
and

and displace all the others. By this Means you will have a Timber Tree in a short Time, whereas had they all been continued, they would be only fit for Fuel, &c.

7. By the preceding Directions of dis-budding the Side Budds, when they appear, our Timber will naturally be streight, and free from Knots, and consequently of much greater Value than Timber that is full thereof.

BUT since that crooked Timber is of great Value to the Ship-wright, Wheel-wright, and Mill-wright, we may for their Uses bend to such Curves, as are best fit for their several Purposes, as many young Oaks, Elms, Beeches, &c. as we please, fixing their Heads bow'd down, by twisting them in their next adjoining Trees. But they should in general be bowed towards the South, because their Sap will then have its natural Attraction by the Sun's Heat, and they will remain in their curv'd Positions; whereas, when they are bent to the northward, they will, by the Attraction of the Sun, break loose, and become perpendicular again.

8. WHEN Timber Trees grow crooked, by the Contraction of their Sap Vessels,
more

more on one Side than the other; the only Help, is to cut or score the Bark horizontally, nearly through on the inward Side, in several Places: And Trees that are Bark-bound, may be relieved, by scoring the Bark from their Tops to their Bottoms, perpendicularly.

9. COPSES are oftentimes fell'd at seven or eight Years after planting, but one felling at sixteen Years, turns to a much greater Account than two of eight Years each; for the feldomer that Coppices are fell'd, the greater Profits arise.

By the Statute of 35, *Henry VIII.* all Copfes fell'd under 24 Years Growth, were to leave twelve Standils of Oak upon every Acre, or the like Number of Elm, Ash, Asp, or Beech, if not Oaks, sufficient; but as 'tis to our Interest to leave more, as I have already prov'd, we should, instead of leaving twelve on an Acre, leave thirty; and instead of leaving them, until they are ten Inches square, within a Yard of the Ground; leave them, until they are at least double that Magnitude. If these Directions are duly executed, we shall reap a quadruple Return more, than when they are cut down so very often, and under Size.

10. 'Tis

10. 'TIS supposed, that there's no Occasion of directing the Place where to begin felling, since by beginning at one Side, the Carts and Horses can enter, without doing any Prejudice to those Trees that are left standing.

11. THE Season for felling of Underwoods, is from the midst of *September*, to the Midst of *November*, and no longer, for when Wounds are made in very wet and cold Weather, the Trees imbibe the Wet and Cold, that oftentimes does them very great Injuries.

AND about the Middle of *January*, when the Frosts are over, you may begin felling again, and continue, until the Middle of *March*.

12. IN the felling of Underwoods, we should always observe to cut them within six Inches of the Ground, with the slope Part of their Cuts, next the south Sun, thereby to be heal'd as soon as possible.

13. THE Time for felling Oaks, is the Middle or End of *April*, when the Heat of the Spring has rarified the Sap to such a Degree, as for the Bark to strip easily off, which is of great Service to the Tanner. But Elms, Ash, Beech, &c. should be fell'd

in the very Depth of Winter, when their Sap hath the least Action.

14. THERE is great Care and Judgment required in the felling of large Oaks, to discharge the Boal of all large Branches, Limbs, &c. that may endanger the Fall, and to cut a Kerf round the Body, to prevent their Butt-ends from splitting in their Fall.

15. BEFORE that we begin to make our Fall, we should make a Survey of our Trees, and examine which are in a thriving State, and which are declining ; which last should undoubtedly be fell'd first, and the most thriving hereafter, when more largely grown ; and indeed we should also consider of the several Uses that we intend them for, and make our Choice accordingly.

16. WHEN your Timber is thus fell'd, be careful that you are not deceiv'd in the Measure, by which you dispose of it ; for if Care is not taken herein, you may be cheated out of above one Half of your Timber, and think that you are justly dealt by also ; an Account of which I have given, and demonstrated in the Appendix hereof.

17. YOU must carefully cleanse away, and bind all the Brush-wood, as Loppings, &c. before

before the Roots begin to shoot afresh, that the young Shoots may not be interrupted in their first advance: And to preserve them from the Injuries of Cattle, until largely grown.

By the 13. *Elizabeth*, yearling Colts and Calves may be put into inclos'd Woods, after five Years, and no other Cattle till six, when the Growth is under fourteen Years, or until eight, if exceeding that Age till the last Felling.

18. Fuel-wood may be cut from *Michaelmas* until *Candlemas*, and Stack-wood may be cleaved at any Time. When you set up Stacks of Billet Wood, their lowest Courses should be set on End, and the others length and breadth-wise at Pleasure.

By the Statute, every Billet should be three Feet and four Inches in Length, and seventeen Inches and a Half compass; ten or fourteen, as they are accounted for one, two, three, &c.

A Stack of Wood is a Solid made of twelve Feet long, three Feet wide, and as many in Height, containing 108 cubical Feet; and in some Places a Stack of Wood is made of eight Feet in Length, four wide, and as many in Height, containing 128

212 *Of the Government, &c.*

cubical Feet, which is twenty Feet more than the preceding.

FAGGOTS ought to be made truly round and not flat, (for then they contain much less than they should do) their Length by the Statute is a full Yard, and their Circumference two Feet. By the *7th Edward VI.* Billets of one Cast are to be ten Inches about; of two Cast, fourteen, &c. which are to be marked with Notches; those of one Cast, within four Inches of the End, and those of two Cast within six Inches of the Middle. But by the *43 Elizabeth*, every single Billet being round, to contain seven Inches $\frac{1}{2}$ Girth, but no single Billet to be made of cleft Wood; if marked one and round, to contain 11 Inches Girth; if half round 13, or if quarter Cleft 12 Inches $\frac{1}{2}$.

IF marked two being round, to contain 16 Inches; half round 19; quarter round 18 $\frac{1}{2}$, and their Length as before.

ALL the Sticks in Faggots must be full three Feet in Length, one excepted, which is to wedge and harden the Binding, whose Length is to be but one Foot.

OAKS being headed, and made Pollards, are in some Countries very profitable, and will last for many Ages; but the Elm will
not;

not ; for immediately after the heading of an Elm, it imbibes the Wet, and soon becomes rotten and hollow.

AND the same does generally happen, when the Arms of Trees are lopp'd, with the Face of the Cut upwards, as represented by the Arm C, of *Fig. A B* ; which is a perfect Pipe to convey the Wet into the very Heart of the Boal, which causes an immediate Decay. To prevent such Damages, the Cut must be made upwards, as the Arm D, or rather cut close to the Boal, as at E.

C H A P. XXIV.

Of TITHES incident to Woodlands, Coppices, &c.

ALL Timber-trees, upwards of twenty Years Growth, are not to pay Tithes ; but if they are cut down before that time, they are tithable ; and therefore all manner of Coppice Woods are tithable, because they are generally cut down twice or thrice in that Time.

BUT if we cut down Coppice Wood for the Use of the Premisses, either for Mounds, Fencing, Plow-boot, or Fuel for the Owner, no Tithes are due.

WHEN Trees are lopp'd under twenty Years Growth, and afterwards permitted to grow past twenty Years, and are then lopp'd again, no Tithe is due for them, though at the first Lopping, it were not so.

NO Tithe is paid for Hop-poles cut down, where the Vicar is paid Tithe for the Hops that grow upon them. But more hereof may be more largely seen in *Cook's Reports*, II, 48, 49, 81. *Plow.* 470. *Browlow's Reports*, Part I. p. 94. Part II. p. 150. D. and 1st. 169. &c.

AN Acre of Coppice Wood, of sixteen Years Growth, must undoubtedly be worth a great deal of Money, if it has been well managed: But at one and twenty Years end, the Value is much greater; so that I advise every one that plants ten Acres of Coppice Wood, to have Patience till the 21 Years are expired, and then to deal with the Country Parson as they please. But if you cut it before twenty Years are over, you must comply with that as pleases him best.

THE preceding Directions being well executed by the Woodward, every Gentleman that's concern'd in these noble and rural Impleys, will find an abundance of Pleasures, and great Profits also : Besides, 'tis the only Means of perpetuating the Glory and Happiness of this now powerful and prosperous Nation, to the last Age of the World.

I shall now by Way of Appendix, proceed to demonstrate the great Losses that Gentlemen sustain, when they sell their Timber by the common Way of Measuring, and how imposed on when they buy the customary square Measure : A Deceit in Trade that's highly worthy of the Consideration of our Legislators.

APPENDIX.

Of the Mensuration of Timber, after the common Method, and the deceitful Ways of taking Dimensions with Geometrical Rules, for the true Mensuration thereof.

THE Customs used in measuring Timber, is to take the Lengths to Feet and half Feet, and the Girths in Inches only, which is usually taken at the middle of the Trees Length. Thus if a Tree is forty Feet in Length, the Girth is taken at twenty Feet from Top or Butt, provided that the Tree hath a gradual Diminution from End to End (as *Fig. A B*): But if the Body of the Tree to be measured has a very large But-End, for fifteen, sixteen, eighteen or nineteen Feet long, when the whole Length is forty Feet, (as aforesaid) as *Fig. D E*, and afterwards its Thickness falls off very considerably, as *G H*;

H; then the Part G H must be measured singly by its self, as A B, so also must the Part D G; and their Quantities added together, will be the Content of the whole.

BUT had this Piece of Timber been measured by one Dimension as the other Piece, *Fig. A B*, then its Girth would be taken at I, where 'tis very small; and the extraordinary Thickness *a a*, quite about the small Body G E, would be lost in the Measure.

THIS is one Way, that many times Gentlemen are cheated out of great Quantities of Timber; but not the most material one.

WHEN a Piece of Timber is measured at two or three Dimensions, as D E is at twice, 'tis called by Workmen, *Joggling* the Piece.

IT is a common Thing among Workmen that buy Timber, and find the Measurer against them to be an easy Man, or a Green-horn at the Business, of which we have many, to agree before they begin to measure; that let the Middle of Pieces of Timber fall how they will, great or small, their Girths shall be taken there. This the young Measurer thinks to be very fair Dealing, and therefore agrees to it, not considering that where one Tree is largest, or its

its mean Thickness in the middle, there's ten that are less; so that when he takes their Girths at their middle Lengths in general, he never fails of losing many Loads of Timber in a large Quantity. Therefore to be certain of the true Dimensions, the Measurer must always observe the Figure of every Tree, and when they are not of an equal Diminution from Butt to Top, then he must joggle them, as before directed.

THERE is also another great Injury that People suffer, by the manner of taking the Dimensions, which the Seller thinks is an Advantage to him; which is, leaving the Pieces with all their taper Tops on to a great Length, whereby the Girth is taken in a much smaller part of the Tree, than when twenty or twenty five Feet of the Top is cut off, and measured by it self.

WOULD it not surprize any one to think, that to leave 16 Feet in length on; to a Piece that is but twenty four feet long in the whole, should cause the whole, being measured together (by the common way that gives a Content about one fifth less than the true Way;) to be near two fifths less than it actually is? Or, would it not again surprize us as much, that eight Feet in
Length,

Length, cut from the Butt, and leaving the other sixteen Feet in Length as nothing, should measure to four solid Feet and an half more, than when the Top of sixteen Feet was measured with it.

THAT the Fraud hereof may appear plainly to the whole World, for the Advantage thereof, I will illustrate the Fact thereof.

SUPPOSE that a Piece of Timber is twenty four Feet long, as K, O, that the Girth at the Butt K is 6 Feet, one Fourth thereof is 18 Inches, that the Girth at the Top, O, is 12 Inches; one Fourth thereof is three Inches; for you must note, that the Method of girthing Timber, is to girth it about with a Line, and then take one fourth Part of that Girth for the Side of a Square, and then measure it as square Timber, whose Sides are severally equal to that one fourth of the Girth so taken. But this is notoriously false, as will appear in its Place.

THE Girths at each Ends, and Length, being determin'd, 'tis also supposed, that the Sides of the Timber are streight from Butt to Top, *viz.* from K to O, which seldom or ever happens; for to the contrary, most Trees hold an equal Thickness, many Feet

Feet forward from the Butt, whereby they measure much more than when they immediately diminish from the Butt: But that Advantage I'll give to the Workman.

SINCE the Sides are supposed to be streight, it therefore follows, that the Girth in the Middle at M, must be 36 Inches, *viz.* 9 Inches, one fourth Part thereof, and consequently the Girths at every third Part of the Length, *viz.* every eight Feet at L and N, will be, that at L four Feet, one fourth thereof being one Foot, or twelve Inches, and that at N two Feet, one Fourth thereof being six Inches; for as the fourth Part of the Girth at O, 3 Inches, is to the one fourth Part of the Girth at N 6 Inches; so is the one fourth Part of the Girth at L 12 Inches, to the one fourth Part of the Girth at K 18 Inches.

THESE several Dimensions being thus settled, we will now proceed to the Work in Hand, which when clear'd, as will immediately be, will greatly surprize the honest Gentleman, that has sold great Quantities of Timber, and guard him for the future; and if I mistake not, make the crafty Timber Merchant blush, to see his fraudulent Dealings exposed.

THE common Way of measuring Timber, is by the double Line of Numbers, placed on a sliding Rule for Expedition Sake, and sometimes arithmetically; but that both Ways may be made plain, I will illustrate this Example, first arithmetically, and lastly instrumentally.

THE whole Length KO being 24 Feet, we must therefore girth it in the Middle at M, where the fourth Part of the Girth, is 9 Inches.

The $\frac{1}{4}$ of the Girth 9 Inches

multiplied into its self 9

Product 81

{

square Inches,
the supposed
mean Area be-
tween the Butt
and End.

The Length 24 Feet, must be re-

duced into Inches, }
by being multiplied } 12
by

—
48

24
—

The Product is 288 The Length in Inches.

Which

Which 288
multiply by 81 the mean Area,

—

288

2304

—

Product 23328 The supposed solid Inches in the whole Piece; which divide by 1728, the solid Inches in a solid Feet.

A.	
Divisors.	Times.
1728	1
3456	2
5184	3
6912	4
8640	5
10368	6
12096	7
13824	8
15552	9

1728)23328(13 solid Feet.

1728

—

6048

5184

—

Remains 864 Inches.

B.	
1728	1 Foot.
1296	3 qrs.
864	half Foot.
432	1 qr.
216	half qr.

N. B. That before you begin to divide the Quantities of Timber, after the solid Content is found in Inches, 'tis best to make a Table of Divisors, as the Table A, wherein you'll readily find how often your Divisor is contain'd in your Dividend, without

without any Trouble of making Essays by Multiplication, &c. This Table is made by placing the Divisor at the Head thereof, writing against it the Number 1, signifying once; then double it, or multiply it by 2, and write down the Quantity 3456 under 1728, and against it the Number 2, signifying twice; then to this add the upper one, and against it write the Number 3, signifying three Times; and in like Manner, by adding the first and last together, you may make your Table of Divisors, as in the Margin. If a Table of Divisors thus made be laid by, or rather written on a small Piece of Past-Board, and hung up in the Study, or Counting-House, &c. It will be ready at all Times, when we have Occasion to measure Timber.

WE should also make a Table of the solid Inches in an Half, Quarter, and half a Quarter foot, as the Table B. This Table is easily made, by halving the Inches in the several Quantities; by which you readily see the Quantity of the remaining Inches, after Division is made. Thus much for the Tables.

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By the preceding Division it appears, that the solid Content of the Piece of Timber K O, is 13 Feet 864 Inches, which is equal to $\frac{1}{2}$ of a solid Foot. This well observe.

Now I will suppose, that the Top is cut off at N, and that we have but a Length of sixteen Feet, instead of twenty four Feet, as before. The mean Girth of the Middle of this last length is 12 Inches. Now observe this Operation.

The $\frac{1}{2}$ of the mid-
dle Girth at L } 12 Inches.

Multiply into its
self by 5 } 12

—

24

12

—

Product 144 square Inches, the supposed mean Area between the Butt and Top.

Now, reduce 16 Feet, the Length into Inches.

The

The Length 16 Feet.
 Being multiplied by 12

—
 32
 16
 —

The Product is 192 the Length in Inches;
 Which multi- } 144 the mean Area.
 ly by }

—
 768
 768
 192
 —

Product 27648 the supposed solid
 Inches in the whole Piece.

Now, divide this Quantity in Inches,
 by a Foot solid, and let's see the Quotient.

1728) 27648 (16 solid Feet.

1728

—
 10368

10368

00000 Remains.

☞ Now, is not this surprizing, that
 tho' the Top N O, which is eight Feet
 long, and not taken any Notice of in this

Q

Men-

Menfuration; the folid Content now found ſhould be ſixteen Feet, when the whole meafur'd together, by the ſame Rule, meafured but to thirteen Feet and a half.

HENCE it appears plainly, that by cutting off the Top NO, we gain two folid Feet, and an Half, and the Top alſo. But obſerve further, which will yet ſurprize you more.

WE will now ſuppoſe, that the Butt is cut off at L, and that we are to take no Sort of Notice of the Top LO. The Length of this Butt, is but 8 Feet, and its mean Girth in the Middle at P, 5 Feet, one fourth thereof being 15 Inches. Now, obſerve this Operation.

The Middle Girth 15 Inches.

Multiplied by its ſelf 15

—

75

15

—

The Product is 225 ſquare Inches, the ſuppoſed mean Area between Butt and Top.

The

The Length of the Piece 8 Feet,
Being multiplied by 12

Product 96 } The Length in
Inches.

Which multiply by 225 the Mean Area.

$$\begin{array}{r} 96 \\ 225 \\ \hline \end{array}$$

480

192

192

Product 21600 The supposed
solid Inches in the whole Piece.

Now, divide this Product by a solid
Foot, and observe the Quotient.

1728) 21600 (12 solid Feet.

1728

4320

3456

864 Remains.

☞ HERE we are again astonish'd, for
tho' there is 16 Feet cut from the Length,
and but 8 Feet in Length of the Butt mea-
sured; yet the Butt measures to 12 solid

Q 2

Feet.

Feet and $\frac{1}{2}$, which is but one Foot less than the whole when measured together. And tho' this last Mensuration gives $12 \frac{1}{2}$ solid Feet, which is much more than any one could imagine; yet I will presently prove, that the same Butt-End does actually contain a fifth Part more, *viz.* $15 \frac{1}{2}$ solid Feet. But before I proceed to the true and exact Way of measuring Timber, 'twill be best to make an end of the false Way, which loudly cries out for Redress from our Legislators.

THE several Quantities produced by these three several Dimensions, are as following.

	<i>Solid Feet.</i>
The whole Piece K O, 24 Feet long, mean Girth 9 Inches, Quantity.	$13 \frac{1}{2}$
The Frustrum K N 16 Feet long, mean Girth 12 Inches, and Quantity.	16
The Frustrum K L 8 Feet long, mean Girth 15 Inches, and Quantity.	$12 \frac{1}{2}$

Now let us measure by the same Method, the Frustrum or Top L O, first entire in one Dimension, and afterwards at twice supposing it to be cut off at N.

The mean Girth of L O at N is 6 Inches,
Multiplied by its self, 6

—————
Produces 36 the
mean Area in square Inches, between Butt
and Top.

The Length of the Piece is 16 Feet,
Being multiplied by 12

—————
32
16
—————
Product 192
the Length in Inches, which multiply by 36.

192 the Length.
36 the mean Area.

—————
1152
576
—————

Product 6912 the supposed solid Inches
in the whole Piece.

Now (as before) divide this Product by a solid Foot.

$$\begin{array}{r}
 1728) 6912 \text{ (4 solid} \\
 \underline{6912} \\
 0000 \text{ Remains.}
 \end{array}$$

HENCE it appears, that the Top L O contains 4 solid Feet exactly.

Now let us cut it in two in the middle at N, and measure each Part by it self. For tho' the whole is always equal to its Parts, in all mathematical Operations, yet the Quantities produced by the Mensuration of these two Parts, by the same Rule, will be found to be otherwise.

WE will first measure the Frustrum L N, whose mean Girth in the middle at M, is 9 Inches; which being multiply'd by

	9	
	<hr/>	
Produces	81	square Inches for the
mean Area.		

THE Length being 8 Feet, is equal to 96 Inches.

81 the mean Area.

96 the Length.

486

729

7776 the supposed solid Inches, which divide by a solid Foot

1728) 7776 (4 solid Feet.

6912

864 solid Inches, equal to $\frac{1}{2}$ of one solid Foot.

SEE here this one Frustrum LN, measures to half a solid Foot more than both Frustrums did before, when measured together, they both measuring but to four solid Feet, and this one measures to four solid Feet and half, exclusive of NO.

Now again, we will measure the Frustrum NO, and see what that contains. The mean

Q 4

Girth

Girth thereof in the middle is 4 Inches,
 which being multiply'd by }
 it self. 4

16

Produces 16 square
 Inches, the mean Area, which }
 multiply by the Length } 96 Feet.

96

144

Product 1536 the suppos'd
 solid Inches ; which is almost one solid
 Foot.

These three last Operations stand thus.

The solid Content of the }
 whole when measured } 4 solid Feet.
 at once

The Solidity of the Frus- }
 tum L N } 4 $\frac{1}{2}$

The Solidity of the Frus- }
 tum N O almost } 1

Sum of the two Parts almost 5
 which is almost one solid Foot, more than
 the whole measured to.

Now

Now seeing that the whole is ever equal to all its Parts taken together; 'tis demonstratively plain, that this Method is absolutely false, and so much, that whoever sells Timber by this common Way of Measuring are certain of being very greatly injured. 'Tis plainly proved, that when this whole Piece of Timber was measured by one Dimension, its Quantity was found to be but $13 \frac{1}{2}$ solid Feet; whereas by being measured in three several Lengths, its Quantity is found to be $23 \frac{1}{8}$ solid Feet, which is 10 Feet $\frac{1}{2}$ difference.

Solid Feet.

The whole measured together	13 $\frac{1}{2}$
The Frustrum K L measured singly	12 $\frac{1}{2}$
The Frustrum L N measured singly	4 $\frac{1}{2}$
The Frustrum N O measured singly } almost }	1
Their Quantities taken together,	18
The Difference of the Parts taken together from the whole.	4 $\frac{1}{2}$

Solid Feet.

AND again, this Difference of $4 \frac{1}{4}$ solid Feet is not all; for by and by, I will make it plainly appear, that there is actually very near 4 solid Feet more, that yet ly conceal'd:

ceal'd: So that the true Quantity of this Piece of Timber, will be found to be very near 22 Feet, instead of 13 Feet $\frac{1}{2}$, which it was measured to, according to the usual and customary Way of Measuring.

THIS being well understood, we have now no Room to wonder how Timber-Merchants, Carpenters, &c. can afford to sell Timber at the same Price *per* Load, as they bought it at, and get great Profits by it also.

THIS to many has been a Paradox; but herein 'tis explain'd: For suppose that a Carpenter had bought this Piece of Timber according to the common Method of Measuring, at one Shilling *per* Foot, and was to sell it again by the same Method of Measuring, at the same Price, he would get 8 s. 6 d. clear by it, provided that he cut it into three Lengths, each 8 Feet, as herein supposed, and sold them as their several Quantities then appear'd to be by Measure. For were Timber-Merchants, &c. to sell their Timber entire, as they bought it, they could have no such great Advantages in the Measure, (provided that they did not square it, as they call it, *viz.* hew off a small skirting of the Convexity, from four opposite
Parts

Parts of its Curvature, whereby they become rather Octangular than Square): But this I shall explain in its Place). The greatest Advantage then that the Buyer hath, when he sells his Timber entire as he bought it, without cutting the Butt-ends off (as before explained) or squaring, is one fifth Part of the Quantity, or very near it, which he gains by selling it by the true and just Way of measuring it, as he ought to have bought it by, to deal fairly.

IN my Passage through this Discovery, I have once or twice promis'd to prove, that even when the Dimensions of Timber are justly taken, that their Quantities then produced, are above one fifth less than the real Quantity: So that what by their unjust Manner of taking the Dimensions when they have an Opportunity, and their unjust Method that they measure by, the Seller is sure of being defrauded of very near (and oftentimes more than) the one half thereof.

THIS notorious fraudulent Method, is as follows.

SUPPOSE that the Girth of a Piece of round Timber is four Feet, or 48 Inches, then one fourth Part thereof is 12 Inches; which they say is, (or take for) the Side of

a geometrical Square, whose Area, they suppose is equal to the Area of a Circle, whose Circumference is equal to the Girth; or if the Timber was cut in two at the Place of girthing, to the Area of either End.

BUT 'tis notoriously false, and what is well known to every one that's tolerably acquainted with the Elements of Arithmetick and Geometry; I will demonstrate the Fact thereof.

A geometrical Square, whose four Sides are equal to 48 Inches, hath each Side equal to 12 Inches, and its Area to 144 Inches.

12

12

—

Product 144 the Area of a geometrical Square, whose Sides are severally equal to one fourth of the Girth.

A Circle whose Circumference is equal to the Girth 48 Inches, hath its Area equal to 183 Inches, which is above one fifth Part more than the geometrical Square of the same Circumference. See the Work. But first we must find the Diameter of the Circle, for which this is the Analogy.

As 22 is to 7, so is the Circumference given to the Diameter required.

$$\begin{array}{r} 22 \ 7 \ 48 \ 15 \ 1\frac{1}{2} \\ \underline{7} \end{array}$$

22) 336 (15 $1\frac{1}{2}$ Diameter required.

22

116

110

6 Remains, equal to $\frac{6}{22}$, or $1\frac{1}{2}$.

Now having the Diameter given or known, find the Area. The Rule is as following.

SQUARE the Diameter, multiply the Product (always) by 11, and divide (always) by 14, and the Quotient will be the Area required.

The Diameter 15 $1\frac{1}{2}$

15 $1\frac{1}{2}$

75

15

4 $1\frac{1}{2}$

4 $1\frac{1}{2}$

Product 233 $1\frac{1}{2}$ the Diameter

squared.

Brought

238 APPENDIX.

$$\begin{array}{r}
 \text{Brought over } 233 \frac{2}{11} \\
 \text{Multiply by } 11 \\
 \hline
 233 \\
 233 \\
 2 \\
 \hline
 \end{array}$$

Divide by 14) 2565 (183 $\frac{3}{14}$ } The Area of the Circle, whose Circumference is equal to 48 Inches.

$$\begin{array}{r}
 14 \\
 \hline
 116 \\
 112 \\
 \hline
 45 \\
 42 \\
 \hline
 3 \text{ Remains.}
 \end{array}$$

Now, if to 144, the Area of the Square, we add one fourth Part thereof, *viz.* 36. the Sum will be 180, which is 3 less than 183, the Area of the Circle: Hence it plainly appears, that the Difference is above one Fifth.

For as 144, the Area of the Geometrical Square is to 183, the Area of the Circle, (leaving

(leaving the Fraction $\frac{1}{4}$ out). So is 4 to 5 and $\frac{1}{2}$.

$$144; 183 :: 4. 5. \frac{1}{2}$$

$$183$$

$$—$$

$$144) 732 (5. \frac{1}{2}$$

$$720$$

$$—$$

12 Remains, which is equal to $\frac{1}{2}$: But we will reject the Fraction $\frac{1}{2}$, and then the Analogy will be *as FOUR is to FIVE. Q E D.*

I having thus demonstrated, that the Area at the Place of girthing is a full fifth more than it is measured to; it therefore follows, that all Quantities so measur'd are a full fifth more than they are measur'd for, and even when their Dimensions are justly taken: But when Tricks are play'd therein, then God knows how far their Knavery may extend.

IN the small Precedents preceding, I prov'd, how by the Deceit of taking the Dimension of the Piece K O, at once, four Feet and half were lost, even by their common Way of measuring, exclusive of the fifth Part wanting besides, as before prov'd;

prov'd, which is four Feet more ; for the true Solidity of K O is 22 solid Feet, and not $13 \frac{1}{2}$ as the common Way measures it to.

FOR as 4 is to 5, so is the Quantity before found at three several Dimensions, 18 to 22 solid Feet, the true Content thereof.

$$4, 5 : 18 : 22$$

Now, seeing that in the common Way of felling but one single Stick of Timber, the Seller is defrauded of near two fifth Parts ; it therefore follows, that where great Sales of Timber have been sold, the Sellers have sustain'd very great Losses, unknown to them.

THE several Calculations here made, being arithmetically performed, I will now (according to my Promise) proceed to shew how the same may be performed instrumentally, by the double Line of Numbers (commonly called *Gunter's Line*) on the sliding Rule.

THE Analogy for measuring Timber that is really square, as the common Method supposes it to be, is as following.

THE

As the Length of the Piece in Feet, accounted on the Slip of the Rule, is to 12 in the Girth Line, on the Rule; so is the fourth Part of the Girth in Inches and Halfs, accounted on the Girth Line, to the Content on the Slip, in solid Feet. But,

The true Analogy for measuring Timber that is round, is the following.

As the Length of the Piece in Feet, accounted on the Slip, is to $10\frac{3}{4}$ in the Girth Line; so is the fourth Part of the Girth in Inches and Halfs, accounted on the Girth Line, to the Content on the Slip, in solid Feet.

N. B. THAT the first Analogy gives the Content of round Timber, according to the common erroneous Method, *viz.* one fifth less than the true Quantity; and the latter, the true and exact Quantity of round Timber, as it should in Justice be measured, between Buyer and Seller.

To illustrate them, I will perform some Examples by both Analogies.

LET it be required to measure the Frustum L K, whose Length is 8 Feet, and mean Girth 15 Inches.

1st, By the erroneous Method.

PRACTICE.

SET 8 on the Slip, to 12 on the Girth Line, and against 15 on the Girth Line, stands $12 \frac{1}{2}$ on the Slip, the supposed Quantity required; and when Timber is really square, then this last Number is the true Quantity required: But in this Example, 'tis supposed to be round, and measured as usual. Now, we will measure the same Stick by the true Way.

2dly, By the right Method that gives the true Solidity.

PRACTICE.

SET 8, (the Length in Feet) accounted on the Slip, to $10 \frac{3}{4}$ — (instead of 12) on the Girth Line; and against 15 the mean Girth on the Girth Line, stands $15 \frac{1}{2}$ —, the true Quantity required, which is 3 solid Feet more than the erroneous Method produces, *viz.* one fifth Part.

EXAMPLE.

LET it be required, to measure (as afore-said) the Frustrum L N.

1st, By the erroneous Method.

PRACTICE.

PRACTICE.

SET 8, the Length accounted on the Slip, to 12 on the Girth Line, and against 9, the mean Girth accounted on the Girth Line, stand $4\frac{1}{2}$ Feet, the Solidity required.

2dly, By the exact Method.

SET 8, the Length accounted on the Slip, to $10\frac{3}{4}$, (as in the preceding to 12) on the Girth Line, and against 9 the mean Girth accounted on the Girth Line stands 5, $\frac{5}{8}$, the Solidity required.

AND the like of any other Quantity whatever, that is either square or round.

IF we have Occasion to measure Timber, and have not a sliding Rule, we must cast up the Dimensions, if the Timber is squared, as before delivered, by squaring the $\frac{1}{4}$ Girth; multiply the Product into the Length, and divide the last Product by 1728, the cubical Inches in one cubical Foot; the Quotient will be the Content required.

BUT if the Timber be round, then you must find the Area of a Circle, whose Circumference is equal to the whole Girth, as

before was shewn: Which Area being multiplied into the Length, and the Product divided by 1728, the Quotient is the Content required.

To make this intelligible and plain, I will measure the Frustrum K L, after the true Method, arithmetically.

THE Length is 8 Feet, and mean Girth at P 5 Feet, or 60 Inches.

ANALOGY.

As 22 is to 7, so is 60 to 19 $\frac{1}{11}$

7

—

22) 420 (19

{ The Diameter
of the Circle
requir'd, whose
Circumference
is equal to the
Girth given.

22

—

200

198

—

2 { Remains, equal
to $\frac{1}{11}$

HAVING thus made known the Diameter, we must now proceed to find the Area
of

of the Circle, not but that we might have done that, without finding the Diameter; but I think 'tis not so easy a Method, and therefore I recommend the finding of the Diameter, before we proceed to find the Area. This being done, proceed to find the Area as follows: *First*, Square the Diameter 19 — $\frac{1}{11}$.

$$19 - \frac{1}{11}$$

171

19

361

$$3 - \frac{1}{11}$$

364 = $\frac{1}{11}$ The Diameter squared.

Which multiply by 11.

$$364 \frac{1}{11}$$

11

364

364

5

Product 4009

R 3

Di-

Divide 4009 by 14, and the Quotient will be the Area of the Circle required.

$$14)4009(286$$

$$28$$

$$120$$

$$112$$

$$89$$

$$84$$

5 Remains, equal to $\frac{5}{14}$.

Now, multiply $286 \frac{1}{4}$, by 8 Foot, viz. 96 Inches, the Length given.

$$286 \frac{1}{4}$$

$$96$$

$$1716$$

$$2574$$

$$34 - \frac{4}{14}$$

27490 — $\frac{4}{14}$ The Solidity in Inches.

THIS

THIS Solidity in Inches divide by 1728 and the Quotient is $15 \frac{7}{8}$, the Content in Feet required.

1728)27490(15 solid Feet.

1728

10210

8640

1570 solid Inches remain,
which are nearly equal to a solid Foot.

Now, here we'll see, that this Piece of Timber, by taking in all the Fractions, as I went on in the Calculation, makes the Quantity thus performed arithmetically, to exceed the Quantity that the same Piece measur'd to, when measured instrumentally, by the sliding Rule, almost Half a Foot. But since that the Custom in purchasing Timber is never to mind such small Trifles, 'tis not worth our Notice.

N. B. THAT if the Bark is on Timber, when 'tis measured, the Custom is, to allow one Inch out of the $\frac{1}{4}$ of the whole Girth for it, *viz.* if the one Fourth of a Girth is found to be nine Inches, then one

R 4

Inch

248 APPENDIX.

Inch is abated, and the Girth is reckoned at eight Inches only: But I must advise, that this Custom be no longer allowed on by the Seller, for 'tis greatly to his Loss.

OBSERVE the following Operations.

SUPPOSE that the Bark is on the Butt-End K L, whose mean Girth is 60 Inches, and the Area thereof 286 square Inches, as in the last Page.

Now, according to Custom, abate one Inch out of the fourth Part of the Girth, viz. out of 15 Inches; then the Remainder will be 14 Inches, which taken 4 Times for the whole Girth, is 56 Inches. Now,

As 22 is to 7, so is 56 to $17\frac{4}{5}$. The Diameter without the Bark

$$17 - \frac{4}{5}$$

$$17 - \frac{4}{5}$$

$$119$$

$$17$$

$$32$$

$$321 \text{ The Diameter squared.}$$

321

11

321

321

—

14)3531(252

{ square Inches the Area, when
four Inches are abated in the
Circumference, and the re-
maining Girth measured as
a Circle, whose Circumfe-
rence is equal thereto.

28

—

73

70

—

31

28

—

3

IF we consider, that when one full Inch is abated from the Surface, all about the Tree, or if the Bark is actually one Inch in Thickness; then the Tree, when the Bark is taken off, must be two Inches less in its Diameter; so that the Frustum or Butt K L, with its Bark on, being then

19 $\frac{1}{4}$ Inches Diameter, is but 17 $\frac{1}{4}$ Inches when disbarked.

WE will now see what the Area at the mean Girth is, when the Bark is taken off.

Diam. 17 $\frac{1}{4}$

17 $\frac{1}{4}$

119

17

3 $\frac{1}{4}$

292 $\frac{1}{4}$ The Diameter squar'd, which

Multiply
by

11

292

2921

14) 3213 (229

square Inches the Area,
when two Inches are aba-
ted in the Diameter of the
whole, for the Thickness
of the Bark.

28

41

28

133

126

7

By

By these two last Calculations it appears, that when four Inches are allowed in the whole Girth, *viz.* one Inch in the $\frac{1}{4}$, the Area of Timber is 252 Inches: But when two Inches are abated in the Diameter, *viz.* one Inch at each Extreme, for the Thickness of the Bark; then the Area is but 229, which is 23 Inches less than the first: So that herein the crafty Buyer is a Loser.

BUT this never happens, when Timber is measured after the customary Method, the Allowances therein being so very extravagant.

FOR suppose the mean Girth of KL to be seventeen Inches, exclusive of the Bark, then according to the customary Way of measuring, its Product is 289 square Inches, and not 366, being considered as the Circumference of a Circle, equal thereto: See the Calculation.

¹⁷ { The fourth Part of the Girth,
allowing 1 Inch for Bark.

17

119

17

Product 289 { square Inches, the Area at
the Girth:

But this Diameter being truly calcu-
lated, as Page 250, the true Area } 342 $\frac{6}{7}$
of Timber at the Girth is,

By this last Account, after the usual } 389
Method, it is but

The Difference is Solid Inches. 953 $\frac{6}{7}$

IF we multiply 53 $\frac{6}{7}$, the Difference
by 96, the Length, the Product gives
5120 $\frac{6}{7}$ solid Inches, which is the real Loss
in the Butt-End KL, when 'tis measur'd
with the Bark on, after the common Me-
thod, which is three solid Feet, wanting
but 64 Inches; that is, the $\frac{1}{7}$ Part of a
Foot.

FROM

FROM what I have here deliver'd, it apparently appears, that to fell Timber by the common Method of measuring, (as 'tis falsely termed,) the Seller, by the several Frauds therein, is actually cheated out of a full Half of the Quantity that he sells. Is not this a Shame? does not this vile Practice deserve the Consideration of his most Sacred Majesty and Parliament, to put a final End thereto, that Honesty may take Place for the future, and be no longer a Skreen to Knavery, where nothing but Frauds and Villany are acting?

THIS I submit to the Consideration of all our worthy, learned, and judicious Gentlemen of *Great Britain*, who have been, and are the only Sufferers by this long practised Villany; and as I am here inviting them to the Propagation of Timber on their several Estates, to their very great Improvements, by undeniable Reasonings and Proofs, I thought it my Duty to declare the Facts of the many Frauds used in buying of Timber; that hereafter, when their Plantations arrive to Maturity, they may reap the full Benefits of their Produce, according to my Calculations here humbly offered, and not be defrauded

ded out of one Half thereof, for Want of just Mensurations.

IN my Calculation of the great Advantages that would arise from Plantations of Elm, it is there prov'd, that one Thousand Acres planted with Elm, (as there directed) will, in twenty Years Time, produce 84439 Pounds neat Profit, clear from all Outgoings. Now, would not it vex any Gentleman, that in felling of this Timber by common Measure, he should be bit out of half the Quantity, which is worth 42419 Pounds ten Shillings? I need not wait for an Answer to this Question, it being natural to think, that every one who knows, will undoubtedly take all possible Care to prevent it.

To consider how long a Time this base and vile Method has prosper'd, and how many bright ingenious Mathematicians have been bred in *England*, that dayly have been and are concerned in the Mensuration of Timber, (who undoubtedly knew the Frauds therein); 'tis very surprizing, that no one among them would (for the common Good) take the Pleasure of making a publick Declaration thereof, (as I have here done) which is doing no honest Man any Sort

Sort of Injury, and I hope no small Service to my Country in general.

AND as our late Parliament thought it necessary to make an Act, forbidding the making of Bricks, under the Standard Size, and without Mixtures of Sea-coal Ashes (call'd *Spanish*) therein, which they wisely conceived was prejudicial to the Subject: So I make no Doubt, but that this our new Parliament will, upon a mature Consideration hereof, enact, that for the Future, whatever Quantity or Quantities of Timber is, or are measured by any Person or Persons that assume the Practice of measuring, (who shall mark after the usual Manner, with his own Hand, before Evidence, the Contents); and the Content or Contents by him or them warranted, are actually considerably less than the true solid Content or Contents afterwards found upon a just Mensuration thereof; that the said Measurer or Measurers shall be prosecuted by the Party or Parties so grieved, as if he or they had feloniously stole such Quantities of Timber, as their Measurements given under their own Hands are less than the true and real Quantities in the Timber, by them (said to be) measured.

BUT,

BUT, as Punishments for all Offences are considered, and executed by the Orders of our wise Legislators, I therefore submit the whole to their better Judgments.

THE only Objections that any of the Buyers of Timber can make to this Reformation of the Measure of Timber, is, that before the Body is hew'd to a Square, there is a Waste in the Chips and Slabbs, which are only useful for the Fire; and that the Expence of hewing is more than the Chips are worth. Now, all this I allow: I know, that when Timber is to be squared, there is some Loss in hewing, and Expence also: But then, let an Allowance (that is reasonable) be made in the Price *per* Load, and not in the Measurement; for then the Seller knows what he is doing, as well as the Buyer, which he knows nothing of, when he is deceiv'd in the Quantity. Besides, 'tis very often seen, that round Timber is never squared, and consequently has no Loss by hewing, as when used for Pipes to convey Water, and for Pumps, &c.

THE Motives that moved me to this Declaration being fully declared at large, in
many

many of the preceding Pages, are thus in Brief.

First, BY the deceitful Method of leaving on the small Tops to a great Length, under a Pretence of making the Quantity the greater; 'tis greatly diminish'd thereby, which is prov'd by K O, that is, 24 Feet long, mean Girth, in the Middle 9 Inches, and Quantity $13 \frac{1}{2}$ solid Feet. Whereas if from the same Piece at the Butt, 8 Feet in Length only be cut off, or measured by its self, the real solid Content thereof (exclusive of the remaining Top L O, which is 16 Feet long) is $12 \frac{1}{2}$ Feet, which is but one Foot less than the whole measured together.

Secondly, BY the Allowance of an Inch, out of the fourth Part of the Girth, 'tis plain, by the preceding, that such an Allowance being made, in the Mensuration of the Butt K L, there is a very great Loss to the Seller, when Quantities are very large.

Lastly, IT has also been proved, that when the Dimensions of Timber are truly taken, yet if they are cast up, after the common Method, the Quantity produced is less than the true Quantity, by

something more than a full fifth Part. All which Practices sum'd together, are fully sufficient to prove the Necessity of a speedy Reformation in the Mensuration thereof; and there's no Doubt, but this publick Grievance will be timely redress'd, to the great Advantages of estated Gentlemen and Landholders; as that of using Sea-Coal Ashes in Brick-earth, to the great Prejudice and early Decay of Buildings, when used in too great a Quantity. But new Buildings do soon decay, and oftentimes fall to the Ground, before they are finish'd, when they are built with the soundest Bricks that can be made, where Workmen have not sufficient Quantities of Timber for Lentils, &c. to bind the Work together; or when they are not allowed to make the Walls of sufficient Thickness, to support the Weights of the several Floors and Roof.

IN these Cases the very best Workmen and Materials may fail, as well as when the *Spanish* is work'd into Brick-earth in too great a Quantity, which, in burning, burns the very Life and Strength of the Earth to nothing, whereby they are incapable of supporting their own Weights: But when

Spanish is moderately mix'd with Brick-earth in the making, and the Earth of a good Kind; those Bricks so made, are much stronger, and of a longer Duration, than others that are made of the same Earth, and burnt in the same Manner, without a moderate Mixture therein. For Bricks made of Earth only, as the late Act directs, cannot be so thoroughly burnt, as those that have a moderate Mixture of Ashes, which burns within the Brick, proportionably to the circumscribing Heat about them. For altho' that in Brick-earths there is contain'd great Quantities of Oil, and consequently Sulphur also; yet 'tis in so small a Quantity, to what is required, that before the middle Parts of a Brick can be half burnt, the out Parts are ready to run into a liquid Mass, (called Clinkers). And if the Heat is so proportion'd as to burn the out Parts of the Brick no more than they should be, then the middle Parts are scarcely more than half burnt. This I thought necessary to recommend to the Consideration of those whom it may concern, and beg Pardon for the Digression.

I will now proceed to exhibit the Manner of placing the Dimensions of Timber,

as they are taken at Measuring. That when you have any to measure, we may be ready therein, as well as to know when others are so also, that are sent to measure against us,

THE Manner thereof is as following.

Round

Round Timber measured, September, 11. 1727. for the Right Honourable the Earl of ——— at his Lordship's Wood, called Bramble-wood, in the Parish of ——— per B. L. of Twickenham.

	Piec. Len.		Piec. Gir.	Sol. Con- tents after the usual Method.		Sol. Con- tents after the true Method.		Diffe. be- tween the false and true Cont.	
N.	Feet	Inc.	inches.	Load.	Fe.	Load.	Fe.	Load.	Fe.
1	101	6	20	0	28	0	35 $\frac{1}{4}$	0	7 $\frac{1}{4}$
2	53	0	17	0	10 $\frac{6}{10}$	0	13 $\frac{3}{10}$	0	2 $\frac{9}{10}$
3	06	9	24	0	27	0	33 $\frac{3}{4}$	0	6 $\frac{3}{4}$
4	15	3	26 $\frac{1}{2}$	1	24 $\frac{1}{2}$	1	43 $\frac{3}{4}$	0	18 $\frac{1}{2}$
5	11	0	12	0	11	0	13 $\frac{1}{4}$	0	2 $\frac{3}{4}$
6	70	6	9 $\frac{1}{2}$	0	44	0	55 $\frac{1}{3}$	0	11 $\frac{1}{3}$
7	24	0	9	0	13 $\frac{1}{2}$	0	17	0	3 $\frac{1}{2}$
8	16	0	6	0	4	0	5	0	1
9	16	0	12	0	16	0	20	0	4
10	8	0	18	0	18	0	22 $\frac{1}{2}$	0	4 $\frac{1}{2}$
11	8	0	4 $\frac{1}{2}$	0	1 $\frac{1}{10}$	0	1 $\frac{1}{10}$	0	1 $\frac{1}{10}$
12	92	6	30 $\frac{3}{4}$	12	5	15	10	3	5
13	22	3	11	0	18 $\frac{6}{10}$	0	23 $\frac{1}{4}$	0	4 $\frac{3}{10}$
14	17	6	15 $\frac{1}{2}$	0	29	0	36 $\frac{1}{2}$	0	7 $\frac{1}{2}$
15	59	0	12	1	9	1	24	0	15
16	60	0	12	1	10	1	25 $\frac{1}{3}$	0	15 $\frac{1}{3}$
17	70	0	15 $\frac{1}{2}$	2	17	2	46	0	29
18	70	0	15	2	9 $\frac{1}{2}$	2	36 $\frac{1}{2}$	0	27
19	85	6	20	4	38	5	47	1	9
20	99	6	32 $\frac{1}{2}$	14	30	18	10	3	30
21	18		6	0	4 $\frac{1}{2}$	0	5 $\frac{6}{10}$	0	1 $\frac{1}{10}$
22	29	6	29 $\frac{1}{2}$	3	29	4	24	0	45
23	30	0	29	3	31	4	28	0	47
Sums.	983 : 9		387 : $\frac{1}{4}$	51 18		64 : 24		13 : 6	

WHEN we measure Timber by this new and exact Method, we need have on each Leaf of our Book but four Columns; the first denoting the Number of Pieces, the second their Lengths, the third their Girths, and the fourth their Quantities.

BUT when we measure against a Measurer after the common Way, then 'tis necessary to have two other Columns, as here exhibited, to exemplify the Differences.

WHEN we measure Timber that is hew'd we must be provided with a large Pair of Callipers, to measure the Thickness or Diameters of the Pieces in the Middle, between both Ends where we did before (in the round Timber) girth it. Which Thickness is always taken for the Sides of Squares, as the fourth Part of the Girths were before; and in like Manner multiplied into the Length for the Solidity.

BUT this is also a notorious Method; for all the Cants, or angular Parts that are wanting, to make the Timber perfectly square, are measured in, and accounted for (tho' not there) as so much real Timber. By this Method, most Timber Merchants, and other Dealers, sell the greatest Part of their Timber; but few or any care to buy
by

by it, except, when by deceitfully taking the Dimensions, they can bite the Seller.

THE least Loss sustain'd by buying hew'd Timber, if the Dimensions are justly taken, is $\frac{1}{8}$ Part of the whole; but it very often happens to be $\frac{1}{6}$, $\frac{1}{7}$, and very often $\frac{1}{4}$ Part.

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