The manner of raising, ordering, and improving forest-trees. With directions how to plant, make, and keep woods, walks, avenues, lawns, hedges, &c.; Also rules and tables shewing how the ingenious planter may measure superficial figures, divide woods or land, and measure timber and other solid bodies, either by arithmetick or geometry; with the uses of that excellent line, the line of numbers, by several new examples; and many other rules, useful for most men / Illustrated with figures, proper for avenues, walks, and lawns, &c.; By Moses Cook.

Contributors

Cook, Moses.

Publication/Creation

London : Printed for E. Bell [etc.], 1724.

Persistent URL

https://wellcomecollection.org/works/znbvtwh8

License and attribution

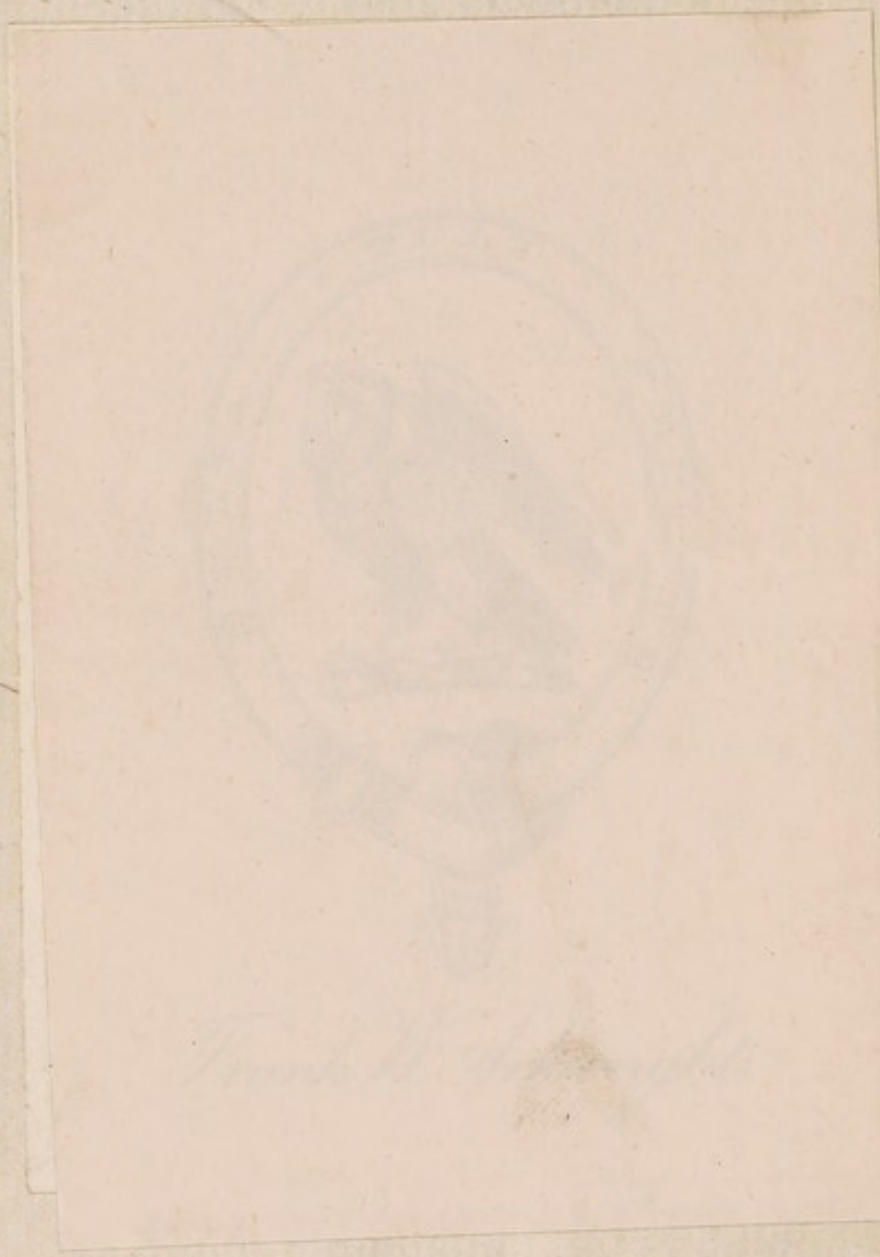
This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.

wellcome collection

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

1865 1/B

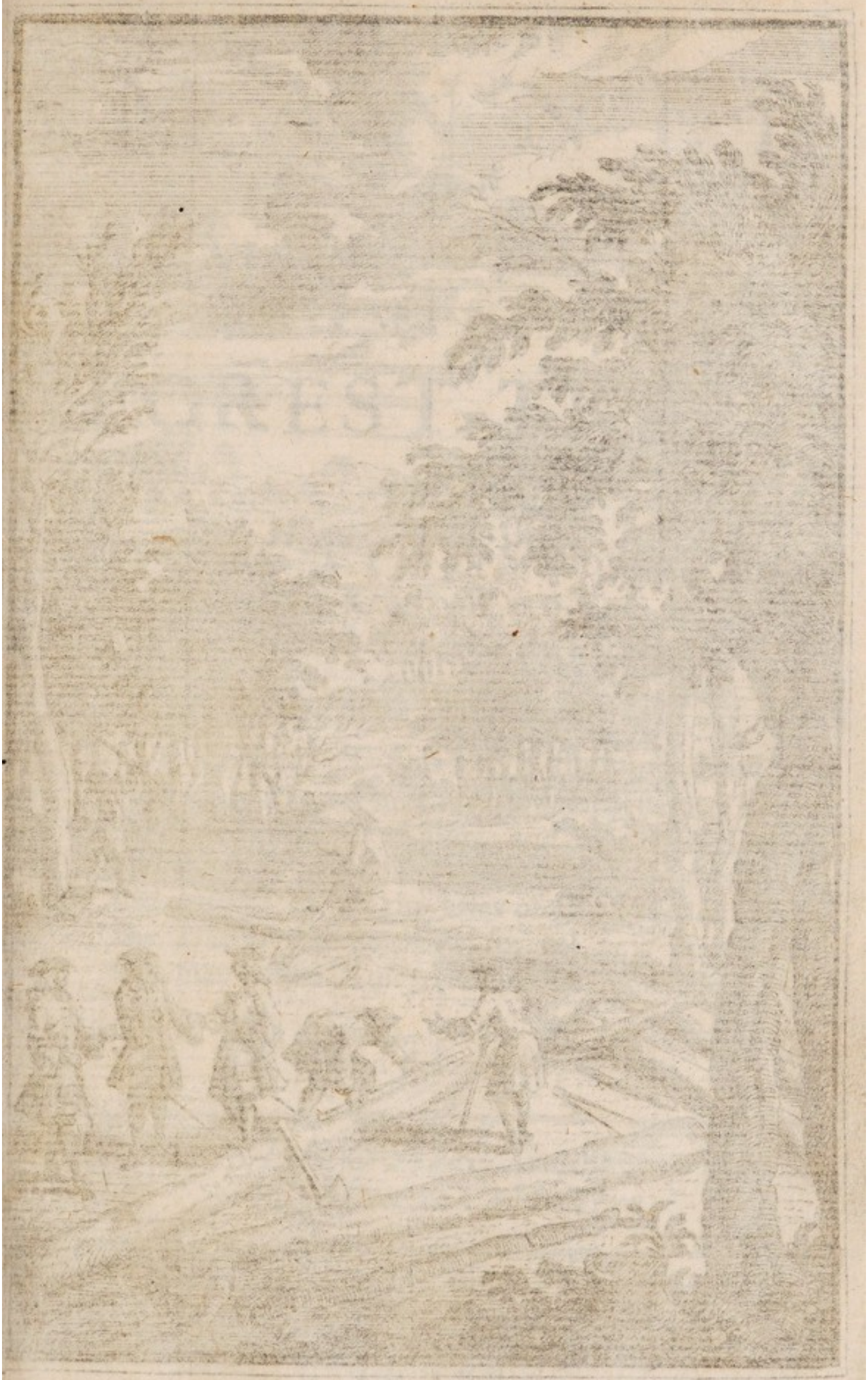


Bradford
24/11/05
311

12794 8/

Digitized by the Internet Archive
in 2018 with funding from
Wellcome Library

https://archive.org/details/b30503656



THE MANNER OF RAISING, ORDERING, and IMPROVING FOREST-TREES:

WITH

DIRECTIONS how to Plant, Make, and Keep WOODS, WALKS, AVENUES, LAWNS, HEDGES, &c.

ALSO

RULES and TABLES ſhewing how the Ingenious Planter may meaſure Superficial Figures, divide Woods or Land, and meaſure Timber and other ſolid Bodies, either by Arithmetick or Geometry: With the Uſes of that excellent Line, the *Line of Numbers*, by ſeveral new Examples; and many other Rules, uſeful for moſt Men.

Illuſtrated with Figures, proper for Avenues, Walks, and Lawns, &c.

By *MOSES COOK*, Gardiner to the Earl of *Eſſex* at *Caſhioberry*.

The THIRD EDITION, Corrected.

LONDON,

Printed for *Eliz. Bell*, *John Darby*, *Arthur Betteſworth*, *Francis Fayram*, *John Pemberton*, *Charles Rivington*, *John Hooke*, *Francis Clay*, *Jer. Batley*, *Edward Symon*. M,DCC.XXIV.

12797

MANNER

OF

RAISING, ORDERING,

and IMPROVING

FOREST-TREES:

WITH

DIRECTIONS how to Plant,
Make, and Keep WOODS, WALKS,
AVENUES, LAWNS, HEDGES, &c.

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

RULES and TABLES shewing how the
Ingenious Planter may measure Superficial Figures,
divide Woods or Land, and measure Timber
and other solid Bodies, either by Arithmetick or
Geometry: With the Uses of that excellent Line,
the Line of Numbers, by several new Examples,
and many other Rules, useful for most Men.

Illustrated with Figures, proper for Avenues, Walks,
and Lawns, &c.

To His Excellency

ARTHUR CAPELL,

Lord Lieutenant and General Governour of the Kingdom of Ireland, *Earl of* Eſſex, *Viſcount* Maldon, *Lord* Capell, *Baron of* Hadham, *Lord Lieutenant of* Hertfordſhire, *and one of the King's moſt Honourable Privy Council, &c.*

May it pleaſe your Excellency,

DID I not very well know your great Underſtanding in, and Love to the Subject of the enſuing Diſcourſe, I durſt not aſſume the boldneſs to implore

your Honour's Patronage of it; but I am well aſſured, that you have not been only a Spectator, but an Actor in moſt of what is treated of in the enſuing Lines: for, to your eternal Praiſe be it ſpoken, there is many a fine Tree which you have nurſed up from Seeds ſown by your own Hands, and many Thouſands more which you have commanded me to raiſe.

Therefore, my Lord, I humbly crave your Pardon for the Preſumption and Imperfection of the Penman: and tho your Excellency knows full well how to prune young Trees, yet I hope you will paſs by the impertinent and ſuperfluous Lines in this my Plantation; which, tho I have endeavoured to keep as well pruned from Errors, and as clean from Weeds as I could, yet 'tis poſſible there may be ſome Things in it, which ſome may term as ill: But to you all Things in it are ſo well known, that I hope both It and I ſhall find ſuch ſhelter and ſupport by your favour-

able

ble Aſpect, as that we need not to fear the Storms of the ignorant or negligent Planters.

And my Lord, ſince the Art of raiſing and improving of Trees, hath ever been eſteemed amongſt the truly Noble, Wiſe, Ingenious and moſt Refined Spirits of the World from Age to Age, and chiefly maintained and practiſed by them; and ſince this Property is naturally inherent in you, (you being not only a great Lover of this Art, but alſo moſt skilful in it) I humbly preſume to dedicate theſe my Obſervations to your Lordſhip; not being ignorant, that he who is moſt knowing in any thing, is the beſt able to judge of the ſame: and that this my Opinion, of your Honour's Ability and Promptitude in promoting the planting and improving of Foreſt-Trees, is ſurely grounded, the large Plantation you have made will abundantly teſtify. But I humbly beg your Lordſhip's Pardon for this Preſumption, not without hopes that my

good Meaning may obtain it. And ſince my good Wiſhes, and the beſt of my Services is all I can contribute to you, theſe ſhall never be wanting from,

My LORD,

Your Excellency's moſt Humble, and moſt Obedient Servant to ſerve you, whilſt I bear the Name of

Moſes Cook.

TO

TO THE Courteous READER.

AMONGST the many Books that are ſent into the World in this Age, I have adventured to increaſe the Number by this one. I know there are many Pamphlets, prodigious Hiſtories and Romances, invented by Mens Fancies, which abuſe many noble Spirits, in reading of which they ſpend their time in vain, and dull their Wits: which Books are more fit for Women than Men; for they will furniſh them with ſtrange Stories, and a few fine Words. Alſo there are many Books of Diſputes in Divinity, which tend more to make our Differences the greater, than any ways to edify or unite us: therefore if your Genius leads you to read ſuch Books, this is not for your Fancy.

But if you take delight in Planting or Gardening, or to raiſe and improve Foreſt-Trees, or to make Walks, Avenues, or Lawns; to plant or improve your Woods, Hedges, &c. or to meaſure

meaſure moſt ſorts of ſuperficial or ſolid Figures, either by Arithmetick or Geometry, with ſeveral other Rules of the ſame nature, as the Titles of each Chapter (but eſpecially the Chapters themſelves) will more fully inform you; then I hope this Book will be of good uſe to you. For here are ſeveral Rules, approved of by ſeveral noble and ingenious Men, which are as faithfully delivered, as they are really intended for the good of this Nation, and all thoſe that will put them in practice; which if you pleaſe to do, you will employ your time ſo well, that you will never have cauſe to ſay, it is ill ſpent: and if once you do but ſtep one Step forward, and ſee but any ſucceſs of your Labours, you will need then no Logician's Arguments, nor no Rhetorician's Eloquence to perſuade you to proceed. And for your better Encouragement, know, that it hath been and is the Delight and Practice of Kings, Princes, Philoſophers, and all noble-ſpirited and wiſe Men: For have not many of them quitted their great Employs, and taken upon them this pleaſing Art of Planting and Gardening, as is proved by ſeveral? See the Prefaces of Parkinſon's, Gerard's, *the Curate of* Henonville's, *and ſeveral others. For Almighty God hath imprinted in the Hearts of moſt wiſe Men ſuch a Love to Plants in part, as their Father* Adam *had in his State of Innocency; that thoſe noble and uſeful Works, which the Almighty made for the uſe of Man, and his Glory, ſhould be the more common for their excellent uſes to the Sons of Men; and that they ſhould take eare of thoſe*

which

which are tender, and want the more Care, leſt they ſhould be loſt; and alſo that both their Virtues and their Beauties ſhould be known in ſeveral parts of the World, that he might be the more admired and glorified.

For I do believe that the Bleſſing of God is much aſſiſting to thoſe who love and endeavour to improve and preſerve his Works; for God's Works and his Word are no ſuch different Things: and alſo it has been and is obſerved, that thoſe that are Waſters and wilful Spoiler of Trees and Plants, without juſt Reaſon ſo to do, have ſeldom proſpered in this World. See this confirmed by Eſq; Evelyn *in his Preface to his* Diſcourſe of Foreſt-Trees. *Therefore, you that are Lovers of Trees and Plants, if once you have them, let your Love be ſhowed in the Care you take of them, to keep them from Cattle and other Inconveniencies; then will you not only have Pleaſure and Profit of them, but others, by being defended from the malignant and ſharp Air by their Heads and Bodies, and alſo ſhaded from the violent Heats, their ſweet Flowers, and their refreſhing Fruit will be uſeful to ſeveral Men.*

Alſo Planting and Gardening *adds much to the Health and Content of Man; and theſe two Jewels, no Man that well underſtands himſelf, would willingly be without: for it is not only ſet down for a certain Truth by many wiſe Men, but confirmed by Experience. The Learned Lord* Bacon *commends the following of the Plough in freſh* Ground, *to be very healthful for Man; but more the digging in* Gardens: *ſaying,*

saying, It is beſt to take the Air of the Earth new turned up by digging with the Spade, or ſtanding by him that diggeth. *He tells you alſo that he knew a great Man, that lived long, who had a freſh Clod of Earth brought to him every Morning as he ſat in his Bed, and would hold his Head over it a pretty while*, &c. *See* pag. 203. *of his* Natural Hiſtory. *For tho the Earth be two-fold, External or Viſible, and Internal or Inviſible; the External is not the Element, but the Body of the Element, in which is the Sulphur, Mercury and Salt: for the Element of the Earth is Life and Spirit, wherein lies the* Aſtras *of the Earth which brings forth all growing Things; for it hath in it ſelf the Seeds and ſeminal Virtues of all Things; and as it is made fruitful by all the other Elements, ſo it bringeth forth all things out of it ſelf, as Trees, Herbs and Flowers; and every one of theſe is again the* Aſtrum *and Seed: ſee* Philoſophy Reformed, *pag.* 38. *Thus is ſhewed, that the Earth hath in it the Virtues of all Herbs; it muſt then be alſo healthful as they be: but for that part of the Earth that is near the Surface, the Plants ſuck moſt of its Virtue into them; therefore that which lieth deeper may be the more healthful for Man to ſmell of, for Conſumption, Loſs of Appetite*, &c. *And Trees do not only catch the Mildew, and other offenſive Dews with their Leaves, but skreen the Air off other bad ones, and make it much the healthfuller for Man. Therefore, you that live near to Fenns, Moors, and other unhealthful Places, plant your Seats round*

round with Trees, and ſome of thoſe that yield healthful Smells; for it is very certain, what the aforeſaid Learned Author ſaith, pag. 204. That Odours do nouriſh: *for he tells us, he knew a Gentleman that would faſt three or four Days, without Meat, Bread or Drink, by only ſmelling to a great wiſp of Herbs,* &c. *And in* pag. 44. *in the Hiſtory of his Life and Death, he ſaith,* That Odours are eſpecially profitable for the comforting of the Heart: *And further he ſaith,* We commend above all other Odours, that of Plants growing and not plucked, taken in the open Air, as Violets, Gilly-flowers, Pinks, Bean-flowers, Lime-tree Bloſſoms, Honey-ſuckles, Wall-flowers, Roſes, Mints, Lavender, *&c.* Orange-trees, Citron, Mirtles, *&c.* Therefore to walk or ſit near the breath of theſe Plants, ſhould not be neglected.

Thus you ſee this Learned Man takes notice of the Lime-tree; and if the ſimple Water that is diſtilled from the Flowers, be good againſt the Plague, or other infectious Diſeaſes, as certain it is, then ſure the Smell from the Bloſſoms themſelves muſt be very good; therefore excellent to plant near your Houſes: And (as I have heard) a wiſe Man's Opinion was, That the Lime-Trees in the Cities in Holland *add much to the Health of the Inhabitants; and it is my belief. I have hinted at the bigneſs of one Lime or Line-tree, in the enſuing Lines, and ſhall here ſhew you, for your further Encouragement to plant and preſerve Trees, the Content of one Tree, as I had it from the Honourable Sir* Henry Capell, *as followeth.*

A Witch-Elm in Sir *Walter Baggott's* Park in the County of *Stafford*,

Two Men five Days felling it.
It lay forty Yards in Length.
The Stool five Yards two Feet over.
Fourteen Load of Wood brake in the fall.
Forty eight Load in the Top.
Eighty pair of Naves were made out of it.
Eight Thousand six hundred and sixty Feet of Boards and Planks.
It cost ten Pounds seventeen Shillings sawing.
The whole Substance was conceived to be ninety seven Tuns.
It was felled in the Year 1674.

And now I shall set before you some Rocks, which are in some Books, and for their strangeness are entertain'd too long, to the abuse of many: But these which I mark here, pray endeavour to avoid.

First Error. *It is affirmed by some, that if you put your Seeds in a Box, Shell, or Quill, and so set them in the Ground, these Seeds will unite in one, and so bring forth larger and better Fruit; but if they should join in Roots or Branches, that will not make the Fruit the better or larger, nor of two kinds in Taste, as some have said. I rather think that putting Seeds into such Things will stupefy them and destroy them; but if they should unite in one Shoot, that Shoot that groweth the fastest would lead all the Sap into its Head, and so strain it thro its Pores, that it would*

would make no more Alteration of a Fruit that ſuch a Shoot would naturally have had, than a a Graft doth by being grafted on ſeveral Stocks.

For what alteration there is of Plants, it is from their Seed, and is ſtamped in them at their firſt Conception and Nativity, which the Art of Man helpeth and may improve ſomewhat, but never to alter the Kind, by Budding, Grafting, &c.

I ſhall not trouble you and my ſelf in anſwering theſe following Errors; but if you be not ſatisfy'd with my ſaying they are ſo, I ſhall anſwer them when you deſire me, as well as I can: ſo ſhall I only name them, and ſhew you them as I have found them.

Second Error. *To water Seeds with coloured Water; or Plants, to make them produce what coloured Flowers or Fruit you pleaſe: It is in vain to think ſo.*

Third Error. *To graft or bud Stone-fruit, or Kernels, or Nuts; or to bud ſuch Fruit as beareth Kernels on ſuch as beareth Nuts or Stones; or to bud Fruit-trees on Foreſt, and the contrary; or to graft or bud Figs on Peaches, or Apricocks; or to bud any ſort of Trees on Coleworts; or to bud Peaches on the Mulberry-tree to have them early; or to bud Damſons on Gooſeberry, Mulberry or Cherries, to have them ripe all Summer; or by budding Cherries on theſe Stocks, and to wet them in Honey and Cloves, makes them taſte ſweet and ſpicy; or by budding or grafting, to make a Fruit taſte half an Apple, and half a Pear, or half a Pippin and half a Pearmain; or an Apple half ſweet, half ſour;*

or

or to graft a Rose on a Holly; or to graft Cherries on other Stone-fruit to come without Stones; or to graft a Vine on a Cherry; or to take the Pith out of two Grafts, and then join them together and graft them, brings a Fruit without Kernels (so they may, when both grow:) or to graft a Cyon with the small end downward, will make it bring a Fruit without Core. These, and the like, are great Errors, and very false in Grafting and Budding.

Fourth Error. *To set a whole Apple or Pear the Pippins will come forth in one Shoot; or to set any sort of Fruit with the fleshy part on; are also great Errors.*

Fifth Error. *To bore holes in Trees, and to put Honey or other sweet things into them, to make them bear more and sweeter Fruit; is also a great Fallacy.*

Sixth Error. *To think that the Sap of Trees at the approach of Winter falleth from the Head into the Root, is a gross Mistake. Many more there are which I could count up; but these are too many either to be written or kept in memory.*

Thus having shewed you some Errors, I here beg pardon for mine own that are in this Book. I know I have committed Tautology: the Reason is, I have been long in taking true Observation; but I hope that which is so useful cannot be too often repeated. I have used Arithmetick the more, because it is so useful to the ingenious Planter; for I have not laboured to please my self only, but all those that seek Wisdom: For the Gifts of God are improved by communicating, and Knowledge thriveth as Ingenuity is improv-

ed

ed and communicated: for Ingenuity hath these Properties of Memory and Charity, the more you use it, the better it is; and the more you give of it, the more you shall have.

And now I shall shew you how I did proceed in that which I was born to, not made: I always took notes of what I did set or sow, the Time, and on what Ground, &c. and when it proved well, I noted it so; but when ill, I did endeavour as much as I could to know the Reason; which when once I found, I noted it well. I also always was very wary of taking things upon trust; for many Learned Men have abused their Works by so doing; and if any Man told me any thing, unless he had sufficient Experience of it, or could give very good reasons why it was so, I always was incredulous of it, unless my Judgment told me it was possible, or he by Discourse made it plain to me. For no Man ought to deprive another of the Liberty of humane Ingenuity, that hath the Light of Nature to discern and judg by.

I have often been blamed by Noblemen, for not consenting to the Opinion of some of their Favourites; for when their Notions were not grounded on Reason, or had not been proved by Experience (tho ever so new) I could not well entertain them. So if you find any thing in these few Lines that hath not reason in it, prove by Experience whether it's true or not: and do not say, it is so or so, because I say it; but as you find it. And let me be plain with you further; always when I undertook any difficult Business, I was as careful as I could be, to elect a fit time

to begin that Buſineſs in: and to the praiſe of God I ſpeak it, I always had the greateſt Succeſs in my greateſt Undertakings, tho many times I have been altogether ignorant in them; and many times failed in ſmall things, when I thought of the leaſt danger. I know ſome will ſmile at this Truth, but let them laugh that win; I never loſt by it. The Wiſeſt Man that ever was, tells you, There is a time for all things; *and certainly there is in Sowing, Grafting, and Gardening: For it ſhall be my Opinion,*

To think and judg as cauſe I find,
My Rule is not another's Mind.

Or as the ingenious Mr. Cowley *hath it from the Learned* Dubartas:

Senſeleſs is he who (without Bluſh) denies,
What to ſound Senſes moſt apparent lies;
And 'gainſt Experience he that ſpits Fal-
(lacians,
Is to be hiſs'd from learned Diſputations:
And ſuch is he that doth affirm the Stars
To have no force on theſe Inferiours.

But to conclude; I have here ſhewed you ſome Rules how to prune Foreſt-trees, which well done adds much to their Shape, Growth and long Life; every one that makes any Obſervation of Trees ſeeth this Truth confirmed in their Shape: and tho many are againſt pruning Foreſt-trees, yet it adds much to their Growth; and if done by a skilful hand, and at fit times, it adds much to the Goodneſs of the Timber, tho ſeveral (it's poſſible)

poſſible) *will tell you to the contrary*; *for it is he that takes things on truſt, that is Truth's greateſt Oppoſer. But to confirm the Growth by pruning, take this Example: There grew a young Oak near the Orange-houſe at* Caſhioberry, *about nine Inches Diameter, with many young Boughs on the ſides*; *which robbed the Head ſo much, that it did ſhoot but little, having more Boughs than the Roots could well maintain: I took off the Side-boughs in the year* 1669; *and in the year* 1675, *my Lord order'd me to fell it, it ſtanding too near a Walk we had made. My Lord being at* Caſhioberry, *and diſcourſing of pruning Foreſt-trees with the ingenious Artiſts Sir* Samuel Moreland *and* Hugh May *Eſquire, I ſhewed them the Truth confirmed in this Tree*; *for that year it was pruned it did grow* $\frac{2}{3}$ *of an Inch, which was near as much as it grew in five years before*; *it continued that Growth very near for the ſix years after, as did plainly appear by annual Circles to them and me. And as good Pruning doth help the Growth of Trees, ſo alſo it doth prolong their Life: For it is well known that the pruning of ſome annual Plants will make them live more years than one*; *for good Pruning may take off that which ill Pruning hath left, or the Wind, which otherwiſe would deſtroy the Tree in little time. And as I have ſaid ſomething in this Book of pruning Foreſt-trees, ſo I wiſh ſome able Man would ſhew ſome Rules, or his Judgment of pruning all ſorts of Fruit-trees and Plants that bear Fruit, that there might be ſome light for a Man to ſee to ground his Reaſons on: for we are much to ſeek*

both

both in the manner how, and the time when to prune our Fruit-trees, both to improve them and their Fruit.

I also have shewed you several Rules of Artificial Arithmetick by the Canon of Logarithms, and several Rules of the Line of Numbers, or Gunter's *Line; which for their excellent Uses cannot be made too common, or too well known to the Ingenious.*

And Lastly, I have not bushell'd my Light, but have set it to the publick View; which if it enlighten thee in thy good and true way which I intend, to thy Benefit and Pleasure, it's possible I shall do thee, if the Lord permit, some other Piece of Service, farther to direct thee in the Truth.

My Request to thee, is to correct the mispointing or paging; for my Business is such, that I cannot see it corrected my self, but trusting in your Goodness shall conclude:

Small Faults if you'll pardon, and some amend,
Then I'll be yours to my Life's end,

From *Cashioberry* near
Watford, Novem. 16.
An. 1675.

M. Cook.

THE Manner of Raiſing, Ordering, And Improving Foreſt-Trees, &c.

CHAP. I.

Of the ſeveral Ways of Raiſing Trees. The beſt for Foreſt-Trees is by their Seeds, Keys, or Nuts, &c.

YOU may raiſe moſt ſorts of Trees by Laying, the Aſh being one of the worſt of any I have experienc'd; but it will take by Laying. If you be an Obſerver of the Growth of the Aſh, you then may read the Reaſon plainly, if that you keep but the Eyes of your Underſtanding open, which I take to be this: Of all the Trees that I know, an Aſh ſhoots with the ſtraiteſt

Shot from his Seed, and ſo continues till it comes to a great height, unleſs by accident, therefore ſeldom touching the Ground by its own Growth; but if it ſhould, it having no Arms to defend it againſt Cattel, and they being great Lovers of the Tops and Leaves, prevents its natural Increaſe that way, finding it ſelf rarely or never encreaſed by this kind of Propagation, it being not accuſtom'd to Laying, therefore the harder to grow.

Your Oak will grow of Laying, ſo will your Elm very frequently, as I have ſeen in ſeveral Hedges, without any thing of Art: As you may ſee the great-leav'd Elm thrive well of a Layer on a Bank by the Road-ſide from *Ware* to the Right Worſhipful Sir *Thomas Leventhorp's* Houſe call'd *Blacks-Ware*. It is worth your noting, to increaſe this uſeful Wood in your Hedges, as alſo other ſorts of Wood, which will be much for your Profit, and alſo a great Improvement to your Fence, tho it be at preſent altogether neglected. Of the Manner and ſeveral ways of Laying, ſee the *Fifth Chapter*.

2. Several ſorts of Trees will grow of Cuttings, the Manner and Time I ſhall ſhew in the ſucceeding Chapter. But let me now invite you, when you fell your Woods, to give ſome of theſe Cuttings Quarters in naked Places, and you ſhall find them afterwards to pay you well for their Board: Remember your Hedges alſo where they want Gueſts to furniſh them.

You may raiſe many ſorts of Trees by the Roots, or part of Roots of other Trees; the Kinds and Manner are ſhew'd hereafter, which if you love your Woods and your ſelf, you may take notice of.

3. Many ſorts of Trees may be increaſed on other Stocks by Budding or Grafting, but this is more proper for Fruit-Trees than for your Foreſt: for take it for granted, that it hinders the aſpiring Growth of Trees, and makes them bear more. I know my Lord *Bacon* tells you of Budding the Elm,

and

and it will have greater Leaves than ordinary; it is likely, if you bud the great-leav'd Elm upon the ſmall-leav'd, whilſt it is young and full of Sap, it will have larger Leaves, eſpecially than an old Tree; but that I judge ſignifies little.

Enquiry may be made, whether by budding the Elm, and alſo the Lime-Tree, it would not make their Seeds keep better than they do many Years with us: I wiſh it were tried. As for the Manner of Budding and Grafting, I refer you to other Authors, for there are many have written largely thereof.

4. The laſt and beſt way to raiſe your Foreſt-Trees, is by their Seeds; and how to do that, I ſhall ſhew you in every particular Chapter, by me experienc'd. I wiſh every Nobleman or Gentleman, that takes Delight in theſe ſtately Monuments, would follow the Example of the Right Honourable, and very much knowing in theſe Lines, the Earl of *Eſſex*, who hath now ſeveral Thouſands of my raiſing.

Let me be bold to tell you, that one Aſh-Tree raiſed in a Nurſery, and order'd as is hereafter ſhew'd, is worth five taken out of a Wood; for there you ſhall have them grow taper and ſtrong, ſo that when you remove them, cut but off ſome of the Side-Boughs, and ſet them with great hopes of a ſtately Timber-Tree. But if you take them out of a Wood, then will they be not ſo well rooted, nor taper, but top-heavy; therefore you muſt be forc'd to take off the Heads before you ſet them, and then expect at beſt but a good Pollard; and it is poſſible you may wait long before you get him to thrive: for the Head being taken off, leaves ſuch a Wound which is long a curing; which you muſt do, or elſe his Roots will not maintain that Head. Ever let me adviſe you to be as ſparing in taking off the leading Top-ſhot of an Aſh or Walnut as you can poſſible.

Thus have I ſhew'd the ſeveral Ways to raiſe Trees; for the performing of the ſame, read here-

after: and this is certain, that a few of your Trees raiſed in a Nurſery, are much better than thoſe you take out of Woods. My Lord was, a little before I came to him, at ſome Charge more than ordinary to raiſe ſome Oaks: Their way was to fence in a great Oak in the Park, and then dig the Ground; and when the Acorns were moſt of them down, then they raked them in. By this Husbandry, my Lord had got eight young Oaks about ſix year old; I perſuaded his Honour to take up his Fence, ſatisfying him we ſhould raiſe them at a much cheaper lay. He therefore order'd me to take up theſe Oaks very carefully; I having then two Men at work with me, I bid the elder go and take up theſe Oaks, but could not get him to go by any means: he alſo had poſſeſs'd the other with ſuch a tragical Story, that I could not perſuade him; which was, that there were few which took up an Oak, but either they or it died in a little time after. I told them that it was poſſible the Oaks might die in a ſhort time, but they never the ſooner. The reaſon may be the ſame with that before, of raiſing an Aſh by laying; it being not uſed to be removed, makes them the more difficult to grow when they are. But I went and took up my eight Trees, and loſt ſix of them the Winter following. Had they been taken up at two years Growth, and the Tap-root cut, you afterwards might remove them with little danger. I judge, if you can, it will not be amiſs to ſave your Acorns or Seeds of this Tree that hath been removed.

CHAP.

CHAP. II.

How to obſerve and know the Nature of Seeds, ſo as the better to raiſe them.

I Ever obſerv'd the Shape, Taſte, Skin or Shell that my Keys, Nuts, Stones, Kernels or Seeds had: and if I found by their Shape they were pory, and by feeling ſpongy, taſting little or very mild; I then did conclude to ſow theſe ſorts of Seeds as ſoon as they were ripe, or as ſoon at leaſt as I receiv'd them: which if they were kept but a little after the time of their being ripe, I then expected but little Succeſs of thoſe Seeds. To give you a Taſte of this Novelty, obſerve but theſe few among many more; that is, the Elm, Sallow, Poplar, *&c.* and Angelico, Paſpere, or Garden Samphire, Scoſanara, *&c.*

I know 'tis a Tradition, that the Elm and Sallow have no Seeds: Then how could I raiſe ſeveral of them of Seeds, as I have done? But if you will not believe me, I pray you ask the Earl of *Eſſex*, or ſeveral others. Therefore,

Be gone Tradition, never more appear,
Out of the Kalendar before next Year:
Truth with Experience through this Nation
Shall ſainted be by a right Obſervation.
Leave room, Aſtrologers, for Truth, and ſee
You write it next Year in your Diary.

Now thoſe Seeds that are of Taſte mild, Skin or Shell cloſe, you may keep them till the Spring approach, and longer, if temperately dried; and dry, keep as your Acorns, and your Cheſnuts, *&c.* but

the Spring, after they be gather'd, is a ſure Seaſon to ſow them; therefore defer no longer.

But as for your Seeds that are of a hot or bitter Taſte, or have cloſe Skins or Shells, you may keep them till the Autumn following after they be gather'd, if occaſion be, if they be ripe gather'd, and dry kept, ſo the fleſhy part be clean taken off when that is ripe: Tho I know an ingenious Perſon did hold, that to ſow them with their Fleſh on (as Peaches or Cherries) they would grow as well, as he ſaid; but that was his Miſtake: for the fleſhy part was ordain'd by the Almighty for the Uſe of Man, Beaſts or Birds, and tends nothing to the Growth of the Seed or Stone, but rather to its Diſſolution, by ſtupefying it, as I have tried, by ſowing the Kernels of rotten Pears and Apples, which would not grow, tho but a little time rotten. There be many Stones, Keys and Seeds which be of a hot and bitter Taſte, as your Aſh, Peaches, Almonds, the Mizerion, Muſtard-Seed, *&c.* yet tho I ſay they may be kept long, I adviſe you not to neglect your Seaſon; for many of theſe Seeds and others will lie near two years in the Ground before they come up: if you ſow them in *Octōber*, it will be the Spring come Twelvemonths before they come up; and if you ſow them early in the Spring, they then will come up the next Spring.

Another way whereby you may know Seed of this nature, is, by their long hanging on the Trees; for there Nature finding it ſelf ſtrong, taketh the leſs care to ſeek out early to preſerve its Kind, and alſo Almighty God hath made theſe very uſeful for the Creatures in this World, therefore hath order'd it thus by his Divine Providence. The Aſh, Holly, *&c.* hang long on the Tree, and lie long in the Ground; the Elm, Sallow, Sycamore, fall ſoon, and come up ſoon.

CHAP.

CHAP. III.

The Shape of Seeds and their Weight do inform you how to ſet them.

THE very Form and Shape of Seeds hath inſtructed me how to ſet them; as an Acorn falls to the Ground moſt with its ſmall End downwards: Thus if they fall upon Mould or Moſs, you may obſerve the moſt of them to be on one ſide, with the ſmall End tending moſt to the Earth. And I ſuppoſe that this Poſture is the beſt for to ſet any Stone or Nut, if you will be curious; for if you obſerve any Seed, of what Tree ſoever it be, that grows in *England*, firſt it puts forth a Root at the ſmall End, and when that Root hath laid hold of the Ground, then it puts forth the Shoot for the Tree at the very ſame place where the Root came. Then ſeeing that both Root and Shoot put out at the ſmall End, if ſet with the ſmall End downwards, the Body of the Stone or Seed may hinder the Shoot; ſo that it is the beſt way to lay them on their ſides in the Ground: if they be heavy Seeds, you may ſow them the deeper; as Acorn, Peach, Apricock, Walnut, Cheſnut, *&c.* about two or three Inches deep.

If light Seed, then cover them with but little Mould; as the Elm, *&c.* as half an Inch deep.

To conclude then, lay the flatteſt ſide of your Seed downwards; as if it be a Peach-Stone, ſet it as it will lie on a Table, or the like, and it will lie with the Crack where the Shell parts uppermoſt, and the other Crack lowermoſt to let out the Water, as I judge; for Kernels in Stones or Shells do not love too much Water at firſt.

Thus have I ſhew'd you the ſeveral Ways to raiſe Trees; that is, how they may be raiſed, and how to know the time, at leaſt to aſſiſt you to know the time to ſet them by their Shapes, *&c.* as alſo how to ſet them the beſt way by their Form and Weight, which may be ſome aſſiſtance to you, if you meet with Far-Country Seeds.

My Lord had thirteen ſorts of ſtrange Seeds ſent him, as I remember, from *Goa*; I never ſaw the like, nor none that ſaw them here. By the help of thoſe aforeſaid Reaſons, I rais'd ten of the thirteen Sorts, tho ſome of them lay almoſt a year in the Ground; but I alſo muſt tell you, I loſt all my ten Sorts, the firſt Winter, but one Sort, and that the ſecond, for want of a Green-houſe: Some of them, I ſuppoſe, were Annuals. I ſhall give you one Chapter more of Seeds, and then I will ſhew you fully what as yet I have but nam'd.

O great Jehovah, thee I do adore,
Thy Works I do admire, and thee implore
So to aſſiſt me, as that I may write
With Solomon's *Wiſdom; that I may indite*
My few Lines, ſo that they may be
Uſeful unto this Land, pleaſing to thee.

CHAP. IV.

Obſervations of all Sorts of Keys and Seeds.

LET your Keys be thorow-ripe, or when you find them to begin to fall much, which is a ſure ſign of any Fruit or Seed's Ripeneſs (unleſs by accident) gather them off ſome young, ſtreight, thriving Tree: my reaſon of gathering them off from a young thriving Tree, is, then will your Keys or Seed be

be the larger and ſolider; therfore by conſequence they be the abler and likelier to ſhoot the ſtronger, and to maintain themſelves the better: And I know by Experience, that the Seeds gather'd of old Plants or Trees, or old Seeds, ſo the Seeds be perfect, will come up ſomewhat ſooner than the Seed of young Trees. My aforeſaid Reaſon doth this ſomewhat demonſtrate: or take it thus; Nature finding her ſelf weak in theſe Seeds (like a provident Mother) ſeeks the ſooner to provide for her weak Children; as a great Philoſopher and Naturaliſt ſaith, That Nature is one in divers things, and various in one thing. See *Parad.* p. 90. *of the Tree of Life.*

And to gather them off a ſtreight and thriving Tree, 'tis likelier they will run more up, and grow ſtreighter than thoſe which be gather'd of Pollards. This I know, that Nature doth delight very much in Imitation; and in Plants and Trees, like doth endeavour to produce its like: tho I know, by the Situation, or Ground, or Grafting of ſome ſort of Stocks, that by any of theſe the Trees may and will alter ſomething, both in Growth and Largeneſs of Fruit, and earlier, or the contrary, but the *Species* will be ſtill the ſame. To which I add, good keeping or dreſſing of any Tree doth much improve its Growth, and Largeneſs of Fruit or Seeds.

Now the Seed being that part of the Plant which is endow'd with a vital Faculty to bring forth its like, it contains potentially the whole Plant in it, therefore it may, and is the more to be obſerv'd. Or as a learned Phyſician has it, ſpeaking of Man and the World; The Chaos, or firſt Matter, was made a World, and of this World was made Man: So a Tree groweth from the Seed, the Seed is the beginning of the Tree, and in every Grain or Seed of a Tree there lies hid another Tree. See *Philoſophy reformed*, p. 58.

The induſtrious Farmer or Yeoman will take care that the Grain he ſoweth be of the beſt Kind for

Largeneſs

Largeneſs and Goodneſs in every Particular; and hath oft found by Experience to his Loſs, that the Corn which is taken to ſow from that which was your ſmutted or mill-dew'd, doth oft produce ſmutted or black Corn again; he knowing alſo that this black Corn, which is like Duſt within, will not grow. Then what ſhould be the Reaſon that that which grows in the ſame Ear, will oft-times produce black ſmutted Corn, that hath nothing but a little black Duſt in it, or a black flinty Kernel of little or no uſe, but harmful to the reſt, tho that which you ſow ſeem ſound, and a very likely berried Corn; when I have found by Experience, that Wheat which hath not been ſo likely to the Eye as that which was freer from ſmutted Corn, hath brought or produc'd clearer Corn by much than the others? Now I have diſcours'd with ſome who would not ſpare to ſay poſitively, that your ſmutted or black Wheat would grow, and ſo produce black Wheat again; which is a great Miſtake. But this I know, that your Wheat which is like black Duſt within, will not grow at all; nor ſome of your black flinty Wheat, but ſome of it will produce Blades, ſome Stalks with Ears, but no ſound Grain; ſome with good and bad in one Ear, and ſo the nearer it is to perfect ſound Grain, the nearer it produceth its like: Yet tho this may and will produce ſome good and ſome bad, as I ſay, yet no black ſmutted Grain (unleſs meeting with ſome accidental Cauſe, if the Grain be perfect ſound) but according to its Defect, ſo may be the Succeſs of your Crop.

Now this which I call the accidental Cauſe is the Mildew, which may well be ſo call'd, becauſe of its Malignity, eſpecially to Wheat and Hops, becauſe in them moſt perfected, tho many other Plants ſuffer as much. This Maldew or Mildew, is a Dew which is drawn from the Earth and Herbs in a dry and calm time, and when Herbs are in their Prime, by the Sun, and wants Wind to fan off their

Groſſneſs,

Groſſneſs, and alſo being drawn from Herbs, which make it thick and ſweet, and not ſo active to aſpire: 'tis moſt in your incloſed Grounds and Valleys, and in thoſe Grounds which lie tending to the Oriental Part of the Heavens, as all blaſting Winds are.

Now I ſuppoſe theſe may be the Reaſons your Valleys do afford more Moiſture than your Hills, as is oft ſeen by your Miſts, which are more frequent in them than on Hills; this being drawn up by the Sun in the Day-time, and wanting Wind to aſſiſt its Motion (as I ſaid before) doth hang in the lower Region: and when the Sun ſets, it falls upon your Plants with its thick clammy Subſtance: and in thoſe whoſe Bark is tender and young, and Pores open with the Heat of the Seaſon, hinders the Sap of the Plant or Tree to aſcend to nouriſh his Flowers or Shoot. 'Tis obſerv'd, that when your Wheat doth ſhoot up to ear and flower, it doth it ſuddenly, and likewiſe your Hops, and then this Clammy or Mildew comes upon it before the Air hath hardned it, to reſiſt it; for the Air being warm, Nature doth not ſo much as dream of this unkind Enemy: And if it falls on Wheat, when the Ear is new form'd, then there is the black ſmutty Wheat; but if the Ear hath blown, even when or before it comes, or that the whole Stalk be not ſurrounded with it, then you ſhall have ſome of your Grains good, and ſome bad, according as they were in ſetting, or find Nouriſhment.

I have oft obſerv'd in your black-Heart, white-Heart, and other great-leav'd Cherries, this Dew to fall upon them at the top, juſt at the beginning of *Midſummer*-Shoot, and hath ſo ſtopped the Shoot, that it hath ſhot forth in other places below; and on the top of the Shoots you may ſee many little Flies feeding on this Dew; and on the Leaves of Oak and Maple, 'tis plainly to be ſeen and taſted;

and

and tho deſtructive to Corn, *&c.* yet it is a mighty Relief to the induſtrious Bees.

The Reaſon why thoſe Grounds, which hang from the Horizon to the Eaſt, are moſt ſubject to this Dew, and to Blaſting, as it is term'd, may be (as I judge) the Sun's drawing theſe Vapours towards it; juſt as a great Fire draweth the Air in a Room to it, ſo the Sun having ſet theſe in motion, yet not having Strength enough to draw them into the middle Region, to form them into a Cloud, doth yet draw them till he is below our Horizon; then theſe Dews tend to the Earth from whence they were taken, and in motion to the Weſt do as it were fall upon that Ground which hangs Eaſtward at right Angles, therefore offenſive to them moſt.

But ſince I am ſpeaking of this uſeful Grain, Wheat, I ſhall take notice of that which I know is uſed with good Succeſs: They take their Seed-Wheat, and ſteep it twenty or twenty four Hours in Water and Salt, which is found by Experience to do good to the Wheat againſt the Blackneſs, and helps it in its Growth. The Reaſons I conceive are theſe: The ſteeping it prepares it for its ſpearing, and makes it take root the ſooner; therefore if late in ſowing, ſteep the longer; if early, not ſo long: And if there be any Grain that is not perfect ſound, this will either kill or cure it. And I ſuppoſe that Brine to Wheat, is as Sack to a young Child, a little doth a great deal of good; but have a care you do not let it lie too long in a ſtrong Brine, leſt you ſtupify it, or kill it with too much Kindneſs. I do adviſe my Countrymen, if late in ſowing any of their Grains, to ſteep eſpecially Barley, as well as Wheat; if your Grain be ſpear'd, it is never the worſe, provided you ſow it before the Spear be chill'd or dry'd; therefore commit it to the Ground, and cover it as you can. Your Wheat, Oats and Barley differ much in their Growth from other Seeds; for they

put forth their Roots at the great end, and then one Blade or long Leaf at the ſmall end, which comes between the Skin and the Body of the Seed. Your Beans and Peaſe put forth their Root at the ſide, and then the ſame ſort of Leaf, at the ſame place where the Root came out, that grows on the Stalks.

So doth your Walnut, Cheſnut, Horſe-Cheſnut, Peaches, Almonds, Apricocks, Plumbs, *&c.* and the only difference from Beans and Peaſe, is, that theſe Stone-Fruits put forth at the ſmall ends, and the other always at the ſides.

In like manner there be ſeveral ſorts of Trees, and moſt ſort of Plants that be ſmall, which put forth Root at the ſmall end; and as ſoon as that Root has laid hold of the Ground, they then ſend out two falſe Leaves, nothing like thoſe that grow on the Tree or Plant; which two falſe Leaves are the Seed, which divides into two Parts, and ſo ſtand ſome ſmall time on the top of the Ground; and then between theſe two falſe Leaves comes forth a Shoot, which produceth Leaves like thoſe of the Tree or Plant from whence it came. Of this way of Growth there be an infinite number both of Trees and Plants; as the Elm, Aſh, Sycomore, Maple, Pear, Apple, Quince, and the moſt ſorts of Seeds of Trees which are not environ'd by Stones or Shells: of Seeds, the Melon, Parſnip, Carrot, Carduus, Angelica, and indeed moſt ſorts of Seeds.

CHAP.

CHAP. V.

Of the ſeveral Ways to raiſe Foreſt-Trees, or others; and how to perform the ſame by Laying.

THOSE ſorts of Trees which will grow of Cuttings, are the eaſieſt to raiſe by Layings; ſome of which ſorts you may ſee in the next Chapter.

Now touching the beſt time for laying your Layers of Trees, obſerve, that if they be Trees that hold their Leaf all Winter, as Firs, Pines, Holly, Yew, Box, Bayes, Laurels, Elix, *&c.* let ſuch be laid about the latter end of *Auguſt*.

But if they be ſuch as ſhed their Leaf in Winter, as Oak, Elm, Lime, Sycomore, Apple, Pear, Mulberry, *&c.* let ſuch be laid about the middle of *October*. I do grant that you may lay at any time of the Year, but theſe times I take to be the beſt; for then they have the whole Winter and Summer to prepare and draw root in, at that time of the Year the Sun having ſo much power on the Sap of the Tree, as to feed the Leaf and Bud, but not to make a ſhoot. And if that little Sap that riſes be hindred, as it is by ſome of the following ways of laying, the Leaves and Buds yet gently craving of the Layer, makes the Layer prepare for Root, or put forth Root a little to maintain it ſelf, becauſe it finds it cannot have it from the Mother-Plant; and becauſe it wants but little Nouriſhment at that time of the Year, I think it is better to lay Layers of Trees, and to ſet Cuttings, than at other times; in Summer when the Sap is much abounding, or in Winter when the Sap ſtirs little, or in the Spring when the Sap begins to riſe:

for

for then it comes too ſuddenly to draw Sap from the Layer before it hath drawn or prepared for Root; for Nature muſt be courted gently: tho I know in ſmall Plants the Spring or Summer doth very well, for they being ſhort-liv'd, are therefore the quicker in drawing root; and beſides that, Trees are many times laid as they are not.

As for thoſe Trees that are apt to grow of Cuttings, take but ſome of the Boughs, and lay them into the Ground, covering them about half a foot with freſh fine Mould, leaving them with the end of your Layer about one foot, or a foot and a half out of the ground, keeping them moiſt in Summer: and in twelve months time you may remove them, if rooted; if not, let them lie longer.

Another way is, Take a Bough you intend to lay, and cut it half way thro right croſs the Wood; then ſlit it up towards the end half a foot, or according as your Layer is in bigneſs; lay the ſlitted place into the ground, and you ſhall find that ſlitted place take root, if laid as the former, and ſo order'd. This way you may increaſe many fine Flowers and ſmall Plants; but they being out of my Element at this time, I ſhall not ſpeak of the ordering them, for fear I ſeem tedious to ſome.

Another way to lay a Layer of a Tree, is, Take a piece of Wire, and tie it hard round the Bark of the place you intend to lay into the Ground, twiſting the ends of the Wire that it may not untie: prick the place above the Wire thorow the Bark with an Awl in ſeveral Places, then lay it into the ground as the firſt.

A fourth way of laying of Trees, is, Cut a place round, about one inch or two, where you find it moſt convenient to lay into the Ground, and ſo proceed as is ſhew'd in the firſt way of laying.

A fifth way to lay ſome ſorts of Trees, is, to twiſt the place you intend to lay into the Ground as you do a Withe, and lay it as is ſhew'd in the firſt way

way of laying. By this way and the firſt, you may furniſh your Woods and Hedges; for they being eaſy, any ordinary Man will perform the ſame. Thus you may from one Stub, as a Sallow, or the like, between one Fall and another of your Wood, for a Rod ſquare of Ground and more, (if that one Stub produce but ſtrong Shoots) fill it well with Wood: For when the Stub hath got two or three years ſhoot, then lay round it, as before at large is ſhew'd, there letting them remain to produce new Stubs.

But if you would increaſe by laying ſome young Trees from a high Standard, whence you cannot bend the Boughs down to the ground, then you muſt prepare either Box, Basket, or Pot, and fill them full of fine ſifted Mould, putting a little rotten Willow-duſt with this Earth, for that keeps Moiſture to help the Layer to draw root: Then ſet the Pot or Box thus fill'd with Earth, upon ſome Treſſel or Poſt, as your Ingenuity will direct you: then lay your Bough by the ſecond, third, or fourth way of laying, leaving not too much head out, becauſe the Wind will offend it if you do, and by its own Motion be likely to rub off the tender young Root: and thus lay your Hops this way. Theſe things obſerv'd, you may raiſe many choice Trees, as Mulberry, Horſe-Cheſnut, *&c.*

Theſe Rules may inſtruct you ſufficiently concerning the Propagation of Trees by laying; but let me tell you, it is hard to raiſe a fine ſtreight Tree by a Layer, or Cutting: I have hinted at the Reaſons before.

Note, The ſmaller your Boughs be, ſet them the leſs out of the ground, and keep them clean from Weeds, that they ſpoil not your Layers.

Alſo note, that the harder the Wood is, then the young Wood will take root beſt, laid in the ground; but if a ſoft Wood, then older Boughs will take root beſt. Now you that be Lovers of Wood, make uſe of theſe ſure Directions; and if you repent, then blame me.

CHAP.

CHAP. VI.

Of thoſe ſorts of Trees that will grow of Cuttings, and how to perform the ſame.

IF your Ground be moiſt, you may ſet with ſucceſs any ſort of Willow, Sallow, or Oſier, Alder, Water-Poplars, any ſort of Apple that hath a black burry Knot breaking out of the Boughs; that Knot, if ſet a foot deep in good Ground, and the top a foot out, is apt to grow: ſome ſorts of Wildings, Codlings, Gennitings, ſome Sweetings, the ſmiling Willow, Quinces, Tamariſk, Laurel, Fir, Box, *&c.*

The time that I ſpoke on for laying your Layers, is alſo the very beſt time for ſetting of Cuttings: which you may ſee in the foregoing Chapter to be in *Auguſt*, for thoſe ſorts of Trees that hold their Leaves; and in *October* for thoſe Trees that caſt their Leaves in Winter.

Thoſe ſorts of Trees that do grow of Cuttings are common, therefore you may take your choice the better for the bigneſs of your Cuttings; which I adviſe you to let be from half an inch to one inch Diameter. If they be leſs than half an inch Diameter, then they will be weak, with a great Pith; which Pith will take wet, and be likely to kill your Cutting. And beſides, when your Cuttings be ſo ſmall, they are not prepared with thoſe Pores, (as at preſent I name them) that is, little black Specks on the Bark where the Root breaks out, I ſuppoſe, if ſet in the Ground; or elſe Almighty God has ſo order'd it, for a Sign to ſhew Man that thoſe which have that Mark will grow, as your Elder, Alder, Sallow, Water-Poplars, *&c.* have: and alſo if they be young, they then have not that burry Knot, which is very apt to take

root, as your Codlings, and ſome ſorts of Apples have; in hard Wood, the younger the better. But if they be greater than one Inch diameter, then the top of your Cutting will be long in covering over, therefore may ſomewhat decay your Cutting by the Wet lying on the Head ſo much.

But you may ſet your Willow and Water-Poplar of a greater ſize; becauſe they are ſet for Pollard, where Cattel come, therefore they muſt be great and high, to be out of their harming the ſooner: but the other ſize is moſt proper for your Hedges and Woods.

If you ſet them by a Crow of Iron, or by an Inſtrument which they have about *Cambridge*, that bores a hole in the Earth, ſomewhat like to an Augur; let the Foot be free from Cracks, cut ſmooth at bottom, and the top of your Cutting the like, but let your top be ſlanted off. Take care you do not rub up the Bark when you ſet your Cuttings; therefore make your Holes large when you ſet them, and ram or tread the Earth cloſe to them, keeping them moiſt the firſt Summer: and let the Slant cut off the head hang downward, and if your Cutting be choice, put a little ſoft Wax on the head and foot to keep out Air and Wet.

When you ſet any Tree or Trees in your Woods or Hedges, be mindful to put in one or two Cuttings with them; it will not be much time loſt to do it, but well ſpent, as I have often proved.

CHAP.

CHAP. VII.

Of ſuch ſorts of Trees as may be raiſed by the Roots of another Tree; and how to raiſe them.

AS for ſuch ſorts of Trees which may be raiſed only from part of a Root of another Tree, there be many; but of thoſe that I have made experience, I ſhall in this place give an account.

Firſt, Let the Tree be a thriving Tree, but not too young, nor an old Tree: for if it be too young, then the Roots will be too ſmall for this purpoſe; if too old, 'tis poſſible the Roots may be decaying, and then not fit for this purpoſe.

Let the Roots be from a quarter of an inch to an inch and a half diameter, and from ſome young thriving Tree is the beſt; for in them the Sap is plentiful, and therefore will put forth the greater ſhoot. Then in the latter end of *February*, or the beginning of *March*, dig round the Trees you intend to increaſe from, till you find ſuch Roots as before are mention'd, and taking your Knife, cut them three or four inches from the great Root, ſmooth at the place you cut off; then raiſe up that end, putting in the Earth to keep it up, that when your Ground is levelled again, the end of this Root ſo cut off may be two or three inches above-ground.

I do judge the foreſaid time of the Year to be the beſt; for then the Sun haſtning to the Vernal Equinoctial, or rather this Star of the Earth to *Libra*, the Sun having Heat, and a ſtronger drawing Faculty on the Head of the Tree, draweth by its ſecret Influence on the ſeveral Branches on the Head, and the Head from the Body, and both Head and Body from the

Roots; and the Root being furniſh'd with Sap from the Earth, to ſupply the Body and the Head, is then the fitter to produce with that Sap a new Tree, likelier than when 'tis in its full Sap, *viz.* in Summer: for then the abundance of Sap will rather choke a Bud, than produce one out of the Root, if the Root be of ſuch ſort as will produce Trees from part of the Roots; and then the Weather is ſo hot that it ſuffocates a new Bud that will be ſo full of Sap, as that will be, if any: and as to the opening of the Roots at that Seaſon, how unnatural 'tis to the Roots of the Mother-Tree, you may eaſily judge.

And then, to do this in Winter, tho there is a continual Motion and Aſcending of the Sap from the Roots (unleſs accidentally hindred by Froſts) all the Year long, (for Nature is no Sluggard) yet to cut the Roots then, and to expoſe them thus cut, as aforeſaid, to the Extremity of the Weather, which then uſually is great, the Froſt and Wet pierce that new Wound ſo much, that 'tis more likely to ruin, than to increaſe its Kind; but if it doth live, the Spring is the time when it will bud, therefore by conſequence the beſt. My reaſon for cutting the Root two or three inches off from the great Root, is (then) that two or three inches of the Root will put forth many Roots at the end, eſpecially if ſmooth cut off, and ſo the better for the Tree from whence you take the Roots. Thus much for the Manner of Raiſing by part of Roots: the Kinds which may be thus raiſed, are theſe that follow, *viz.* Elm, Maple, Poplar, Aſpen, Abete, Cherry, Crab-Tree, Plumb, White-Buſh, Serves, *&c.*

CHAP.

CHAP. VIII.

What Soil, or Dung, is beſt for Trees, or their Seeds, &c.

ANY ſort of Dung that is very hot of it ſelf, as Pigeons, Hens-dung, Sea-Coal, or Wood-Aſhes, Soot, or Malt-duſt; or ſuch as heats after 'tis laid in the ground, as Horſe-dung and Horſe-Litter, or green Graſs, or Weeds: theſe or the like, unleſs a ſmall quantity, and in very cold Ground, are better ſaved than uſed for Trees, eſpecially Foreſt-Trees; and ſome Reaſons may be given for this. Firſt, Their Forefathers have not met with ſuch Kindneſs, therefore their Children do not, nor cannot digeſt it ſo well. Secondly, Theſe Sorts of Dungs are good for ſeveral Sorts of Plants, eſpecially Annuals; for 'tis the Nature of them, where they meet with ſuch warm Entertainment, to come up the ſooner, provided the Dung be not ſo hot as to burn them: for Nature has accuſtomed them ſo much to a yearly Decay, that the Seeds of them will lay hold of the firſt Opportunity, and put forward for their Journey, either Spring, Summer, Autumn, or Winter; according as they meet with Proviſion for their Progreſs, till they have accompliſh'd that which was done for them, *viz.* produced Seeds.

When your Foreſt-Tree knoweth its continuance to be long, and that naturally it hath many Years to produce its like, it will not be much forced by Art or artificial Means; for who can by the beſt Art or Care that can be uſed, force the Keys of an Aſh to come up in a Year, or to grow but one Inch? For it will lie a Year or more before it will begin to

ſhoot; whereas ſeveral ſorts of Annuals will at any time of the Year come up in three or four days, if their Entertainment be accordingly. Therefore neither your Foreſt-Trees nor their Seeds require much Dung, but love a Ground trenched deep with ſome addition of freſh Earth, ſuch as they delight in: as, if your Ground be a ſtrong Clay, then trench it deep, and mix it with fat Sand, Rubbiſh of Buildings, Seacoal-Aſhes, Highway-Earth that hath drift Sand in it, or ſmall Gravel-Lime, or Lime-Rubbiſh, *&c.*

And if your Ground be a Gravel or Sand, then trench it and mix it with Loom-Clay; the Turf and upper part of each is very good, digging the Ground deep, and mixing it well: But if it be for an Orchard, you may add any ſort of Ground; ſome rotten Dung of Horſe or Cow, *&c.* will do very well, ſo it be not where your Root is: but ſet the Roots of any ſort of Trees in freſh fine Mould.

In ſtiff Ground it is good to trench it with Straw, Thatch, Litter, Woodſtack-Earth, or ſmall Wood; but let not your Roots ſtand upon theſe by any means, nor upon any Dung or Turf, but let them be at leaſt one inch or two from every Root: and then in a Year or two, when the Roots of your Tree come to this Dung, or Soil, the Ground will then have made it rotten, and fit to lead your Root along in the Veins as it lieth for them, to find their Nouriſhment the better.

Note, That thoſe Trees whoſe Roots run ſhallow, do moſt delight in light Ground; as on a Gravel your Beech, Cherry, Aſh; if mixed with Loom, the Elm, or any; on a brick Earth the Oak, Elm, Pear, *&c.* But for theſe I ſhall refer you to each particular Chapter of their Kinds.

Of all ſorts of Ground for Trees, or moſt ſorts of Plants, I take your Clays to be the worſt; that is, your ſtrong blue, ſtrong white, or ſtrong red: but if any of theſe have ſome Stones naturally in them,

they make them the better; and the nearer they turn to a mixture of Loom, they are ſo much the better. So likewiſe gravelly or ſandy Ground, the nearer a Loom the better; for a Loom, that is, a light Brick-Earth, is the moſt natural Ground for Gardens or Plantations.

Your ſtrong Grounds are worſe for Trees than your light, eſpecially for their Seeds; for they are more ſubject to great Weeds, as Couch-graſs, Thiſtles, Nettles, *&c.*

When your gravelly Ground hath in moſt places a ſhort Graſs, or Mother of Thyme, or Moſs, commonly the greateſt Plant is Fern, which is very natural to Seeds of Trees, and to the Roots of Trees. You may often ſee ſeveral young Trees come up in Fern, which naturally grows on your light Ground, therefore is moſt natural for the increaſe of Wood. But your ſtrong Ground doth moſt commonly produce the greateſt Oak, and your gravelly or ſhallow Ground the fineſt Grain; that is, when Trees are on ſuch Ground as they do naturally love to grow on, they then produce the greateſt Grain, for then are their annual Circles the greater: therefore ſuch Trees are your ſtrongeſt and tougheſt Timber. But when a Tree grows on a Ground it naturally doth not like, then the annual Circles being ſmall, the Grain of ſuch a Tree muſt of conſequence be finer, and the Wood not ſo tough. So that theſe ſtately Trees do not love ſuch great Variety as your Annuals: for if they be in a Ground which they do not very well like, if you give them but room by deep and often digging, they will then ſearch the further from home, and provide ſuch Nouriſhment as will make them thrive, and be ſtately.

Whereas your annual Plants, and others that be not very long-lived, will deſire better and more variety of Dung than your Foreſt-Trees. I have often admired what ſhould be the reaſon that ſome Plants will not come to their perfection, unleſs they ſtand

on Dung, or that which will give a great heat; which would kill the Seeds of ſeveral others, did they but ſtand there one day: But as for the Reaſon of the Heat that ſuch Plants deſire, it is becauſe they were made for hot Countries, and therefore if we would have them come to Maturity in our cold one, we muſt give them warm Lodging, eſpecially in the Spring, which is too cold with us for them. But what is it then that Plants do feed on?

Now to conſider this well, why the Heat of Graſs or green Weeds ſhould bring them forward as well as the Dung of Horſes, provided you can keep it but as temperate (for 'tis ſubject to be too hot) and as long laſting, for it will not keep its Heat long: where is then the Salt, Sulphur, and Mercury or Spirit in the Dung more than in the Graſs, to feed theſe Plants? Alſo I have obſerv'd, that if you take rich Mould, half or more of it rotten Dung, and cover one end of your Bed; the other end cover the ſame thickneſs with poor hungry Mould, provided you make it fine, and fit for the Roots to run in: this laſt ſhall do as well, and many times better for any Seeds on a hot Bed than the rich Mould. Where is then the Salt, Sulphur, or Mercury in the rich Mould, more than in the hungry? as moſt do hold, that the richer the Mould, the more of them, and that all Plants draw their Nouriſhment from theſe Matters; when I know that the Seeds (moſt we ſow on hot Beds) could well digeſt that Matter in the rich Mould, if it were there more than in the poor, and come on much forwarder in theſe Moulds, each, if not on a hot Bed: the rich Mould would bring on Plants much ſtronger than the poor, provided the Seeds be of ſuch Plants that are quick of Digeſtion.

Pigeons Dung, ſown thin upon cold Land, and early in the Spring, is very good for Barley; but if ſown late, and on dry hot Ground, it will then do more harm than good, for it will burn up your

Seeds

Seeds or Plants. This Dung is too hot and quick for the Seeds of Trees; for 'tis the Nature of Pigeons to eat Salt, and to go to the Sea-ſide early in the Mornings, and there to pick up Salt, which the Heat of the Sun makes by drying up the ſalt Water, and then leaving the Salt upon the Sand. Now this Fowl feeding ſo much upon Salt, the Dung of it is hotter and ſalter than any Fowl I know. Now the Reaſons why it is good for cold Lands, and withal to ſow it early, are theſe: Every one knows that 'tis the Nature of Salt, that the dryer and hotter 'tis kept, the more it keeps its own Body, and doth not turn to Water; and when it ſtands in a cold and moiſt place, it then diſſolves in a little time to Water; and when 'tis turn'd into this Element of Water, then it is fit for the Nouriſhment and Feeding of Seeds, eſpecially Annuals: for they be always prepar'd to ſet forward in their Journey, provided they meet but with ſuitable Entertainment. But the Seeds of moſt Foreſt-Trees will ſtay the time that their and our great God hath allotted them.

But then why Salt ſhould be a Feeder of Plants or Seeds, I take the Reaſon to be this, namely, Salt-Water; (yet I do not mean of Salt in a great quantity, and in meet places that will turn it into Water.) I have oft obſerv'd, that Salt, if fallen upon a Board or other place, will be long a drying; and if Heat have made it dry, then Dews or Rain make it moiſt again, then it ſteams forth; and that it is which nouriſheth all Plants: when if on a hot and dry Ground, and late in the Spring, if dry Weather come, then it doth not, nor cannot yield its Steam or Fume: as *Paracelſus*, in his Philoſophy to the *Athenians*, *lib.* 3. *p.* 57. ſaith; Every Body, or tangible Subſtance, is nothing but a curdled Fume; whence (ſaith he) we may conclude, that there is a manifold Coagulation, one of Wood, another of Stones, a third of Metals, but the Body is not that

on Dung, or that which will give a great heat; which would kill the Seeds of ſeveral others, did they but ſtand there one day: But as for the Reaſon of the Heat that ſuch Plants deſire, it is becauſe they were made for hot Countries, and therefore if we would have them come to Maturity in our cold one, we muſt give them warm Lodging, eſpecially in the Spring, which is too cold with us for them. But what is it then that Plants do feed on?

Now to conſider this well, why the Heat of Graſs or green Weeds ſhould bring them forward as well as the Dung of Horſes, provided you can keep it but as temperate (for 'tis ſubject to be too hot) and as long laſting, for it will not keep its Heat long: where is then the Salt, Sulphur, and Mercury or Spirit in the Dung more than in the Graſs, to feed theſe Plants? Alſo I have obſerv'd, that if you take rich Mould, half or more of it rotten Dung, and cover one end of your Bed; the other end cover the ſame thickneſs with poor hungry Mould, provided you make it fine, and fit for the Roots to run in: this laſt ſhall do as well, and many times better for any Seeds on a hot Bed than the rich Mould. Where is then the Salt, Sulphur, or Mercury in the rich Mould, more than in the hungry? as moſt do hold, that the richer the Mould, the more of them, and that all Plants draw their Nouriſhment from theſe Matters; when I know that the Seeds (moſt we ſow on hot Beds) could well digeſt that Matter in the rich Mould, if it were there more than in the poor, and come on much forwarder in theſe Moulds, each, if not on a hot Bed: the rich Mould would bring on Plants much ſtronger than the poor, provided the Seeds be of ſuch Plants that are quick of Digeſtion.

Pigeons Dung, ſown thin upon cold Land, and early in the Spring, is very good for Barley; but if ſown late, and on dry hot Ground, it will then do more harm than good, for it will burn up your

Seeds

Seeds or Plants. This Dung is too hot and quick for the Seeds of Trees; for 'tis the Nature of Pigeons to eat Salt, and to go to the Sea-ſide early in the Mornings, and there to pick up Salt, which the Heat of the Sun makes by drying up the ſalt Water, and then leaving the Salt upon the Sand. Now this Fowl feeding ſo much upon Salt, the Dung of it is hotter and ſalter than any Fowl I know. Now the Reaſons why it is good for cold Lands, and withal to ſow it early, are theſe: Every one knows that 'tis the Nature of Salt, that the dryer and hotter 'tis kept, the more it keeps its own Body, and doth not turn to Water; and when it ſtands in a cold and moiſt place, it then diſſolves in a little time to Water; and when 'tis turn'd into this Element of Water, then it is fit for the Nouriſhment and Feeding of Seeds, eſpecially Annuals: for they be always prepar'd to ſet forward in their Journey, provided they meet but with ſuitable Entertainment. But the Seeds of moſt Foreſt-Trees will ſtay the time that their and our great God hath allotted them.

But then why Salt ſhould be a Feeder of Plants or Seeds, I take the Reaſon to be this, namely, Salt-Water; (yet I do not mean of Salt in a great quantity, and in meet places that will turn it into Water.) I have oft obſerv'd, that Salt, if fallen upon a Board or other place, will be long a drying; and if Heat have made it dry, then Dews or Rain make it moiſt again, then it ſteams forth; and that it is which nouriſheth all Plants: when if on a hot and dry Ground, and late in the Spring, if dry Weather come, then it doth not, nor cannot yield its Steam or Fume: as *Paracelſus*, in his Philoſophy to the *Athenians*, *lib.* 3. *p.* 57. ſaith; Every Body, or tangible Subſtance, is nothing but a curdled Fume; whence (ſaith he) we may conclude, that there is a manifold Coagulation, one of Wood, another of Stones, a third of Metals, but the Body is nothing

but

Conny-Clippings are of the ſame nature (but I do ſuppoſe they will not laſt ſo long) and are better for a ſtiff Ground.

Saw-Duſt, if well rotten, and of ſoft Woods, is very grateful to the tender Roots or Seeds of any ſort; 'tis good for dry Ground, for it holds Water, and makes way for the Roots of Trees very well, and is as good as moſt Preparers are.

Rotten-Duſt out of hollow Trees, eſpecially thoſe of ſoft Wood, is a rich Leader of tender young Roots: the Reaſon is ſhew'd before.

Soot is good to kill Moſs, for its Heat kills the Roots, for they lie on the top of the Earth; and good alſo to keep Worms from doing harm to young Seeds.

Sea-Coal Aſhes are very good in cold ſtiff Ground, either for Trees, or any other Plant, to make that Ground work well, and to keep it hollow for the Roots to run in, *&c.*

Rubbiſh of Buildings, that is, broken Bricks, and Stones and Lime, is very good for the Roots of Trees in a ſtiff cold Ground; the Reaſon is told you.

Chalk broken ſmall into pieces, is a very good Compoſt for ſtiff cold Grounds. There is much difference in Chalk, but that which is ſoft fat Chalk, is good for ſuch Ground as aforeſaid, and for Ground that is not very ſtiff. Let your Reaſon inſtruct you further.

Lime is a very rare Compoſt for cold Grounds and ſtiff Clays; for its Heat cauſeth a Fume, and its Tenderneſs makes way for the Roots, to fetch home their Nouriſhment; and its Heat is great at firſt, therefore lay not on too much on any Ground, and let that be ſlacked. If your dry Ground be what your Trees delight to grow in, and you are forc'd to ſet them on wet, then add ſome of this Lime among your Earth.

Clay, eſpecially that ſort which is a light Brick-Earth, is very good for ſuch Land that is a light

ſhovey

ſhovey Gravel, or hath too much Sand in it. Such Grounds as theſe do not retain the Spirit of Plants; for when Nature hath by the two Lovers, Star-Fire and Water, generated their Babe, ſuch Ground as this doth drink down too faſt, and again doth dry too haſtily; ſo that the Water cannot have time to leave nor to prepare its Slime: which is the Mercury that makes that Fume which feeds all Plants and their Seeds. But this Clay muſt not be digged too deep, for then it wanteth of that which feedeth Plants, *&c.*

I have taken the green Slime that is common in Standing-Water (I do not mean the Frogs Spawn, which is caſt many times into this) and have dry'd it and beat it into fine Duſt, and then have mix'd it with good freſh Earth, and have found very good Succeſs in raiſing ſeveral ſorts of Flower-Seeds and others: tho I have Notes of them, yet it is out of my Road to ſpeak of them now, becauſe I am writing of the ſtately Foreſt-Trees. However, I may (it's poſſible) write ſomewhat of them, if the Lord permits, and according as I find theſe few Lines accepted of by ſome of the Royal Oaks of this our Age.

For I do ſuppoſe that there is not one thing in Gardening yet well known: For (as a learned Author hath it) *he that knows a thing well, muſt know what it was, is, and ſhall be*; therefore all human Knowledg is but a Shadow of ſuperficial Learning, reflecting upon Man's Imagination, but not the leaſt thing comprehended ſubſtantially.

But to the Buſineſs in hand: Take Clay or Loom, and lay it on your Ground, not too thick, the beginning of Winter, and there let it be till the Froſt hath made it fall into Mould; then in ſome dry open time harrow it all over: and if it be Ground you plough, then plough it in a dry time; but if it be Ground you trench for Foreſt or Fruit-Trees, obſerve to order it ſo: for by thus doing, the Clay will mix with the Sand or Gravel much better. The

better

better that any Man cheweth his Meat, it is certainly the eaſier to digeſt; and the dryer you put it into your Ground (provided it hath but time to water it ſelf well before your Trees be ſet) 'tis the better; for then it draws the Mercury, and ſtores it up till the Roots have occaſion for it, for 'tis quickly exhaled out of Sand: but the Clay holds his Store till a time of Neceſſity, and then contributes to the Roots, that is, in dry Weather; and the ſmaller you make it to mix with your Ground, the likelier the ſmall Roots (as well as the great) are to meet with it.

Note further, that the ſmaller your Plants be, the finer muſt your Earth be made, by skreening, ſifting, beating, turning, *&c.*

I know by good Succeſs this to be true; for the Right Honourable my Lord (and the more to be honour'd becauſe a great Planter, and as great a Lover thereof) gave me order to make three Walks of Lime-Trees, from the new Garden to the new Bowling-Green, and withal to make them deſcend towards the Houſe, as near as we could; which to do, I was forc'd to cut thro one Hill thirty Rod, moſt of the Hill two Foot deep, into a ſharp Gravel, and the greateſt part of all the Length of the Walks was the ſame: they being Trees that I rais'd of Seeds, moſt of them, and the reſt of Layers, at *Hadham-Hall*, they being with my Lord ever ſince their Minority, and he many times their Barber, engag'd him to have the more particular Kindneſs for them, therefore he order'd me to do what I thought good in preparing the Ground for them; which I did as followeth.

Firſt I levell'd the Hill, and when I had brought the Ground near to the Level concluded on, I ſtaked out my Ground where every Tree ſhould ſtand, and then order'd my Holes to be made for my Trees, each Hole three Foot deep, and four Foot wide, becauſe the Ground was ſo bad. This I did near a year before

I ſet my Trees; and having the Convenience of Brick-Earth near, I got near a Load to every Hole, and mix'd this with the Earth digged out of the Holes, turning it over twice, and in dry Weather throwing out the greateſt Stones, but the Turf I did throw into each Hole (the Graſs-ſide downward) as ſoon as they were made; but the Hill of Gravel I trench'd with Loom, Cow-dung, and the Litter under the Cow-racks, two Spade deep, and five Foot on each ſide every Row of Trees.

Thus having prepar'd my Ground, and the Seaſon of the Year come, about the beginning of *November* 1672, I had the Trees taken up with good help, as carefully as I could, and carry'd to *Caſhioberry*, the place of their now Abode; and then having good ſtore of Help, and good Mould prepar'd, of the ſmalleſt and fineſt, I ſet the Trees with the upper part of the Roots of each Tree level with the top of the Ground, making a round Hill half a Foot high about every Tree, and the Compaſs of the Hole.

Having prun'd the Heads of each Tree, and cut off the bruiſed Roots, and the Ends of ſuch Roots as were broken, I ſorted the Trees, and obſerv'd this Method in placing them; namely, I ſet the higheſt next the Bowling-green, and ſo ſhorter and ſhorter till the loweſt were next to the Garden; which I did for theſe Reaſons: Next the Green was the worſt Ground, and the Trees more in danger of being ſpoil'd, by reaſon of a Market-path that goeth croſs that end of the Walks to *Watford*.

Thus having ſet my Trees ſtreight in their Rows, and trod the Earth cloſe to their Roots, and made my Hills, I then laid round every Tree, upon thoſe Hills, wet Litter taken off from the Dunghill, a good Barrow-full to every Tree, and cover'd that with a little Mould, leaving them to take their reſt for a time; but early in the Spring I found them to begin their Progreſs, and that Summer they had ſuch Heads ſhot forth, that I was forc'd to cut off ſome of their

Heads

Heads (that is, the Side-boughs) to keep the Wind from breaking them. There are in theſe four Rows of Trees 296, and of theſe I loſt not one Tree the firſt Year: but they did grow and ſhoot ſo well, that there were ſeveral Noblemen, that ſaw them, did think, as they ſaid, that they were not remov'd the Year before; but the Year after we had three ſpoil'd by ſome baſe Men or Boys.

Of the very ſame Parcel of Trees my Lord gave Sir *William Temple* thirty of the beſt of them, which he himſelf ſaw choſen out; they were ſet at Sir *William's* Houſe at *Sheen*, a much better-natur'd Ground than ours, yet they loſt all of them but ſix the firſt Year. I ſaw a Walk of Lime-Trees (but I think they were the Baſtard-kind, which we have growing in many of our Woods in *England*) ſet at *Debden-Hall*, the Right Worſhipful Sir *Richard Brown's* Houſe; the natural Ground was not bad for them, but how they were order'd I do not know, for they had the firſt Year not above one in ten that did grow any thing conſiderably.

I ſaw the like (or worſe) Spoil of the ſame Trees at my Lord Chief Baron *Turner's* near *Stratford*, where the Ground might eaſily have been made very good for them. I only write this, to perſuade Noblemen, and others that are Lovers of Planting, to remember the old Saying, *viz. A thing once well done, is twice done*; and thoſe that are reſolv'd to plant, that they make their Ground fit for thoſe Trees before they ſet them, and not bury them in a Hole like a dead Dog, as too many do. Let me then beg that they may have good and freſh Lodgings ſutable to their Quality, and good Attendance alſo, to preſerve them from their Enemies, till they be able to encounter with them: they that will not do this, let them never reſolve to plant Trees; for why ſhould they ſpoil the leaſt of thoſe ſtately Monuments, and in ſo doing throw away their Money? For let ſuch note that Nature beſtows not her Gifts

but

but where ſhe finds ſutable Convenience; therefore order your Ground well, and then you may ſee a good Succeſs, as my Lord hath had in ſeveral of his Plantations, tho as bad Ground as moſt is to plant on. One Night (methoughts) walking up one of my Lord's Lime-Walks, I heard the grateful Trees thus paying the Tribute of their Thanks to his Lordſhip:

Like Pyramids our ſtately Tops we'll raiſe,
To ſing our Noble Benefactor's Praiſe;
Freſhly we will to After-Ages ſhow
What Noble Eſſex *did on us beſtow:*
For we our very Being owe to him,
Or elſe we had long ſince intombed been
In Crop of Bird, or in Beaſts Belly found,
Or met our Death neglected on the Ground.
By him we cheriſh'd were with Dung and Spade,
For which we'll recompenſe him with our Shade:
And ſince his Kindneſs ſaw us prun'd ſo well,
We will requite him with our fragrant Smell;
In Winter (as in Gratitude is meet)
We'll ſtrew our humble Leaves beneath his Feet:
Nay, in each Tree, Root, Trunk, Branch, all will be
Proud to ſerve him and his Poſterity.

Thus having ſhew'd you by Example the good Effects of a light Brick-Earth upon Gravel, I could alſo tell the ſame of a Fat-Sand, Drift-Sand, ſmall Gravel upon your Clay or ſtiff Ground; but I hope that I have inform'd your Judgment ſo much, that you will reaſonably conclude with me, that the preparing of Ground for Trees, is, only to mix Ground ſo together, that there may be convenient room for the Roots to ſearch for their Nouriſhment; and to humour the Tree ſo, that there may be a good part of the natural Ground which each Tree delights to grow in. I know if your Ground be a ſtiff Clay, then to trench and mix it with Fat-Sand, Drift-Sand, Lime,

Rubbiſh, or Chalk and Lime, are great Helps to ſuch Ground, either for Trees, or Corn, or Graſs; and more laſting than Dung, and for Foreſt-Trees full as good as Dung: for it doth not only give leave, and make way for the Roots to run in the Earth, but takes away that Over-moiſtneſs in the cold ſtiff Ground, which hinders Conception, by letting the Water down into the Earth, and by keeping it from cracking; and ſo nouriſheth the Spirit of the Earth, and alſo keeps it from ſpending too haſtily.

Horſe-Dung is the beſt to make your hot Beds with, for ſuch Plants as are commonly rais'd of them by Annual Plants; but it is too haſty for the Seeds of Trees, unleſs it be rotten, and well mix'd with natural Mould: it is beſt for your ſtiff cold Lands, and if you lay it upon ploughed Ground (which 'tis beſt for) then plough it in as ſoon as you can, for if it lies there to dry, there will a great part of the oily Subſtance, which makes the Fume for Nouriſhment of Plants, be exhaled out by the Sun. Let no ſort of Dung lie long on the top of your Ground unploughed-in, but plough or dig it in as ſoon as you can; for by lying ſo, it doth not only loſe a great part of its Goodneſs by the Sun (eſpecially if it lies thin) but where your Dunghil lies, every Shower will waſh the Strength of the Dung into the Ground; ſo that if you take the Dung off from that place as clean as you can, yet you ſhall have that place bear ranker Corn than where you thought the Dung had lain much thicker, if it lies long in a place. The Obſervation of this taught me many good Uſes; as firſt, to lay Dung about the Roots of Trees is much better than Stones, as my Lord *Bacon* adviſes in his Natural Hiſtory; for this keeps moiſt the Ground better than they, and Rain waſhes the Strength to the Roots, as is aforeſaid: and if you dig in this when the Strength is gone, and your Trees ſtrong, it then prepares way for the Roots, and there is a great Benefit to your Trees. Or if it is not digged

in, but lies on the top, and there turns to Earth, it then feeds the Roots on the top, and leads them upward.

And ſeeing where Dung lies, the Ground is ſo much improv'd by the waſhing in of the Strength of the Dung, it may well inform you that Dung ſteeped in Water is very good, eſpecially if you uſe Dung in quantity according to the Nature of your Plants, and Strength of your Ground; the weaker your Ground, make your Water the ſtronger. There is in ſome places in Farmers Yards, a Water that waſheth from their Dunghils, a Load of which is not inferior to a Load of Dung, yet by them totally neglected; but of Waters I ſhall ſpeak more in the next Chapter. Thus having hinted of theſe two uſeful and common Dungs, Cow and Horſe, in the Example of theſe Lime-Trees, only obſerve this, and then I ſhall proceed: Horſe-Dung is beſt for Plants that are quick of Digeſtion and Growth, and for Trees or Plants that ſhoot much in a year; for it yields a great Fume, and ſuch Plants can well diſpoſe of it. Cow-Dung is a good Soil for moſt Trees or Plants of hot Ground, and better for durable Plants than it is for Annuals: It is excellent for many ſorts of rare Flowers, if firſt it be thorow-rotten, and then dry'd and beaten to Duſt, and ſome freſh fine Earth then mix'd well with it.

Deers-Dung is much of the Nature of Cows or Bullocks; but 'tis more proper for tender and ſmaller Plants.

Sheeps-Dung is alſo of the ſame Nature, but more agreeable to tender and ſmall Seeds and Plants: By this our Yeomen and Farmers find good Profit, by folding their Sheep every night on their own Lands; for there they find a certain Benefit on their Ground by the Dung and Urine which the Sheep make in one Night; tho it is not long laſting, yet 'tis a ſure Help for the firſt Crop, and a good Addition to the ſecond.

This may teach you, that a thin ſprinkling of Dung is more ſure moſt Years for your Corn-Land than greater Quantities; and alſo that to break your Dung ſmall is beſt; for the ſmaller the better, eſpecially if you have laid it on your Ground not long before you ſow, particularly for your Summer-Crops. From this I do adviſe my ingenious Countrymen of theſe few Rules which are ſpoken to before.

To well obſerve the Nature of your Land, and by ſo doing to enrich it with ſuch Soil and Dung as is moſt natural to the Ground, and to the Seeds you intend to ſow on it; and to lay it on your Ground at the moſt convenient times.

Firſt, as to the Ground; I have hinted at many uſeful Compoſts, and alſo that ſeveral of them are far more proper for ſome Grounds than they are for others: tho there be many more ſorts that may be, and are made uſe of to very good Effect, yet I ſhall not trouble my ſelf nor you with the naming any more, knowing that he that underſtands to number to 20 in Arithmetick, may ſoon count to 100.

Now as to the Seed you intend to ſow, whether it be of Trees, Plants, or any ſort of Grain, the ſmaller your Seed is, make the Ground the finer; the quicker your Seeds be of Growth, and the more they run into Stalks or Leaves, your Dung may then be the newer and ſtronger, and the more in Quantity, according to the Digeſtion of your Plants. But if for Trees or Plants of long laſting, then let the Dung be the more rotten; and the more they be apt to ſhoot great ſhoots, the more you may allow them; but let them be ſure of ſome ſuch Ground as they naturally delight to grow in, and alſo to allow them room that is large enough: for high and lofty Spirits do not love to be confin'd to little and ſmall Cottages.

And as for laying it on your Ground, if the time be the Spring, that is moſt proper to ſow your Seed, then lay ſuch Dung as is hot and dry early on your

Ground; and rather err in too little than too much, ſuch Dungs as be your Pigeons, Hens, Seacoal-Aſhes, *&c.* But if they be hot and moiſt, ſuch as Horſe-Dung, Horſe-Litter, or green Graſs, Hay, *&c.* theſe be moſt proper for Annuals, and it is not good to be too ſparing toward theſe tender Plants; rather err in keeping your Dung too dry than too wet, for in ſo doing you ſhall keep its Heat the longer, and have the more Command to keep it ſo. But if you have occaſion to lay Dung on Ground to help ſuch Trees or Plants as are not Annual, but more ſlow in their Progreſs, then mix ſuch Dung thin, and not too near the Roots: but if it be the Autumn Seaſon that you have occaſion to lay it on your Land, then lay it ſomething thicker, for the Winter will qualify the Strength and Heat of it.

To conclude, if you are to lay Dung on Land, that you are to ſow with Seed, which doth not run much into Stalks, and is but ſlow in growing, then do as our Farmers do; let it be rotten, and mix'd well with Mould before you lay it on your Land, and then your Grain or Seed will the better agree with it; or elſe you may find on your Land ſtrong great Weeds, ſuch as the Ground is moſt inclined to: for ſtrong Land will produce the ſtronger Weeds, and the other the contrary.

Therefore if your Dung be too rank and new for the Seed you intend to ſow your Ground with, then mix it with ſome other Compoſt as is moſt proper for your Land, and moſt convenient to be had; and if your Land be ſtiff, then mix it with Chalk, light ſandy Ground, or ſomewhat of the like nature, laying a good Quantity of Earth firſt, then your Dung, and then Earth to cover your Dung all over; by ſo doing you will ſave that oily Water which will ſoak from the Dung by Showers of Rain into the Earth under the Dung: and by covering your Dung with Earth, it will keep the Sun from drying out that Moiſture; and whatever Fumes ariſe, the Earth on

the top will receive. Be ſure you let it not grow with Weeds on the top, but when you find them to appear, take them off, and ſuffer none to grow on your Compoſt; or turn it over, and mix it with your Earth below, however let it be mix'd together before you lay it on your Land. Thus do with new Horſe-Dung and Litter, but if it be any other Dung, lay it on your Land as ſoon as Opportunity ſerveth; for the longer you let it lie, the more it loſeth of its Strength: therefore lay it on rather too thin, and in dry Weather, and early.

To aſſiſt Nature do thou not neglect;
Uſe her not roughly, leſt there be Defect.

Thus much may ſerve for Trees, but if it be for Flowers, or other fine and tender Plants, you then muſt be more curious, and mix your Earth better; but they are out of my Road at this time. The main Buſineſs is to prepare your Ground ſo, that there may be room for the Roots to run in to fetch their Nouriſhment. As for Trees and Plants that root deep, trench your Ground accordingly, *&c.* Now, for to pleaſe the Tree or Plant with ſuch Earth as it delights to be in, add ſuch a Quantity of Dung as may be ſutable to the Growth of your Tree or Plant, thereby to make a Fume to feed it: let this Fume be made of what it will, for my part, I ſhall not contend whether it be Salt, Sulphur, or Mercury; or, as ſome affirm, that 'tis Salt, Sulphur, Mercury, and Spirit; all, or any one of theſe feed the Plants of this Terreſtrial Globe: Or if it be Fire, Earth, Water, or Air, as was formerly the Opinion of the Learned; for Sulphur or Brimſtone may anſwer to Fire, Salt to the Earth, Mercury to Water, Spirit to Air.

For 'tis certain, that Plants have Salt, Sulphur, Mercury, and Spirit in them; ſome more than others, according to their Heat or Coldneſs; but that they feed

feed on theſe, is not certain to me: but it is, as I conceive, the Fume, Steam, or more properly the Spirit of the Earth that they feed on; for the Earth is full of Spirit, which is the Cauſe of the vaſt many Productions of Plants and Inſects which are produc'd every year, and from no Seed or Sperm, but according to the fit Matrix of the Earth, and the Star-Fire, and Virgin Mercury: their Dame Nature is then buſy to make ſome Plant or Inſect, according as ſhe hath provided a Breaſt to ſuckle and feed them.

The Earth is then but only a Lodging-place, and ſimple Water is only its Garment; for ſimple crude Water feeds nothing, but is rather deſtructive, as is ſeen by Water that runs forth on a Gravel, and the Stream quick; there be ſeldom good Meadows by ſuch Rivers, unleſs there be ſome Town that waſheth it ſelf into the River, or good rich Land, or Lanes, or the like. Your Spring-Water, unleſs it have ſome Aſſiſtance, is the like; but of Water, ſee more in the next Chapter.

And now I ſhall give you an Example of Earth, by which you may well perceive that Plants do not feed on ſimple Earth, nor crude Water. My Lord was the Author that told me this, and as ſoon as the Seaſon of the Year did permit me, I then did try the Experiment, which was thus perform'd: I took out of a Hill of good rich freſh Earth (which I had prepar'd for other things) ſome of the dryeſt, ſomewhat above a good large Flower-pot full, this I carry'd into a little Room, which I had at *Hadham-Hall*, it join'd upon the Bake-houſe; there I ſpread this Earth thin upon the Shelves, now and then turning it, till it was as dry as Duſt, and, as I thought, as dry as it well could be, provided it were not burnt. Having thus prepar'd my Earth, I fill'd a Flower-pot with it, which Pot and Earth thus fill'd, weigh'd, as exactly as I could weigh it, juſt eighteen Pounds and a half.

March approaching, in the Year 1666, I put this Pot into a hot Bed to ſecure the Seeds, and withal to help forward my Deſign to preſerve them; the Seeds were Purſlain which I ſow'd in it, the Quantity was very ſmall: I kept this Pot in hot Beds till the beginning of *May*, and then I ſet it under a South-Wall, where it ſtood till that Month was out, and then I ſet it in the Shade from the Meridian Sun; there it ſtood till the latter end of *Auguſt*, and then finding my Plants full of Seed, and at a ſtand, I cut up the Purſlain cloſe to the Ground, at Noon-time, when it was very dry, and weigh'd the Purſlain as exactly as I could, and it weigh'd juſt ſix Pound two Ounces. Then I took the Pot of Earth, and ſet it in a South Window in a Banquetting-Houſe to dry, turning the Earth to the Sun, to dry out ſome of the Moiſture, for the Earth was wet; for I had kept this Pot with watering all the Summer, as occaſion ſerv'd: then I took this Pot of Earth, and carry'd it into the little Room, to dry the Earth as I did before, and putting ſome of the Earth into a Box, and the reſt in the Pot, I made it as dry as it well could be, or at leaſt as dry as it was when I ſow'd my Seeds in it; and then putting all my Earth into the Pot again, I weigh'd it as exactly as I had done before, and then the Pot and the Earth weigh'd juſt eighteen Pound and ſeven Ounces; there was, I confeſs, the Roots of the Purſlain, but when they were dry'd, I do believe they did not weigh one Ounce; and this one Ounce that it loſt of Weight might be Earth daſh'd over with Rains.

Now theſe Plants weighing ſo much, and the Earth waſted or decreaſed in its Weight ſo little, doth plainly ſhew that Plants do not feed only on Earth; for I do believe this, that the Earth that was waſted, was daſh'd out of the Pot by haſty Watering, and by ſudden Showers of Rain, or perchance ſome might go out of the Holes of the Pot with the Water.

Now, tho Plants do not feed on Earth, yet Earth is the Nurſe and Receptacle of moſt things; and the Earth is ſpongy and porous, fit to receive the ſeveral Influences of the Heavens, of Heat, Rains, and Dews, and ſtores them up for the Conſervation of her Products: and when the Seed or Plant deſire it, is put into motion by the Celeſtial Heat the Earth freely gives out of her ſtore, according as the Plant can diſpoſe of it.

And if there be no Plants to feed on this Spirit of the Earth, then many times Nature makes ſome which do: for the Earth will produce ſeveral Plants of it ſelf, without Seed or Root, but they be Plants of no long laſting, and when they die, they turn to Air and Spirit, as all things do: for there is nothing that is at a certain ſtay, for all things have their time of increaſing, and time of decaying, till they be turned to that of which they were made.

No Man can ſee Trees grow, yet all Men know that they do: It is plain to ſee when a Tree is decaying, yet to know how long it will be before it is of its own decaying turned to Earth or Duſt, is hard to know. Tho it is reported, that an Oak is a hundred Years a growing, a hundred Years ſtands at a ſtay, and a hundred Years decaying; yet this is very erroneous: for on ſhallow Grounds an Oak will not grow ſo long, and on deep Ground much longer, and neither it nor any thing elſe ſtands at a ſtay, but when it doth begin to decay, it keeps on, according as it meets with Accidents, till it comes to Duſt.

Thus have I gueſs'd, but whether right or no,
The Critick's Laſh I'm ſure to undergo.
I to th' ingenious Practiſer direct
Theſe Lines, which hope with him to gain Reſpect;
For Learned Men oft-times miſtaken are,
When Fools as oft gueſs right, tho unaware.

CHAP.

CHAP. IX.

Of Water for Trees and Seeds, and watering them.

I Have oft obſerved your Ciſterns and other places, which are only filled with Rain-water, that that Water will in Summer-time produce ſeveral ſorts of Inſects, and ſome ſort of Water-Plants; and alſo that it will leave a green Slime, not much unlike to Plants: which Subſtance (or Slime as I term it) would certainly be ſpent into Plants, were there but ſome quantity of Aquatick Plants put into this Water; ſuch as Mints of any ſort, yellow Water-flag, Flower-de-luce, Crabs-claws, or Water-Sengreen, Brook-lime, Ducks-meat, *&c.*

I once made an Experiment to try this, which I have here inſerted; and thus it was: I took two Water-pots, and filled them full of Water, out of a Fountain which had been filled by Snow and Rain the Winter before, and which was made clean the *Michaelmas* before. I ſet theſe two Pots, thus fill'd, in the open Air, but in the Shade, and put into one of them a good handful of Mints, the Runners, which I put in the firſt of *March* 1664, where I let them continue till the firſt of *April* next, and then put in a freſh handful, and let that continue for one Month more, and ſo I did both *May* and *June*. I poured out this Water about the beginning of *September*, to obſerve which of thoſe Pots had the moſt of this Slime: whereupon I found, that Pot which had no Mints put into it, had twice as much, and being forced too to fill up that Pot which had the Mints with the ſame Water often, and that Pot which had no Herbs in it, the Slime of it was green:

th

the other Pot's Settlement that was in it, was black, and of an earthy Colour. I did intend to have proſecuted this further; as to have filled two Pots of freſh Earth, and not too rich, and to have ſown in them ſeveral Seeds, and to have kept them from all Water but this, and then to have noted well the Succeſs, with more like Fancies which I thought on: but I was prohibited by one of the Drones of this Age, and did not know whether I ſhould ſtay or not.

A Stone lying in Water gets a kind of Slime about it; and if you put into Water Seeds that be quick of Growth, (as moſt of your Annuals are) keep it but temperately hot, and they will in a little time ſpear out; and then if you put them into fine Mould, temperately moiſt and warm, you may (if you pull up one of them and obſerve) ſee the Roots feeding upon a white Subſtance, which I have often obſerv'd: for in Water is the Seed of all things. Likewiſe put Seed into Earth, and if it be very dry, then tho it be kept ever ſo temperately hot, it will rather keep the Seeds from growing than haſten them.

But Water diſſolves, then Life followeth the Diſſolution: for Water opens the Parts of the Seed, and makes them ſwell, then they draw the Spirit of the Water to them, (for the World is full of Spirit) ſo the Seeds when they have been ſo long in Water till the Body of them cracks, which is as ſoon as it hath filled it ſelf with enough to make a Root, then that Seed if once dried, and a ſtop put to its proceeding, the Art of Man cannot make it grow again. I have heard ſome affirm that Malt will grow, but 'tis falſe, unleſs they mean ſome Barley-corns which never ſpeared.

Therefore if you have once water'd Seed, keep them with watering if the Earth require; and if your Earth be poor, and Seeds great Growers, then water with rich dunged Water, and often; but let it not touch the Leaves: and if you think your Ground

be

be too rich for the Nature of your Seed, then water your Seed with Water not very rich. But if your Seeds be Slow-growers, for ſuch keep your Ground only moiſt, and no more: for tho it be Earth that ſtores up the Spirit that feeds Plants, yèt it is Water that ſets it on motion, and Water is full of Spirit alſo; but without Heat both theſe lie ſtill: for Heat draws out firſt the crude Water, and ſends it into the Air. Therefore, unleſs it be for Aquatick Plants, or Plants that grow much, and the Weather be warm and drying, do not water too much, keep your Earth juſt moiſt: for when Ground is full of Water, the Celeſtial Fire heats firſt the Superficies of the Earth, and puts that into a Fume; but the Roots which are deeper in the Ground, being cover'd with Water, there is no Fume riſeth there till moſt of the Water be drawn up by the Sun, or ſettled into the Earth. Therefore if your Ground be ſubject to be wet, keep it looſe and open by deep trenching, and Earth to drain away Water: for it is oft ſeen, that good Land that lies low in a wet Spring hath no great Burden, becauſe it is over-preſs'd with Wet: and dunged Land in a wet Year bears the worſt of Corn, eſpecially if it be low ſtiff Land: for Dung then holdeth the Moiſture, and the Ground being wet withal, commonly doth produce great Weeds, which can digeſt the Spirit of the Earth and Water better than Corn; becauſe they grow much quicker, and ſo they ſpoil the Corn. For the greateſt good that Dung doth to Land, is to hold the Water in the Ground, and to keep the Ground hollow, for the Roots to fetch their Nouriſhment: For 'tis the Nature of Dung to draw Water to it, to fill it ſelf like a Sponge; and when dry Weather comes, then it ſpends it ſelf in Fume, and ſo it waſtes it ſelf, and feeds Plants by its Decay. Thus you may ſee and admire the Order of the great God of Nature, that the Deſtruction of one ſhould be the Preſervation of another.

This

This you may obſerve in rotten Wood, Malt-duſt, Wool, woollen Rags, Horn-ſhavings, *&c.* how full they will be with every little Dew, and keep that longer than a Clod of Earth twice as big: thus will they do till they be turn'd to a very little Earth. By this you may inform your ſelf what ſort of Dung will laſt longeſt.

Some ſorts of Dung there be, that if they be not over-preſs'd with Water, will waſte themſelves by their own Heat; witneſs your Hot-beds, *&c.* yet notwithſtanding, this Heat is very natural to annual Plants.

Dung ſteeped in Water, or Water ſtrain'd thro Dung, doth take a great part of the Subſtance and Strength of the Dung with it; and that Water when dry'd up in the Ground, and evaporated, when Rain or Dew falls on that place, it there leaveth ſuch an oily or ſlimy Subſtance as catcheth the Water or Dew, and hindereth it from running deep into the Earth; and then the Over-plus which the Plants receive not, is rarefy'd into Air, till it hath ſpent it ſelf as it were to nothing.

After dry Weather in Summer, if there comes a good Shower, and a warm Day after, you may ſee this Fume hang in the Air, ſometimes low cloſe to the Ground, as if it were loth to part with the Earth; and toward the latter end of Summer, if great Rain and warm Weather happen, then this Fume being great, and the Nights ſomewhat cold, it will ſpend it ſelf in Muſhrooms, Puffes, *&c.* as old Trees and rotten Wood will do, where there is a great decay, and nothing to feed on.

Therefore if you fear dry Weather, do not defer too long before you water your Trees and Seeds, but water while your Ground is yet moiſt: for believe me, I would not have you ſtay too long before you water, if you be minded to water at all; and alſo when you do water, do it well. Conſider the depth of your Roots, and thoſe that root deepeſt, water

moſt:

moſt : and alſo when you begin to water, continue it as long as you find occaſion. Water Trees well, and Seeds and ſmall Plants often : Uſe not Well-water, eſpecially for tender Plants ; for it is ſo ſtrain'd thro the Earth, that it hath little Spirit to make Nouriſhment in it for Plants. Rivers that run quick and long on ſharp Gravel are little better ; therefore if you muſt uſe ſuch, let them ſtand ſome time in the Sun, in Tubs, *&c.* mixed with Dung.

Let the Quantity and Quality of your Dung be according to the Nature of your Plants : as, if your Plants be great Growers, and require Heat, then put Horſe-Dung, *&c.* in the Water.

If your Plants be fine and tender, then put Sheepsdung, or Cows-dung, *&c.* into the Water ; remembring, that if you think your Ground be bad, you muſt add the more Dung.

If your Water be bad (as is aforeſaid) and that you put Dung into it to help it, let it then ſtand in the Sun and open Air uncover'd.

Take care you water no Plants with ſtanding ſtinking Ditch-Water, nor with Water that ſtinketh : for ſweet Water, not too clear, and freſh Mould, not muſty or tainted by ſtinking Weeds, *&c.* is as proper for tender Plants, as ſweet and good Food, and warm and clean Lodging is to a tender fine-bred Man.

Rain-water I take to be very good, if not too long kept ; yet if your Veſſel be large, the oftner you ſtir it, the longer it will keep ſweet.

Large and navigable Rivers, (ſuch as our *Thames*) that receive much Soil by the waſhing of Streets, and the many Sinks that run into it, and which by its own motion doth cleanſe it ſelf from that which is noxious both to Man and Plants, is a moſt excellent Water for all ſorts of Plants.

The larger Ponds be, the better their Water is for Plants ; and if they have the Shoot of ſome Stable-yard into them, it adds much to their Goodneſs :

the

the opener they be to the Sun, the better, and the more of Motion they have, as by Horſes waſhing in them, or Geeſe or Ducks ſwimming in them, 'tis ſo much the better; for the ſwimming of Ducks in Summer in your ſmall Ponds, will keep the Water from ſmelling.

Now having ſhew'd you ſeveral ways of raiſing Foreſt-Trees, with ſome other hints of their Seed, *&c.* and of Compoſt for them, and of Water and watering them; I now ſhall ſhew you the Manner how to raiſe them of Seed, which is to be prefer'd before all others, tho ſome of the aforeſaid ways for ſome Trees are much eaſier and quicker.

Good Air for Plants (as well as Men) is much aſſiſting to their Health and Life, for without this nothing can live; and that which is moſt healthful for tender Men, is alſo the beſt for tender Plants. Air takes up the earthy Exhalations of all ſorts, and there mingles them together, and being touched with Celeſtial Fire, it reduceth them into general Principles, for great uſes. I ſhall ſay no more of Air, for it is an Hermaphrodite, and is inclos'd in Water, therefore near a-kin to it.

CHAP. X.

Of Raiſing and Improving Oaks.

I Shall not trouble you with the ſeveral kinds there be; tho the Learned *J. Evelyn* Eſq; reduceth them to four, in his Diſcourſe of Foreſt-Trees: but if they were diſtinguiſh'd by ſeveral Names, as we do our Pears, you might find as many Varieties, only according to the Shape and Taſte of the Acorn. For as we know by Experience that ſeveral of our Pear-Trees grow Pyramid-like, as the Oakmanberry, and

and Bordon-muſk-Pears, *&c.* and ſome likewiſe grow much ſpreading, as the Winter-Bonchriſtian, the back Pear of *Worceſter*, &c. even ſo do ſome of your Oaks. Therefore if you deſire aſpiring Trees, take care to gather your Acorns off from ſuch Trees, or rather gather them from under ſome ſuch Trees, when fallen, and in a dry time if you can.

When you have ſo done, lay your Acorns thin in ſome open Room to dry, and when they be dry, keep them in ſome dry place till the latter end of *January*; and having prepar'd ſome good freſh loomy Ground, by digging and keeping it clean before-hand, ſow them, and let them be cover'd about an Inch and a half, or two Inches deep: by ſowing them at this time, you ſhall ſave a great many, which otherwiſe would have been ſpoil'd by Mice or other Vermin. But if it happen to be a wet time when they fall, then will they begin to ſpear out in a ſhort time after; and then ſo ſoon as you ſee them ſhoot forth a little Bud at the ſmall Ends, commit them to their Spouſe as ſoon as may be: For when they be come to the time that the Almighty hath allotted them, and be fed and made luſty by the Dews and Showers of the Heavens, then the Star-fire impregnates the Moiſture in the Seed, and then the Seed throws off, or endeavours to do it, and then takes his Lodging in the Earth, where he prepares a room for his Off-ſpring; that is, as ſoon as the Seed has imbib'd himſelf in the Water, and receiv'd Heat, (for without both theſe no Seed can produce its kinds) the Body of the Acorn cracks, and the Spear ſhoots into the Earth: and as ſoon as it hath got Entertainment there, and the Seaſon of the Year agreeable, the Body of the Seed turns either into Leaves, or ſpends it ſelf into Leaves, and that little ſmall part of the Seed, the Spear that ſhoots forth root, and the Shot and Leaves. So that if the Acorn hath had a convenient Quantity of Heat and Moiſture (but if too much of either of theſe, that is deadly to all Seeds) then the

Seed

Seed ſpears forth, and if it be not committed to the Ground before it be dry'd, and the Spear wither'd, then for certain that Seed, Acorn, Nut, or Stone, will never grow. For Nature, if once ſet on motion, will rather ceaſe to be, than alter its Courſe; for it hates Violence, neither can the Seed receive this precious Sperm without this two, Father and Mother; and theſe two muſt have a ſuitable Agreement between them: for tho one Veſſel be ſufficient to perfect the Infant in the Womb, yet Nature hath not been wanting to provide ſeveral Breaſts to nouriſh it. Therefore if your Acorns have taken wet, and the Heat hath made them ſpear, you muſt ſow them as ſoon as you can, and venture them a whole Winter in the Ground, remembring to keep ſome Traps ſet to catch the Mice.

In the Spring following they will come up, keep them clean from Weeds, and let them ſtand two or three Years on their firſt bed: then having prepar'd a piece of good freſh Ground, by adding ſome rotten Dung to it, if poor, or good freſh rich Ground (which is better than Dung) cut the Tap-root, and the Side-Boughs, and ſet them as you do other Trees in your Nurſeries; keep your Ground with digging, and the Trees with pruning up every year. Thus order them till you find them fit to remove, and you will then find no ſuch hazard in removing them, as if they were never tranſplanted before: for there is a great deal of reaſon to be given that the oftner you remove a Tree, the likelier it is to grow when it is remov'd again, provided it be not too great. Beſides, Experience doth plainly ſhew the ſame; for I have often experienc'd of a Walnut-Tree ſet of a Nut, and never remov'd in its Minority, but ſtill keeping its Place of Situation, till it is ſix or ſeven Foot high, that in removing ſuch a Tree, you ſhall find near as much hazard in the growing of that Tree, as in removing an Oak of the ſame ſtature, provided the Oak hath had his abode in open Air, and not been

tenderly nurſed up in a Wood; for ſuch Trees, let them be of what kind you will, are nice to be removed out of their warm Habitation: but at this I have hinted before. Now, to ſhew you ſome Reaſon why any Tree being removed before, is the likelier to grow when remov'd again, obſerve theſe few Rules.

Firſt, 'Tis the Nature of all Trees to put forth one Root firſt, and then ſome Side-roots, according to the kind and nature of the Ground; and this moſt ſtately Tree doth commonly run to the Bottom of the Soil that is fit for its Nouriſhment, before it puts forth many Side-roots, eſpecially in a looſe hollow Ground; and then at the end of the Tap-root it puts forth feeding Roots: and when this Tree comes to be pretty big, it having few feeding Roots near home, the Tree can hardly be taken up well, without loſing moſt of them, which will be a great hazard to the loſs of your Tree.

Secondly, But when a Tree is taken up young, as at one, two, or three Years old, then there is but ſmall Head, ſo that a little Root will maintain that; and then this little Root lying not deep, and in a little compaſs of Ground, may be taken up with leſs loſs to the proportion of the Head, than a greater.

Thirdly, When you have taken up theſe young Trees, in cutting off the end of the Tap-root, and the end of the greateſt of the others, thoſe very Ends ſo cut off with the Slope lowermoſt, will at that place put forth many ſmall Roots, which lying near to the Body of the Tree, are the eaſier to be taken up with the Tree when 'tis removed again.

Laſtly, Cuſtom in removing of Trees tends ſomewhat to their growing, being remov'd; for I fancy, that if you could get ſome Acorns of an Oak, that had (with its Fore-fathers) been accuſtomed to removing, as our Apple-ſtocks are, I do judg it would be then as patient of changing its Habitation as they. From that which hath been ſaid, I hope you will

conclude with me, that 'tis beſt to remove, either Foreſt-Trees or others, when young; for if you remove them when they be older, the better the Ground is, the more the Tree runs down with a Tap-root: therefore if never remov'd before, the worſe to remove off from ſuch a Ground.

Thus having order'd theſe young Trees till you have nurſed them up to the Stature of ſix or ſeven Foot high, you may afterwards tranſplant them into your Walks, Wood, or where elſe your Fancy pleaſeth; only in tranſplanting obſerve this:

Make your Holes four Foot wide, and two Spade deep at leaſt, half a year, or a quarter at leaſt before the time of Planting, (if it be a year 'tis the better, provided you keep that Mould which you threw out of the Hole clean from Weeds and Graſs, by turning it over as occaſion requires) and if you think your Ground be poor, or of ſome contrary Soil to what your Tree naturally delights to grow in, mix it with ſome ſuch like Earth as your Tree doth beſt delight to grow in: as for an Oak, if your Ground be gravelly, mix it then with the upper Spade of Ground that is a Brick-Earth, turning theſe together with the Earth you did throw out of the Holes; if Clay, mix it then with a light Loom, or a fat Sand, or ſmall Gravel; and if the Ground be poor, lay a little rotten Dung in the bottom of your Holes, but let none be among your Earth when you ſet your Trees; that is, to touch the Roots of them.

Having thus prepared your Holes for your Tree, and your Earth, if your Ground be a dry Soil, then begin as ſoon as you find the Leaf to fall, that is, in *October*. 'Tis not the Hill or Valley, North or South Situation which makes the finer or tougher Grain; but if there be a feeding Ground on the Top of a Hill, or on the North-ſide, more than there is in the Valley or South-ſide, there then will be the toughest

Timber: for where a Tree grows moſt in a year, that Oak is the tougheſt Timber, and there that Tree ſhall have the moſt Sap, as on a deep loomy Ground. But let it be Hill or Valley, if it be a ſhallow Ground and the bottom Gravel, and not mixed with Loom or Clay, there Oaks will grow ſlow, and the annual Circles being cloſe together, the Timber muſt then be the finer grained; and the Sap of ſuch Oaks is little, as I have many times obſerv'd: Experience and Reaſon (which I have always hitherto taken with me as Guides in my Travel and Search after Nature) have confirm'd me in this. A light Brick-Earth, or a Loomy-Clay, produce the ſtatelieſt Oaks ſooneſt, and tougheſt Timber, for there they grow quickeſt.

Your Clays produce great Oaks, for that is a holding Ground; altho they grow ſometimes ſlow, yet they laſt long.

Your Gravel produceth many Oaks, and ſtreight; they grow ſlow, the Timber is fine, and they decay while they be young: the Reaſons of this I have told you before.

Having made ready your Holes, and taken up your Trees well, I adviſe you to open the Earth well round your Tree, keeping the Side of your Spade to the Body of your Tree, to prevent cutting the Roots when you take them up; and alſo to dig deep round the Tree, that when you come to pull up your Tree, it may come up eaſily, which will prevent thoſe Roots which grow Elbow-like, which if they do not break off in pulling up, by ſtraining them to pull up, they will crack ſo in the Elbow, that they will never grow, nor put forth Roots below that Place: therefore for ſuch Trees as be tickliſh to remove, take the more time, leſt you verify the old Proverb, which ſaith, *Too much haſte oft makes waſte.*

Such Roots as you find bruiſed, or much cracked, cut them off till you come at firm ſound Root. Such Trees as are Slow-growers, as the Oak is, you may prune up to the ſmaller Head; as, if your Tree be

taper and ſtreight, you may prune up ſuch a Tree to one Shoot: but if your Tree be not taper, then leave two Side-Boughs, or more, to receive ſome of the Sap, which will make the Shoot, that you intend ſhall lead to make the Body of the Tree the ſmaller, and ſo your Tree will be taper. But top your Shoots, all but your leading Shoot, which will make the Body of your Tree ſwell the more, and hinder them from equalling the leading Shoot, and by topping the other it will grow the ſtronger. I need not tell you which Shoot you ſhould leave to be the leading Shoot for your Tree, not queſtioning but Senſe and Reaſon will teach you to leave that which grows ſtreighteſt and ſtrongeſt: if you do leave any Shoots, as moſt often it is neceſſary, leave them not right againſt one another, for that will make the Tree grow too ſuddenly thick in that place, but leave them one above another, ſo will your Tree grow the more taper: for it will be leſs and leſs upward between the Shoots, which Shoots you muſt take off year after year, as your Tree runs up in height; minding ſtill now and then to leave ſome Side-Boughs to keep the Tree taper, or elſe you will want your height of Timber; or your Tree may grow top-heavy, and ſo crooked. I ſpeak of Timber-Trees, or the ways to order Trees for Timber, (for I wiſh all Oaks were fit for Timber) but if your leading Shoot be much crooked, then top it underneath a Bud that tends upward, ſo low as if that Bud lead away, it may grow near ſtreight up; or cut off the leading Shoot under another that grows more upright, ordering it to be the leading Shoot: ſo as your Tree grows, mind to lead it up every Year, according as you ſee cauſe, taking care to keep off the Suckers, eſpecially the firſt Year, unleſs you find the Head grow too great for the Body, then leave ſome Side-Boughs to receive ſome Sap, and to make your Tree taper; but this you ſhall hardly find in Oaks in their firſt Years growth, namely, to grow too much in Head.

Thus endeavouring to keep your Tree (of what ſort ſoever it be, if it be for Timber) with no great Head, ſtill keep the leading Shoot uppermoſt, by ſometimes heading the other Side-Boughs, about a Foot or more from the Body, or elſe they will be ready ſometimes to make your Tree top-heavy, therefore keep your Tree till you have got it to the height you intend, by keeping it as above-ſaid; and if you find it is not taper by theſe means, then in the Month of *February* ſlit the Bark quite thro on three or four Sides, according to the Bigneſs of your Tree; but if ſmall, but one or two: ſo if the Tree be three yards high to the Head, then let three Slits go up one yard, two Slits two yards high, and one to the top. But if it be a ſtreight Tree, and taper, as you would have it, if the Bark be bound, ſlit it on one or two Sides, from the Ground to the top.

If your Tree be young, tho thriving, it will do it no harm, but much good; for you may ſee in many thriving Trees the Bark part of it ſelf, telling you that it wants your Help: therefore obſerve Nature, and aſſiſt her in all your Undertakings; for Wiſdom ſtandeth not only in the Streets, but in the Woods, calling to you to learn of her.

Note alſo, if you find any Tree crooked, ſlit it in the Ham at the aforeſaid time, and take off ſome of the lower ſide of his Head, and you will help the Crook of the Tree, whether it be great or ſmall; and in time by ſo doing, it will grow ſtreight: for by ſlitting the Bark in the Ham, it makes the Tree ſwell there, and ſo ſets the Tree ſtreight; therefore make two or three Slits in the Ham, according to the Bigneſs of the Tree or Crook. But if the Tree be pretty great, then take your Bill and cut the Bark thro in the Ham in ſeveral Places, about two or three Inches aſunder; let the Cut be cut ſlanting upward, a little croſs the Diameter of the Tree: by ſo doing you will ſtop the Sap in that place, the Bark

will

will dilate, and the place grow greater, and ſo the Tree will go ſtreighter.

Sometimes if your Tree be not taper, in Summer when it ſhoots much, the Weight of the Head will draw the Body crooked, and the Head will incline to the Ground: in ſuch Trees leave Shoots on the Body, to check and receive the Sap, and to keep it from abounding too much in the Head: but when you find your Tree grown crooked by the Head, in Summer, with Leaves and Boughs weighing it down, as ſoon as you find it begin to lean, take off ſome of the Boughs on the leaning ſide, and top ſome according as you ſee cauſe. By this Summer-pruning you may keep your Tree ſtreight, therefore obſerve it. I have found good Succeſs on Walnut-Trees and Limes by it, *&c.*

But tho Oaks grow crooked, it is not often by their great Shoots, for on moſt Grounds they grow ſlowly; but ſometimes their Head or leading Shoot being cropt off by Cattle, it then breaks out on the ſides into ſeveral leading Shoots, and one leads one way, and another another, and ſo diſtributeth the Sap, which makes the Tree not only grow crooked, but ſlowly: and ſometimes the early Shooting of the leading Shoot in the Spring cauſeth the ſame; for Froſt coming upon the tender Leaves and leading Bud, kills them, and then it is forc'd to break out a-new on the ſides: this happens oftentimes to young ſeedling Oaks in long Graſs, which would gladly be more in the open Air, but by making too much haſte, many times they loſe their Heads for it. Now in ſuch Caſes you muſt take off ſome, and cut ſome half a Foot off from the Leading-ſhoot, preſerving that which is moſt likely for the Leading-ſhoot, which tho it be crooked, deſpair not, for naturally it will grow ſtreighter; and if you uſe Pruning, and the aforeſaid Rules, it will be ſtreight much the ſooner. But in caſe you find your young Oak very much ſtubbed near the Ground, and never a

Shoot that is fit to lead to make a Tree; in ſuch a young Tree you muſt cut it off cloſe at the Ground in the Spring-time, ſo ſhall you have one fine Shoot or more, but be ſure take off all but one, and then you ſhall find that Shoot thrive very much, till it hath got ſuch a Head in bigneſs as the Head was before; and the Bark being then fine, it will enlarge it ſelf for the Growth of the Shoot, and give good way for the Sap to run into the Head, and ſo make a fine Tree: therefore if your Tree be ſtunned, or much crooked, then take this Courſe, to head them cloſe at the Ground, and the Summer following neglect not to take off all the Shoots but one; for at *Mid-ſummer* it is as good, nay better to prune ſome Trees than in the Spring; for then the Sap will ſoon cover round that wounded place, and if not heal it quite, it will preſerve it from much harm, till the Spring following, and at that time Shoots will not break out much into the Head, to make it top-heavy. You may ſafely cut off ſmall Branches, and prune ſmall Trees at this Summer-Seaſon; and for ſuch Trees as have a great Pith, as the Aſh and Walnut, I take it to be the beſt time for them: And whereas ſome ſay to the contrary, yet if the Reader will be advis'd by me, let him prune ſuch in Summer. But in the midſt of Winter forbear to prune moſt Trees, eſpecially great Boughs, or ſuch Trees as have a great Pith, or tender; for then the Wound lieth expos'd to the open Air and Wet, and Froſt coming upon the Wet, and piercing ſo far into the wounded Place as the Wet hath gone, kills the Wood, and makes a hole in that place; and that Hole holding Water many times, kills many a good Tree, eſpecially where great Boughs are taken off; for they are long a covering over, and never will be cover'd if the Tree be old.

Therefore if your Tree be old, forbear to cut off great Boughs; but if for ſome Reaſons you are forc'd to do it, then cut off ſuch Boughs two Foot, or a

Yard

Yard from the Body of your Timber-Tree; and let the place where you cut off ſuch a Limb be perpendicular to the Horizon, rather inclining to the *Nadir* than the *Zenith:* by ſo doing, the Water will not lie on ſuch a place, and then the Tree will receive no harm.

But if your Tree be young and thriving, then cut off the Boughs as cloſe as you can, keeping the wounded place perpendicular to the Horizon, and be ſure not to leave Elbows to receive the Wet, as too many of our Husbandmen do; for the cloſer you cut off a Bough to the Body, the ſooner the Bark covereth that place: therefore cut off the Side-Boughs of young Timber-Trees cloſe and ſmooth.

I wiſh I could perſuade all Lovers of handſom Timber-Trees, at every Fall of their Woods, to prune all the Timber-Trees; but then the Wood muſt not ſtand too long before it be fell'd. You may prune off Boughs of ten Years Growth very well, and ſo every ten Years, or oftner: if it be in Hedg-Rows, prune up your Trees till you have got them to ſuch a height as you find moſt convenient, *viz.* to fifty or ſixty Foot high: for I have many times obſerv'd Trees, of Oak, Aſh, Elm, and Beech, to have leading Shoots ſixty Foot high and more, when they have had not above ten Foot of good Timber; for Boughs have broke out at that height, and have ſo diſtributed the Sap, that they were little worth, but for the Fire; when, if they had been pruned up as if before directed, you might have had the ſame height of good Timber: which, how much more profitable it would be, and alſo beautiful, I leave to any Man's Judgment.

The Aſh and Beech cover the wounded place over ſoon, and ſeldom break out many Side-Boughs; the Elm very frequently breaks out Side-Boughs, yet will arrive to a great height of good Timber: the Oak is a little ſubject to break out Side-Boughs,

and

and tho a ſlow Grower, yet by its own Hardneſs of his Wood he preſerves himſelf well till it hath over-grown the wounded place, which it will in a few years do, if your Tree be young and thriving, and the Boughs not very great; for if the Boughs be great, that place, when they be cut off, is ſuch a Damm to the Sap, that it forceth it to break out with many ſmall Boughs there; eſpecially in ſuch Trees as have a thick and rugged Bark, as the Elm and Oak have when old.

But if the Tree be young and thriving, then is the Bark thin and looſe, and will more readily give way to the Sap to aſcend into the Head, and not break out into Side-Boughs: but if ſome few do break out, often pruning them cloſe off will prevent that: but if you would be at a little more trouble, note this which I have found to be true, and your Timber ſhall pay you well for your pains.

At *Midſummer*, after you have pruned up your Trees, take off all the ſmall Roots that are broke out on the ſide of your Trees, cloſe to the Body of the Tree; do thus two or three Years together, and you will find every Year the Side-Boughs to be fewer and fewer, till you have a clear Body, beautiful to behold, and profitable for good Timber, thirty or forty Foot or more, which otherwiſe would not have been a quarter ſo high. Thus may you make an Elm (which is a Tree moſt ſubject to break out Side-Boughs) as clear from Boughs forty or fifty Foot high as they be.

Your Oak that is young you may eaſily maſter, and bring it to a clear Body: tho it is ſomewhat troubleſom in Woods, yet in Hedg-Rows it may be practiſed with eaſe, or in Walks, or on ſingle Oaks: but our Yeomen and Farmers are too much ſubject to ſpoil ſuch Trees as would make our beſt Oaks, by heading them, and making them Pollards. I wiſh there were as ſtrict a Law as could be made, to puniſh thoſe that do preſume to head an Oak,

the

the King of Woods, tho it be on their own Land.

By this means we ſhould have the Farmer that is ſcanted in Wood, by often pruning off the Side-Boughs, make many finer Trees than now there are; for in ſuch places there is great Food to make him a great Tree: and then in Coppices, if you let a Tree ſtand to be very great, it ſpoils many a young one, and alſo your Under-Wood.

But methinks I hear ſome oppoſing me, ſaying, that by ſo pruning up of Trees, they do not prove ſo well for the Joiner, Carpenter, Wheeler, *&c.* for they ſay, if the Tree doth overgrow the Knot, when they come to cleave ſuch a Tree, that place proves faulty within, and the Timber is not ſo good.

Secondly, they ſay, that cutting off the Side-Boughs makes Trees more knotty.

Thirdly, they ſay, that it makes a Tree decay the ſooner.

To theſe three Objections I ſhall anſwer, and then haſten to conclude, and ſo leave my beloved Oak.

I do grant, that if the Knots be great, tho the Trees be young and thriving, and have cover'd the place over well; if you come to ſaw out ſuch Trees for Plank, Board or Wainſcot, that there may be ſome Defect there, where great Boughs were cut off: but ſuppoſe there be, you have ſtill the ſame Length clear Timber at the lower end, as you would have had if theſe Boughs had not been cut off; and then by pruning up your Trees, they grow ſtreighter, and your Tree carries a greater Length of Timber, uſeful for Beams, Summers, Raiſing, Wallplats, Rafters, Joice, *&c.* and how much Timber theſe ſpend more than the other, *viz.* Board and Wainſcot, *&c.* I leave you to determine. But my Advice is, not to let your Boughs be great, but take them off from ſuch Trees whilſt young, and then the Boughs will be young and ſmall, and ſuch Trees will cover ſuch

places

places in a little time, and theſe ſmall Knots will not be perceiv'd then, in caſe the Tree be ſawn for Wainſcot, *&c.*

Again, as to the firſt Objection, this ſeems to me a full anſwer: as firſt, for ſuch Trees as ſtand abroad ſingle, you ſhall find them to have a clear Body, of ſix, ſeven, eight or ten Foot high; I only ask my Opponent, whether ſuch a Length of Timber had Knots on it or no? I hope they will grant it had. Well then, how comes it to be ſo clear without Knots? Now I tell you, 'tis Cattel that crop off the Boughs whilſt they be young, and that makes it clear from Boughs, and the Sap mounts up higher, and there break out, which if it were but taken off as it is below, it then would be as clear ſixty Foot as it is ſix, and as ſtreight.

This very Reaſon poſſeſs'd me ſo much, that it told me, an Elm (which is the moſt ſubject of any Tree to break out Side-Boughs) might be made clear Timber ſixty Foot high, as well as ordinarily they be ſix, by early, often, and Summer-pruning. This my Experience has proved true.

Again, a Thorn or White-buſh growing in a Park, and kept under by Deer cropping of it, for eight, ten, or more Years, ſo that it hath got a hundred little Boughs, if it once get but a leading Shoot, and that out of the Deers reach, all ſhall unite in that one, and that ſhall come to be a ſtreight Body, and ſtreight-grained, notwithſtanding it was ſo crooked below; for the lower ones will all die by the Deer cropping them, and the Sap's free aſcending into the leading Shoot.

But as to the ſecond Objection, I grant, that ſometimes cutting off Boughs (eſpecially great ones, and of old Trees) makes more, but then they are ſmall; for the more a River is divided into ſmall Rivulets, the eaſier thoſe little ones are ſtopped and brought into one: for a great River muſt have a great Damm, and taking off a great Bough is a great

Damm

Damm to the Sap: for the Tree falling ſuddenly narrow upwards, and the Sap being uſed to ſpend it ſelf there, and having free Paſſage thither, when it is got into that place, it breaks out on each ſide of the Knot into many little Boughs; but if you take off theſe little Boughs that *Midſummer*, the Summer after there will be but a ſmall quantity in compariſon of the Spring-Sap: and the Bark being then looſe, it makes the eaſier way for the Sap to aſcend into the Head, and not to break out into Boughs; and ſo having prepared the way by the Sap, that *Midſummer*-Shoot will not be at a ſtand ſo much the Spring following.

Or if the Spring, after you have taken off the Boughs, you take off the little ones that were ſhot out the year before, and ſlit the Bark above each Knot, that is, ſomewhat great down to the Knot; by ſo doing you may bring your Tree to have a clear Body by a few years pruning: for I have obſerv'd it uſual in many Trees the year they have been pruned up, for the Bark to have cracked an Inch or more; which tells you moſt plainly, that the pruning of Trees doth make them ſwell in Body, therefore help the pent Places by ſlitting the Bark. You may often ſee this on your Aſh, *&c.*

Pray you, how comes it, that in your Coppices you ſhall have Timber-Trees ten or twelve Foot high clear, without Bough, and then the Tree break out all into Head? It is (I am confident) the Under-Wood which ſmothers, and beats off the Side-Boughs as high as that grows, and ſo makes the Timber clear ſo high. Alſo if you mark where high Timber-Trees are, that have clear Bodies a great height, they do, or did ſtand thick together, and ſo one draws up another, ſmothering the Side-Boughs, and beating them off (ſometimes) by their Motion in great Winds.

Thus by what has been ſaid of Cattel's cropping Trees ſtanding in Coppices, and by Trees ſtanding

ing

ing thick together, you may learn that you may do the ſame, and have Timber, by pruning, as clear from Knots, as it is by thoſe Accidents.

Thirdly, Whereas they ſay it makes a Tree decay ſooner; I grant this, that to prune off great Boughs from an old Tree, makes it decay ſooner: for the wounded place being great, and the Tree ſlow of Growth, is a long time covering over that place (if it can be done at laſt) and that takes Wet and Air, and decays the Tree: therefore I do not adviſe you to take great Boughs off from any Tree.

But ſmall Boughs cut off ſmooth and cloſe, from an old Tree or young Tree, cauſeth the Tree to laſt longer, and to be clearer Timber; for when ſmall Boughs are taken off from the ſide of your Tree, tho old, the Tree then not drawing much Sap, that little Sap doth moſt of it then aſcend into the Head, and ſo makes the Head continue freſh and thriving the longer; and taking off the Side-Boughs makes the Tree to ſwell, and grow ſooner into a great Body.

For the Boughs that break out of the ſide have not ſuch deep Root in the Body of the Tree (I mean thoſe who come forth after the Tree hath been once pruned) for every Bough that breaks out, breaks out thro the Bark, and hath its Root between the Bark and Tree that Year; and as the Tree encreaſeth, the Knot is deeper and deeper in the Body of the Tree. Thus taking off the ſmall Boughs often, keepeth the Tree clearer from great Knots within the Timber; and the little Knots do cover over ſo ſoon before the out-ſide of the Knot be dead, that they become as clear Timber.

Thus have I ſhew'd you, that all ſorts of Trees come to have clear Bodies by pruning, either Natural or Artificial; that is, by Cattel cropping, by Under-Wood beating off the Side-Boughs, or by ſtanding cloſe one to another, and ſo drawing up one another, and ſmothering the Side-Boughs by ſtanding ſo thick, or by pruning, *&c.*

Reader,

Reader, if thy Faith hold out, read on;
But if you find you can't believe, be gone:
For with more eaſe a Man might undertake
To bring brute Bear unto the fatal Stake,
Than him to teach, whoſe Infidelity
Does Demonſtration, Reaſon, Truth defy.

Thus have I ſhew'd in part how to raiſe and order the Oak from the Acorn, till it is thirty or forty Years old. There is one thing more to be known, which is, how to remove an Oak that is large (or other Tree) and that was never remov'd before; I ſhall borrow part of it from the Learned Eſquire *Evelyn*'s Diſcourſe of Foreſt-Trees, *p.* 13. Chuſe a Tree as big as your Thigh, ſaith he, (but if leſs, the better to grow) remove the Earth from about him, cut thro all the Collateral Roots, till with a competent Strength you can enforce him down upon one ſide, ſo as to come with your Ax at the Tap-root; cut that off, and cut all the Roots ſmooth on the under-ſide; re-dreſs your Tree, and ſo let it ſtand, cover'd about with the Mould you looſen'd from it, till the next Year, or rather longer; then take it up at a fit Seaſon, and you will find it will (at thoſe ends where the Roots were cut off) have drawn many tender young Roots apt to take, and ſufficient for the Tree whereſoever you ſhall tranſplant him. Further, to facilitate the Removal of ſuch great Trees, or ſmall ones that are tickliſh to remove, for the Adornment of ſome particular Place, or the Rarity of the Plant, there is this Expedient: A little before the hard Froſts ſurprize you, make a Trench about your Tree, at ſuch diſtance from the Stem as you judge ſufficient for the Roots; dig this ſo deep, till you come lower than the Side-Roots: if your Ground be a dry Ground, water the Hill of Earth, the Froſts will lay hold on it the more, but commonly in Winter

ter before Froſts we have Showers ſave you that labour; then lay ſome Litter in the bottom of your Trench, which will keep that part from freezing, in caſe you have occaſion to undermine it more to looſen it when you take it up, as is very likely you will. Thus let it ſtand till ſome hard Froſt do bind the Earth firmly to the Roots, and then convey it to the Pit or Hole prepar'd for its new Station, having before cover'd the Earth by with ſome Horſe-Litter to keep that Earth from freezing; which Mould will then be ready to cover that Clod round the Root of the Tree, and the ends of the Roots, and ſo ſecure it the better; and that Litter will do well to lay round the Tree on the top of the Ground.

But in caſe the Tree be very great, and the Mould about the Roots be ſo ponderous as not to be remov'd by an ordinary Force, you muſt then have a Gin or Crane, ſuch a one as they have to load Timber with; and by that you may weigh it out of its place, and place the whole upon a Trundle or Sledge, to convey it to the place you deſire: and by the aforeſaid Engine you may take it off from the Trundle, and ſet it in its hole at your pleaſure. By this Addreſs you may tranſplant Trees of a great Stature without the leaſt Diſorder, and by taking off the leſs of their Heads, which is of great Importance where this is practiſed, to ſupply a Defect, or remove a Curioſity.

I do ſuppoſe that one of theſe ſmall Cranes or Gins would be very uſeful to thoſe that have a great many pretty big Trees to take up in their Nurſeries, eſpecially ſuch as have ſtrong and tough Roots; for if the Ground were but well looſen'd round the Roots, and a Rope well faſten'd a little above the Ground to the Stem of the Tree, I dare engage, that this way one Man with a Lever ſhall draw up more than ten Men: and beſides, this will draw upright, which is better than drawing on one ſide, as many are forc'd to do. You muſt have on the

lower

lower end of the three Legs, Pieces of Plank, to keep it from ſinking too far into the looſe Ground: I have now one a making, and hereafter I ſhall be able to give you a better account of it than now; the only Inconvenience I think of at preſent, is, in faſtening the Rope abont the Tree ſo, that it may not ſlide or gall the Tree; but a piece of good Leather, about four or five Inches broad, with three or four Straps to come thro ſo many Holes, when it is faſten'd to the Rope they may all be ſtrain'd alike: this I ſuppoſe will do your work. The aforeſaid learned Author adviſeth you, before you take up Trees, to mark them all on one ſide, the better to place that ſide to point to the ſame Aſpect it did before: for Oaks growing on the North-ſide of an Hill, are more moſſy than thoſe that grow on the South-ſide. This I grant, becauſe that ſide is colder and wetter; for it is cold and wet Ground that breeds Moſs moſt, and that gets from the Ground upon the Trees. Alſo he ſays, that Apple-Trees ſtanding in a Hedg-Row, after the Hedge was taken away, the Apple-Trees did not thrive ſo well as they did before, for want of the Shelter of the Hedge. I ſay, that if the Hedge-Row had drawn up the Apple-Trees ſo as to make them top heavy, they might not thrive ſo well; but if they were not, the Shelter being taken away, they would thrive the better, unleſs by thriving he means growing in height. *See Lord* Bacon's *Natural Hiſtory, p.* 113. For a Tree pent up cannot ſpread.

But as for placing the South-ſide of a Tree South again, this is not to the purpoſe; for the greateſt time that Trees grow in, is from the Sun's entring into *Aries* to his entring into *Libra:* and all that time (that is, half a year) the Tree has the Sun on the North-ſide both Morning and Evening, and the North-ſide has the benefit of warming it ſelf later in the Evening, and earlier in the Morning, having two hours time earlier, and two later in the height

of Summer, more than the South-ſide. Again, you ſhall have the Cold as much on the South-ſide of a Wall or Tree in the Night, as on the North, if the Wind blow on the South-ſide; therefore I do judge that to place a Tree the South ſide South again, ſignifieth little, tho the ſame Author ſaith, *p.* 88. and the Author of the Book, call'd *Mathematical Recreations*, p, 75. ſaith, That a Tree groweth more on the South-Side than on the North. I have oft obſerv'd the Annual Circles, and have found as many, nay, more, to the contrary: for thus I have always found, on a Tree near the Ground, the Annual Circles have been the greateſt on that ſide from which moſt of the great Roots came; as if a Tree grow on the South-Side of a Bank, you ſhall find the Circles on that Tree to be greateſt on the North-ſide, *&c.* but higher on a Tree the Circles are the greateſt on that ſide where there is a great Bough breaks out, for the Sap has great Recourſe thither; many times by ſudden Cold ſome is ſtay'd by the way, and ſo increaſeth that ſide of the Tree moſt.

For I take the Sap of a Tree, if the Weather be open (that is, of thoſe Trees that ſhed their Leaves) to be ſtill aſcending into the Head, tho it be Mid-winter: tho there do not riſe enough to keep the Leaves on, nor to make it bud forth, yet it is plain that it keeps the Buds full and freſh, and increaſeth the Growth of the Tree, for that ſame pory Subſtance of the Tree which is between every Annual Circle is made by the Winter-Sap; and the milder the Winter is, the greater you ſhall find this to be; as is viſible in Aſh, Oak, Elm, *&c.* The other, which is more hard and clear, is increaſed by the Sap in Summer: and the more feeding the Summer is by Showers, the more ſhall the Circles increaſe on dry Ground: and according to the Nature of the Ground that the Tree loves, and the Depth of the Soil, ſo doth the Tree increaſe in theſe Circles and Growth in all Parts.

Between theſe Annual Circles doth ſome Sap riſe, as is plain in a Tree that is barked round, for that Tree ſhall put forth Leaves, and increaſe in Body, but produce little or no Shoot; and the more porous the Tree is between theſe Annual Circles, the longer that Tree will live, as accidentally I have had it experimented on Walnut-Trees, Aſhes, *&c.* And they have continu'd ſometimes two Years, and ſometimes near three before they have died, when they have been barked quite round the Stem a Foot or more; and by way of Experiment I cut off the Bark from a Holly-Tree and a Box-Tree about half a Foot clean, quite round the Stem or Body of each Tree, and the Tops of both did die in leſs than one Year's time; which inform'd my Reaſon as much as tho I had learned it out of the moſt learned Author, that the Sap of thoſe Trees that ſhed their Leaves doth in a ſmall quantity aſcend between the Annual Circles, in that pory place: for Trees that hold their Leaves, their Wood is cloſe and compact between the Annual Circles, and that is the Reaſon that they die ſoon, being barked round: alſo their Sap being of a turpentine and clammy Subſtance, is the Reaſon they hold their Leaves all Winter, being as it were glued on by that Subſtance; and the Sap of ſuch Trees as hold their Leaves, being once ſet by Cold, requires a pretty deal of Heat to make it thin, and ſet it on motion: as comparatively, a little Cold will ſet or make ſtiff Pitch or Turpentine; but it muſt be Froſt that ſets or ſtays the Motion of Water.

Alſo thoſe Trees which hold their Leaves will grow much better under the dropping of other great Trees, than thoſe that ſhed their Leaves; for their Turpentine-Sap ſhoots off the Drops, ſo that they have little or no harm by ſuch a Situation.

But in caſe you ſhould have a Tree barked round by accident, and would willingly preſerve it, your beſt way is to get a Shoot below the wounded place;

and if your Tree be young, you ſhall then have ſeveral break out a little above the Root: if you find they ſhoot ſtrong, preſerve two of the ſtrongeſt, and ſee that the barked place be near the Ground; but if your Tree be barked high from the Ground, or that it ſhoot up ſlowly, then leave but one Shoot, keeping all other that ſhoot out clean taken off, as ſoon as ever you ſee them break out: ſo nouriſh up the two Shoots or Shoot till you have got them higher than the wounded place; then cut a long Slit in the Bark, above the Wound, and join in that Shoot exactly, making it fit the Slit, the Inſide of one Bark right againſt the Inſide of the other; tie it cloſe in, and loom it over with good and well-temper'd Loom, to keep the Air and Wet out; or better it with ſoft Wax. The Spring is the beſt Seaſon, but if you fear your Tree to decay, defer not, but do it as ſoon as your Shoots be ſhot long enough.

If you would be further ſatisfy'd concerning the Largeneſs and Uſefulneſs of this Royal Tree, ſee Eſquire *Evelyn*'s Diſcourſe of Foreſt-Trees, who hath writ very well of this and others. But before I bid adieu, I muſt plant theſe few unpruned Verſes, and ſo leave the moſt Uſeful Oak.

O ſtately Tree! Who right can ſpeak thy Praiſe,
Doth well deſerve the Laurel or the Bays.
Ask but our Thames *what Burdens thou haſt bore*
Of Gold and Silver fine, and in their Ore,
Of Rubies, Diamonds, and Pearls moſt rare,
With others, which paſt Valuation are:
Of Silks and Sattins fine to clothe the Back;
Of Wines, Italian, French, *and* Spaniſh *Sack:*
Of Spices, Fruits, and many a rich Dye,
To ſatisfy and feaſt the curious Eye:
Of Maſtich, Myrrh, and many a rich Gum;
Aloes and Drugs which from the Indies *come.*
He who loves this thy Burden, and not Thee,
He deſerves never to be worth one Tree.

'Twas

'Twas faithful Oak preſerv'd our King, that we
Might thence learn Leſſons of true Loyalty.
Kings, Lords, and Earls, and Men of low Degree,
Tranſported are by this our Royal Tree;
Oak Walls our Seas and Iſland do incloſe,
Our beſt Defence againſt our Foreign Foes.
No thing on Earth but Oak can Time redeem,
No Wood deſerving of ſo high Eſteem.
When in ſalt Seas Sir Francis Drake *did ſteer,*
Sailing in Oak he ſav'd one Day i'th' Year.
His Oak, which the Terreſtrial Globe did meaſure,
Thro Dangers led him t' Honour, Profit, Pleaſure.
No Wood like Oak that grows upon the Ground,
To make our Houſe and Ships laſt long and ſound;
No Oak like ours: by Love to Oaks let's then
Appear true Subjects, and right Engliſhmen.

CHAP. XI.

Of Raiſing and Ordering the Elm.

THERE are ſeveral ſorts of Elm, but the beſt ſort (becauſe it produceth the greateſt Trees, and ſooneſt comes to perfection) is that which hath its Leaves not much leſs than Lime, or Lime-tree Leaves, and ſhoots with a Shoot not much leſs than a Sallow when it is lopped: it is call'd by ſome the Trench-Elm, by others the Marſh-Elm. Some other ſorts there are that are not much inferior to this for producing high and good Timber. One ſort there is that hath on the young Shoots great pieces like Cork, ſubject to ſpread in Head much, and grow crooked; this is not very good to make high Trees, but makes good Pollards. Another ſort there is which I ſaw in *Eſſex*, the Sides are ſubject to have Wens thick on them, which makes the Body hard

to cleave: This is not very good to make a high Tree, but good Pollards.

All ſorts of Elms do increaſe from the Roots much of themſelves; and the more you take, the more they will give, provided you keep them from being taken from you; that is, from being ſpoil'd by Cattel: and tho they be ſo kind of themſelves, yet there are ſeveral ways to increaſe them; but the way to have of the beſt Kinds, and to make the fineſt Trees, is by raiſing them of Seeds.

Therefore about the beginning of *March*, or about the tenth, you ſhall find the broad things like Hops begin to fall, which have the Seed in them; when you find theſe begin to fall, in a dry Day (if conveniently you can) gather what quantity you pleaſe to ſow; then lay them thin in ſome place where they may dry four or five Days, and then having prepared a Bed (in bigneſs according to the quantity of your Seeds) of freſh light Brick-Earth, ſow the Seeds and their Veſſels all over; then ſift ſome of the ſame Mould all over the Bed, for they will not well rake in; let them be covered about half an Inch thick; if the Summer prove dry, water them ſometimes, and keep them clean from Weeds: let not Weeds ſtand on your Bed till they be great, leſt in pulling ſuch up you ſpoil their ſpearing, by breaking it off, or by letting in the dry Air, and ſo kill it; therefore keep your Beds clean from Weeds, and about the middle or latter end of *Auguſt* they will come up. About the midſt of *September* ſift a little richer Mould all over the Bed, but not ſo much as to cover them; thus do the next Summer, and take off the Side-Boughs tho young, and when they have ſtood two years on that Bed, then plant them on Beds in your Nurſery, keeping them with digging and pruning up yearly, till you have got them to the Stature you think convenient to plant abroad. In ſetting this or any ſort of Tree, forget not to top the Ends of the Tap-Root, or other long ones, and alſo not

to leave a bruiſed End uncut off. You may ſet them in ſtreight Lines in your Nurſery, about a Yard one Row from another, and about a Foot and a half one Tree from another in the Rows; mind the natural Depth it firſt did grow at, and ſet it ſo when you remove it. Have a care of ſetting any Tree too deep, and alſo keep not this Tree nor a Walnut long out of the Ground, for their ſpongy Roots will in a little time grow mouldy and be ſpoiled: therefore if you cannot ſet them, let them be cover'd with Earth, and then you ſhall find this Tree as patient in removing, and as certain to grow as any Tree I know.

The Ground they like beſt is a light Brick-Earth or Loom, as I ſaid before; that they diſlike moſt is a rocky Ground, or a ſtiff Clay: but if you have one Mixture of Brick-Earth, *&c.* and the other of ſmall Gravel, Drift-Sand, Sand, *&c.* then there they will do pretty well.

They naturally increaſe very much of themſelves, and the more where they meet with natural Ground; if you fell a thriving Tree, and fence in the place, you then may have a ſtore to furniſh your Woods and Hedg-Rows with the worſt, and the ſtreighteſt to nurſe up in your Nurſeries, for to make Walks, Avenues, Glades, *&c.* with: for there is no Tree more proper for the Certainty of its growing, eſpecially if you make good large and deep Holes; and where the Ground is not natural, there help it by ſome that is, and then you may hope for a ſtately high growing Tree, if you take care in pruning it up, as is before ſhew'd of the Oak. You need not much fear its growing top-heavy; for it having ſuch a thick Bark, the Sap is ſubject to lodge in it, and break out many Side-Boughs, and the Roots apt to break out with Suckers, the more when pruned; therefore prune it up high, and often, but let the Seaſon be *February*; for then its fine, dark, green-co-

lour'd Leaf, and long hanging on it, is the more ornamental, and fit for Walks.

As for the way to increaſe it from the Roots of another Tree, I do refer you to the ſeventh Chapter, which will ſhew you fully how to perform the ſame; obſerve but thoſe Rules, you may raiſe many fine young Trees from the Roots of another, much better than naturally they will be produc'd from the Roots.

I adviſe you where you find your Ground natural in your Hedg-Rows, there to plant ſome of this moſt uſeful Wood; for it will run in the Banks, and thicken your Hedges with Wood, and is very courteous to other ſorts of Wood growing by it.

Do not let ignorant Tradition poſſeſs you that it will grow of the Chips, or of Truncheons ſet like Sallows, tho the Author of *the Commons Complaint* ſaith it will; for I aſſure you it neither doth nor will.

In lopping of this, be careful to cut your Boughs cloſe and ſmooth off, minding to keep them perpendicular to the Horizon, the better to ſhoot off the Wet.

It will grow well of Laying (as is before noted, and alſo directed in the Chapter of Laying) in which if you take but a little labour more than ordinary, from one Tree you may have (in a few Years) many in your Hedg-Rows or elſewhere; therefore defer not, but put this in practice, eſpecially the great Kind. My Lord *Bacon* adviſeth to bud it, to make the Leaves the larger, but that is needleſs.

Part of theſe Rules I wrote ſome years ago, at the Requeſt, and for the Uſe of the truly ingenious Planter, and Lover thereof, Sir *Henry Capel*; and I ſhall give you the ſame Concluſion now, that I did then to him, which take as followeth.

Since Gard'ning was the firſt and beſt Vocation,
And Adam *(whoſe All are by Procreation)*

Was the firſt Gard'ner of the World, and ye
Are the green Shoots of Him, the Original Tree:
Encourage then this innocent old Trade,
Ye Noble Souls that were from Adam *made;*
So ſhall the Gardner's Labour better bring
To his Country Profit, Pleaſure to his King.

CHAP. XII.

Of Raiſing and Ordering the Aſh.

AND as for Raiſing the Aſh, I ſhall give you the ſame Rules as I did to the aforeſaid Honourable Perſon the ſame time, before the Diſcourſe of Foreſt-Trees was written.

Let your Keys be thorow ripe, which will be about the middle or end of *October* or *November*; when you have gather'd them, lay them thin to dry, but gather them off from a young ſtreight thriving Tree. My Reaſon to gather them off a young thriving Tree, is becauſe there will the Keys, or Seeds in the Keys, be the larger and ſolider; therefore by conſequence they are the abler to ſhoot the ſtronger, and to maintain themſelves the better and longer. Tho I know by Experience that the Seeds of ſome old Plants will come up ſooner (ſo the Seed be perfect) than the Seed of young Plants; and alſo that old Seed (ſo it will but grow) will come up ſooner than new Seed. My aforeſaid Reaſons do in part demonſtrate this: Or thus, Nature finding her ſelf weak, doth (like a provident Mother) ſeek the ſooner to provide for her weak Children; for Nature is one in divers things, and yet various in one thing.

Now if you gather them off from a ſtreight Tree, 'tis the likelier they will run more up, and grow ſtreighter than thoſe which are gather'd off a Pollard

or

or crooked Tree: for it is well known, and might be prov'd by many Inſtances, that Nature doth delight in Imitation, and the Defects of Nature may be helped by Art: for the great Alterations which many times we find viſible in many Vegetables of the ſame *Species*, they all proceed either from the Earth, the Water, or the heavenly Influences; but th elaſt is the greateſt Author of Alteration, both in Senſibles, Vegetables and Animals. However, like ſtill produceth its like; and ſince there is ſuch Plenty of Foreſt-trees that bear Seed, you may as well gather all ſorts of Keys and Seeds off or under ſuch Trees, as not.

As for the time of ſowing them, let it be at any time between the latter end of *October*, and the laſt of *January*; for they will lie till Spring come twelve Month before they appear: if your Ground be not very ſubject to great Weeds, you may ſow them with Oats, if you be minded to make a Wood of it; and in your Woods on the top of your Ground: but if they be prepar'd before-hand, they will be much more certain of growing. Therefore if you would be ſure to raiſe good ſtore of them for to make Walks, or furniſh your Woods with, *&c.* having gather'd your Keys, and order'd them as is aforeſaid, prepare ſome ſifted Earth, or Sand which is better by keeping an equal Warmth and Moiſture, to prepare them for ſpearing. Having prepar'd your Sand, and a Houſe to lay them in, where the Air may freely come, then in this Houſe lay one laying of Sand and a laying of Keys, parting your Keys well: ſo do till you have (laying after laying) cover'd all your Keys in the Couch, any time in Winter, as is before directed. Let your Sand be pretty moiſt, and ſo keep it all that year; and having prepar'd your Ground by often digging, and a tender Soil (which the Aſh loves) then about the latter end of *January* ſow them on this Bed, covering them about one Inch, or an Inch and a half thick. Do not let them lie too

long

long uncover'd when you take them out of their Couch, for then they will be ſpeared: and if they lie too long in the Air, it will ſpoil them. Do not ſow them in froſty Weather; but if Froſts be, ſtay till they be over.

Mind to keep them clean from Weeds the firſt year, for they will ſhoot but little the firſt year, but the ſecond they will ſhoot ſtrongly: the Winter after you may tranſplant them upon Beds, pruning the little Side-Shoots, and topping the Tap-root. Keep them with digging and pruning every year on theſe Beds, and in few years they will be fit for Walks, Woods, *&c.* and one of theſe thus order'd, ſhall be worth ten taken out of Woods; for they will be taper and fine Trees. When you remove an Aſh, take not off his Head, if he be not too top-heavy, that you can poſſibly help it: for an Aſh and a Walnut are two of the worſt Trees I know to head, they having ſuch a great Pith; but the Side-Boughs you may be bold to take off, provided you take them off cloſe, and the Boughs not very great. This Tree is not very apt to break much into Side-Boughs, and heals over the Wound as well as any Tree except the Beech; then why will you have low Timber-trees of Aſhes, when you may as well have high ones? therefore prune up your young Aſh-trees well and often. And if you follow but theſe Rules, you may raiſe them as eaſily as Barley, and as thick.

As touching the ſeveral kinds, ſome Authors will have two ſorts, the Male and Female; but there is no ſuch thing as Male and Female among Plants, tho ſome Plants are ſo called: for what Act of either do any two Plants communicate to each other? The greateſt Difference that ever I obſerv'd in young Aſhes, among the many thouſands that I have raiſed, was in their Bark; for I have had ſome that have had blackiſh Bark, ſome reddiſh, the Leaves alike; but what difference there will be in the Keys and Timber, I yet know not.

The

The Aſh is not fit to be ſet near fine Gardens, for the Leaves turn to Soil ſuddenly, and ſo ſpoil your Walks; alſo the Roots run ſo ſhallow that they will rob your Borders, and ſpoil your Fruit-trees: they are as bad by your plough'd Ground, for the Roots will ſo draw the Strength of the Ground from the Corn, that it will languiſh and pine away. And this I have obſerv'd, that the Summer after a Tree is lopped, it ſhall rob the Corn more than another bigger ſtanding by it, as may be viſible by the Growth of the Corn: I have wilfully experienc'd it, and I conceive the Reaſon to be this; the Sap riſeth into the Head of the Pollard (as uſually it did) and ſo into the Boughs, but finding the Boughs cut off, it filleth the Head ſo full, that it cauſeth it to ſwell in the Spring: and this is the reaſon Pollard-heads are bigger than any other part of the Body of the Tree; the Head being ſo full that it can contain the Sap no longer, it then breaketh out into abundance of young Shoots, and when they ſet once a growing they grow apace, and ſo the Bark of them being thin and open for the Sap to run in, they receive as much as the Roots can poſſibly provide for them, and endeavour to enlarge the Head to that Magnitude as it was at before.

But tho the Aſh doth harm to grow near or upon plough'd Ground, yet it is the uſefulleſt Wood that grows, for the Plough, and other Uſes belonging to the Ploughman. It is a quick growing Wood, and will grow pretty well on moſt ſorts of Grounds, provided they be not too wet, or very ſhallow: It grows beſt on ſuch Grounds as have their Surface of a looſe Nature, ſo that it be not too ſhallow. It produceth excellent Timber for ſeveral uſes, and is ſuch a Quick-grower, that from a Key, in forty years, one Aſh was ſold for thirty Pounds Sterling; as witneſſeth the ingenious Author of the *Diſcourſe of Foreſt-trees*, p. 22. And this I can tell, which my Lord and I meaſur'd, of the Shoot of an Aſh that ſtood be-

tween

tween the Wood-yard at *Hadham-Hall*, and a place where I uſed to raiſe Melon-plants, that the ſecond year's Shoot was eight foot within two Inches; which had it ſhot but a few years at this rate, it would ſoon have been a very great Tree, and worth a like Price.

Of all the Wood that I know, there is none burns ſo well green, as the Aſh; and this is one Reaſon that many a fine Pollard is ſpoil'd: For your bad Huſbands (as they are term'd) are as unkind to Trees as they are to themſelves. For their want of Wood early in the Winter, makes them fly to the Aſh, whence they hack off the Boughs, and thus leave him all Winter; in which time the Wood not being very hard, drinks in the Wet at theſe wounded Places, and before the Spring comes to heal it over, decays: and ſo by this means every Winter it receiveth the Wet more and more, till it hath deſtroy'd Root, Body, and Branch.

On the other ſide, there are ſome who will not lop their Trees till they bear very great Boughs, and then lop them off (ſmooth and well cut off) tho it be in the Spring; yet in ſuch great Wounds, before the Sap can cover the Place, the Wet makes a hole in ſome or many of theſe Places: and ſo you loſe both Body and Lops in a few years. Beſides the lopping of Trees young, that is, at ten or twelve years at the moſt, by ſo doing you keep your Tree much the longer alive; and you ſhall have Shoots of Trees at firſt felling, grow more into Wood in one Year, than they do when old Lops in two or three, and in all reſpects are as uſeful for the Fire. Then I entreat you be not ſo wilful, as to make you and yours poor, and alſo ſpoil your Trees.

Therefore in lopping of Pollards, eſpecially ſoft Wood, let it be towards the Spring, and let not your Lops grow ſo great, as to ſpoil your Trees and loſe the uſe of your Money. If once you find your Pollard grow much hollow at the Head, down with it as ſoon as may be, for it then decays more in the

Body

Body than the Lop comes to: and if your Timber-trees be dead-topt, or moſt of the Head dead, or that you find Wood-peckers, or Nihils, make Holes in them, then fell them as ſoon as the Seaſon is, (which is from *October* to *February*) for when they begin to decay, they decay apace.

I know it is the opinion of moſt Men, that theſe Birds ſpoil their Trees: but let me tell you they rarely make Holes in ſound Timber: therefore learn of them, and fell the Trees of which they give you warning by making holes in them: the ſooner, the leſs Timber loſt.

CHAP. XIII.

Of Raiſing and Ordering the Beech.

OF the Kinds of Beech I know but one, tho ſome ſay there be more.

About the middle of *September* you will find the Maſt begin to fall apace, then gather what quantity you think good to ſow; and as ſoon as your Seeds are dry make a Couch of Sand, as you are before directed for the Aſh, and ſow them before the Month of *September* be paſt. Keep them in the Couch moderately moiſt (not ſo wet as you keep the Aſh) until the latter end of *January*, then ſow them in a Bed of light gravelly Earth, made on purpoſe: or if you fancy to ſow them in your Woods, that is the beſt time; or you may ſow them in the Month of *September* in your Woods. But if you keep them in the Houſe all Winter, and ſow them at the firſt riſe of the Spring, you will preſerve them from Mice and other Vermin the better; they affect a gravelly light Soil, and will not thrive on Clays. If you would make a Nurſery of them, your Ground muſt be accordingly,

cordingly, or elſe they will thrive but badly with you.

Of all Woods that are, this may the beſt be pruned up; for it grows over the place in little time, and is not ſubject to break out Side-Boughs. It is fitting for Walks where the Ground is natural for it, but is ſo nice in its Ground that I do think there are few Walks of any great Length, but have ſome Veins of Ground it doth not like.

CHAP. XIV.

Of Raiſing and Ordering the Walnut.

BEfore we come to raiſe this Tree, or gather the Nuts, there may be theſe Enquiries made.

Firſt, you will deſire to know what kind of Nut is likelieſt to produce the beſt Fruit; and to know what kinds will alter from that kind to a better (as moſt kinds of Fruit will degenerate, ſome for the better, and ſome near the ſame, and ſome worſe) as alſo to know the very Nut, or Nuts, and other ſorts of Fruits which will do ſo.

As for the Kinds that are likelieſt to produce the beſt Fruit, and the moſt likely to produce better, obſerve to gather your Nuts, Stones or Kernels off from ſome young thriving Tree, that is in its prime of bearing, and hath the Kernels plump, large and full, and of the beſt ſorts; and if it be of Fruit that is too ſubject to ripen late with us, then let it be of the earlieſt Kinds, and as for the lateſt Kind, preſerve them for Stocks only: Alſo if it may be, make choice of ſuch Fruit as is lately produc'd from ſome other good kind, and is better than the Kind it came of; for you cannot expect to have as good an Apple produc'd from the Kernel of a Crab, as you may have from

from the Kernel of a good Pippin: for if the one bring you a good Wilding, and the other an Apple, either more large, or more beautiful, and as good, if not better and of different taſte, this is as much as can be well expected: for Nature doth not run her Journey all at once, but makes ſeveral ſmall ones, and many times more backward than forward, the better to encourage ingenious Men to try and obſerve her Ways; but to thoſe that are diligent ſhe often drops her Bleſſings, and requites them well for their Diligence. And if you would obtain a Bleſſing in your Works by Nature, you muſt frequently be begging it of the great God of Nature, and by his Aſſiſtance and your Diligence, you need not doubt accompliſhing your lawful Deſires: of this Truth doubt not.

The Lord *Bacon*, in his natural Hiſtory, tells you of an old Tradition, that Boughs of an Oak put into the Earth will put forth wild Vines. I wiſh all ſuch old Traditions were bury'd in the Earth in the room of the Oak-Boughs.

He tells us alſo of an old Beech-tree cut down, the Root whereof put forth a Birch: See *p.* 111.

This moſt learned Man, in his next page lays down ſix Rules (tho all, as he confeſſeth, untry'd by him) concerning the Tranſmutation of Plants.

The Firſt is, If you would have one Plant turn into another, you muſt have the Nouriſhment overrule the Seed.

The Second is, To bury ſome few Seeds of the Plant you would change among other Seeds.

The Third is, To make ſome medley or mixture of Earth with ſome other Plants bruiſed or ſhaven, either Leaf or Root.

The Fourth is, To mark what Herbs ſome Earth does put forth of it ſelf, and to ſow ſome contrary Seed in that Earth.

The Fifth is, To make an Herb grow contrary to its Nature,

The Sixth is, To make Plants grow out of the Sun, or open Air; as the bottom of a Pond, or in ſome great hollow Tree.

I might and could anſwer to all theſe, but I think it would be too tedious; for I verily believe, that to ſow Seeds any way that can be deviſed by Man will not in the leaſt cauſe them to be quite another kind of Plant: for if you find any Alteration of any Plant that is, it is from the Conception and Nativity of the Seed; for there is no real Alteration but by Seed. I know that Plants or Trees may bring fairer, or ſmaller Flowers, or Fruits, according to the ordering and natural Situation of the Ground, and the contrary: for it is in vain to think, that the Kernels of an Apple will bring forth a Pear, or a Pear an Apple; or that Cherry-ſtones will produce a Plumb, or Plumb-ſtones a Cherry. But if you ſow the Kernels of good Pears or Apples, *&c.* then you may expect good Fruit, and of different Taſte, Shape, or Bigneſs, as is aforeſaid: for I do believe all our ſorts of Pippins come from one; the Burry-pear from the Green-field, the Petit Rouſelet from the Katharine, *&c.* and ſo of Walnuts, or other Fruit. And what ſhould be the reaſon then we do not raiſe as many new ſorts of Fruit as the *French*? And tho I do deviate a little from my intended Diſcourſe, I ſhall ſhew you that we can do it as well as they, and I ſuppoſe better, tho we do it not: But before I proceed to give you further Judgment of it, I will in ſome meaſure anſwer my Query, which was, to know the very particular Fruit that will alter for the beſt. I do not affirm it as true as the Goſpel, but only conclude according to Reaſon.

Firſt, It is known by Experience in Flowers to be true, that ſuch Flowers as differ in number of Leaves, in Shape, in Colours, the Seeds of ſuch will produce Flowers much different from the ordinary Kind of Flowers, tho produc'd all of one Flower but a year or two before: nay, a particular Flower, a-

mong many others, of one Plant ſhall bring more double ones than twenty others that are not ſo qualify'd as it. This is apparently known to all that take delight in raiſing of Flowers, that the Stock-gilliflower that hath Flowers of 5, 6, 7, 8, or 9 Leaves, that the Seed of ſuch a particular Flower or Flowers will produce more double ones than thoſe Plants that bring forth but four Leaves, quantity for quantity of Seed, twenty for one: you may know theſe Flowers before they blow out in the Bud. I confeſs this Flower doth ſhew this by its Leaves more than any other I know: for this Flower having no Thrum in the middle, as the moſt of Flowers have, Nature had given her this Sign to inform Man, that thoſe that have a Leaf or Leaves added to them more than their uſual kind, will bring forth thoſe with many Leaves, and make a fine double Flower; which when it hath attain'd to, it then is come to the Bounds of Nature, which the Almighty hath allotted it, ſaying, *Thus far ſhalt thou go, and no further.* For when it is thus a double Flower, it never beareth Seed more, but by endeavouring blows it ſelf to death.

If you be curious, you may obſerve the ſame Rule in ſeveral other Flowers that have no Thrum in the middle; as Auriculaes, Prim-roſe, Wall-flowers, Campians, and ſeveral others: and when you find one Leaf, or Leaves, more than the ordinary number, you may conclude there Nature hath ſet one ſtep forward in altering from the ordinary kind. Therefore if you be a Lover of Plants, or a Servant of Nature, be diligent, and whenſoever you ſee your Miſtreſs ſtep out of door, then do you wait upon her to her Journey's end, for 'tis on the Diligent ſhe beſtows her Favours.

Alſo thoſe Flowers which bear Seed when double, as the Gilliflower, African, &c. ſowing the Seed of ſuch double Flowers, they will bring you more and better Flowers a hundred for one than ſingle ones;

and in ſowing the Seed of ſuch, you ſhall have ſeveral Varieties, but moſt marked with the Colour the Mother-plant was of; and ſome of theſe will, as it were, run beyond the Limits of Nature, and then they will break, or have Pods in the Middle, and then never bear Seed more. Gilly-flowers have their Sign, which will bear Seed, and which not; thoſe that will bring Seed (if Weather or other Accidents hinder not) have their Horns in the middle, of the Flower.

It is alſo obſerv'd in the marking of Flowers, that the Seed of thoſe that be ſtriped ſhall bring the moſt ſtriped ones; and ſome of different Colours and Stripes, their Seed all alike. But it may be anſwer'd; that this may be true in Flowers, for none can deny it, but that ſuch Flowers will alter, and bring forth ſuch Flowers as aforeſaid: But can the altering of the Fruit be known by the Flower?

To this I anſwer, that you have not only the Leaves of the Flower, but the Thrum and the Fruit it ſelf to inform you which will alter; therefore by the Shape, Colour, or Thrum in the Flower, you may know which Fruits will alter, and it is poſſible, which will alter for the beſt: for it is commonly known, that Fruits will alter from the Fruit they come of, by ſowing the Nuts, Kernels, or Seeds.

Now when you have made choice of your Seeds, Stones, Nuts, raiſe them as is directed in each Chapter of the kind, in good freſh Ground; and by Midſummer that Year they will have ſhot ſo ſtrong, that you may take off Buds of ſome ſorts, and of all ſorts the next year; having in readineſs ſome fine thriving Stock againſt ſome good Wall, for that will make the Fruit ſet the ſooner when it comes to blow. At a fit Seaſon bud theſe Stocks, if Pears on Quince-ſtocks; if Peaches, Nectarins, or Plumbs, on ſome large white Plumb-ſtocks, *&c.* if they be Apples or Walnuts, they may be from the Wall. Bud your Ap-

ples or Codlins, or Apple of Paradiſe (which is a ſort of Dwarf-ſweeting, and will grow of Cuttings;) if Waltnuts, on a fine young Walnut-tree, bud it five or ſix Foot high; this doth not only alter the Property of the wild Kind, but it makes the Tree more naturally bear Fruit much ſooner and better, if well order'd. Your Pears, Plumbs, and Peaches will bear in three or four years after, your Apples and Walnuts in five or ſix years after.

I know my Lord *Bacon* tells you, that Peaches come beſt of Stones unbudded, but I adviſe you to bud all you raiſe of Stones, Seeds, *&c.* tho it be to take a bud off from the ſame Stock, and to bud it on that, as I have often done.

Thoſe that have large Grounds to look to, and good Ingenuity, let them but put this in practice, and I am confident they will find great Satisfaction therein, and in a little time raiſe many new ſorts of Fruit.

Now, the Reaſon why in *France* they raiſe more Varieties of Fruit and Flowers than we do, is this; there are many ingenious Men in their Monaſteries, and there they being ſeated as long as they live, there they raiſe many fine Fruits and Flowers.

Now, if our Noblemen that take delight in Gardens, as all that are ingenious do, would provide themſelves good ingenious Gardiners, and allow them good Encouragement, with Aſſurance of continuing in their Service ſo long as they carry themſelves carefully in their Employ, and are faithful in their Place; this would certainly cauſe them to improve their Places, much for their Maſter's Good and Profit, and their own Credit; or give them Patents for their Places, as his Majeſty does to the Gardiners he keeps, for which I hope none is better ſerved. A good Cook can dreſs you ſeveral Diſhes of Meat very well in half a Day, and if one miſcarry, they can in a little time make another; but the Gardiner muſt have ſeveral Months or Years, to bring ſome things to Perfection; and if he miſcarry, he cannot

begin again when he will, but he muſt wait his time with Patience; therefore he ought the more to be careful.

But for this Digreſſion I muſt crave your Pardon. And thus I have ſhewed you that it is not the mixing of Earth with other Plants, that will make them change into ſuch Plants as you mix the Earth with, or make the Plant alter to any purpoſe; for the main Alteration of all Plants is from their Seed: tho it may be, mixing ſuch Plants or Shavings with the Earth you ſow Seed in, may cauſe them to have ſome Quality of the Phyſical Uſe of the Plant in them; as is the Opinion of the Learned, that Miſletoe on the Oak, and Polypody of the Oak, and Elder on the Willow, *&c.* do partake of the Phyſical Uſes of thoſe Plants on which they grow: for in Nature you may find that many Bodies do not only by their Qualities affect their Adjacents, but alſo infuſe their Virtue into them, and endue them with the ſame Faculty: as the Loadſtone doth not only attract Iron, but communicates its Virtue to it, and makes it magnetical by touching, *&c.*

But I ſhall leave the Stones, and return to the Walnut-tree. Let your Nuts be very ripe, and when they begin to fall, then beat the reſt off from the Tree, and lay them by, that the outward Husk may crack; then peel them, but do not waſh them, for wet doth make the Kernels crack, and mould, and ſpoils them. When you have taken off the Husk, lay them thin to dry in ſome open Room, turn them ſometimes with a Broom.

When they have ſweated and are dry, about the beginning of *October* put them into Sand a little moiſt, making it a little wetter about *Chriſtmas*, for then they will begin to ſpear, and then will digeſt it: Sow them not in their Husks, neither ſteep them, as ſome adviſe. Set or ſow them about the latter end of *January*, or beginning of *February*, in good freſh Ground, minding the aforeſaid Rules, and you ſhall

not loſe one in a hundred, and cover them about an Inch and a half, or two Inches: keep them well weeded on their firſt bed, and when they have ſtood two Summers, then remove them into other beds, ſetting them about a yard aſunder, one Row from another, and about a Foot and a half one from another in the Rows. Cut the Tap-Root and all bruiſed Roots off, and the Side-boughs, but cut not off the Head of a Walnut-tree.

Keep them with digging, and boughing, and pruning up, till you have got them five or ſix foot high, then bud them; it will make them bear ſooner, and then you are certain of a good Kind: for I preſume you will not bud them with a bad Kind, if you know it.

If you do not bud them, let them head about ſix foot high a year or two, and then remove them: but keep them not long in the open Air, for the Roots being of a ſpongy Nature, will take in the Air ſo faſt, that they will ſoon mould, and kill your Tree; therefore ſet them as ſoon as you can, when once taken up.

Remove them young off from the Seed-bed, as is before adviſed; for if you let them ſtand to be great on the Place where they were firſt ſowed, they will be much more dangerous to remove, and not ſo likely to thrive.

The Ground they love is a deep Soil, and of a dry Nature; on a ſharp Gravel, if the Ground be ſhallow, they will not proſper, but if the Gravel be mixed with Loom, they will do well. They love not a ſtiff Clay, but if it be mixed naturally with Stones or Chalk, and not too ſhallow, then they will thrive on it.

It is a proper Tree to ſet in Woods, for it will run up (if the Side-boughs be taken off) to a great height, and yield very good Timber for many Uſes.

CHAP.

CHAP. XV.

Of Raiſing and Ordering the Cheſnut.

TOuching the Kinds of this Nut, there may be ſeveral, but I know but three; one of them is very good, which ought to be the more increaſed.

For the time of gathering, obſerve the ſame as before is ſaid of the Walnut. When you have gather'd them, and taken the Husks off, lay them dry to ſweat, but not too thick.

Do not ſteep them in Water, as ſome adviſe you; for it is not good to ſteep any ſort of Seed, unleſs ſome Annuals, and to ſteep them is good, eſpecially if lated in ſowing: but to ſteep Stones, Nuts, or Seeds that are not of quick Growth, watering them may kill them, by making the Kernel ſwell too haſtily, and ſo crack it before the Spear cauſeth it; or it may mould and ſtupify the Spear: therefore let no Seeds whatſoever, that are not quick of Growth, have too much Wet at firſt.

You muſt put your Cheſnuts (then) in Sand, a little moiſt, about the beginning or middle of *November*; make it a little moiſter about the beginning of *January*, and at the latter end, or beginning of *February* ſow them on Beds, and cover them about two Inches; or you may ſet them by a Line, as you ſet Beans; or you may ſow them in Drils, as Beans; or you may ſow them where you intend they ſhall ſtand; and in any of theſe Ways or Places keep them clean from Weeds the firſt or ſecond year, then you may remove them into your Nurſery off from the Seed-bed. Prune off the Side-Boughs and Roots.

They are ſubject to put forth many Side-Boughs near the Ground, whereby they may be increaſed

by Laying very eaſily; to do which, ſee *Chap.* 5. But the beſt way is to raiſe them of Nuts.

Set them in Rows in your Nurſery, and order them as is ſhew'd of the Walnut.

The Soil they love is ſuch as the Walnut takes delight to grow in.

They are excellent to ſet in Coppices or Woods; the Timber is very uſeful, and they will grow to be large for Under-Wood: if the Tree be much crooked, fell it, it will yield great Store of ſtrong Shoots from the Stem, ſome of which it will be convenient to lay, whereof you may leave ſome layed to thicken the Place, and others to plant where you pleaſe, and may have great Shoots from the Stem for ſeveral Uſes alſo.

CHAP. XVI.

Of Raiſing and Ordering the Sarvice-Tree.

AS for the Kinds of the Sarvice, they may be many: there is one whoſe Fruit is much better than the other; but whether it is the Ground makes it ſo, I cannot poſitively ſay. We have them grow at *Hadham* on very ſtiff Ground, the Trees bear well, and the Fruit is good: and at *Caſhioberry* we have them on a ſharp Gravel, the Fruit naught, and the Trees bear very badly.

It may be raiſed of the Seed or Stone that is in the Berries, which when they are rotten, are then ripe, that is, about the latter end of *September*, or beginning of *October*: eat off the fleſhy part, or rub it off by rolling them in Sand, then dry them in the open Air, and keep them in moiſt Sand till the beginning of *January*, then ſow them on moiſt Ground, or in the

the Shade; keep them from Weeds, then let them ſtand two or three Years, and then plant them in your Nurſery, as you are directed for Walnut-Trees; there keep them with digging and pruning till they are fit of Stature to plant out: they grow in good Shape, and laſt long. It is a fine Tree for Walks; it likes beſt a ſtrong Ground, but let it be good, and there they will bear ſtore of Fruit, and grow to be large fine Trees.

They are very ſubject to put forth Suckers, by which they be eaſily increaſed from the Roots of the Mother-Tree; but how to do that, ſee *Chap.* 7. there you may be fully ſatisfy'd how to raiſe them.

When you have got them to five or ſix Foot high, bud them; they will bear ſooner, more and better, *&c.*

CHAP. XVII.

Of Raiſing and Ordering the Cherry-Tree.

I Know many will ſay, that it is not proper to rank this among Foreſt-Trees; but if ſuch did but ſee the fine ſtately Trees that we have growing in the Woods at *Caſhioberry*, they would then conclude it proper for Woods; and if for Woods, then for Foreſts.

Where they like the Ground, they make a glorious Shew in the Spring, their white Bloſſoms ſhewing at a diſtance as tho they were clothed with fine white Linen; their Bloſſoms are a great Relief to the induſtrious Bees at that Seaſon. The way to raiſe and order them is as followeth.

And firſt you muſt know, that the beſt way to raiſe them is of Stones; let your Cherries be very ripe,

ripe, for the riper the Cherry is (or any other Fruit) the better and plumper is the Kernel.

The time they be ripe is according to the Kind, but it is the black Cherry which grows common in Woods and Hedges about *Caſhioberry*, which is the Tree fitting for Woods; and therefore how to raiſe it I ſhall ſhew, tho there be much difference in theſe alſo: for we have ſome full as large and good as the *Corowne*; and at a Place call'd *Red-Heath*, at one Mr. *Baldwin's*, they have ſome ſorts not inferior to the black *Orleance*, which are produc'd naturally from the Stones, without Budding or Grafting, or any other Help but the Nature of the Ground, which indeed is very natural to them.

They are ripe in *July*, and the largeſt ſorts are ripe lateſt; the Fowls of the Air will give you notice of their time of being ripe, by their viſiting them, which are as ſo many Meſſengers to awaken the Induſtrious to take care in time to preſerve them; and to the careleſs Man and Sluggard, to take that away from him which he will not take care of: for, as the wiſeſt of Men ſaith, *Prov.* 20. *The Sluggard will not plough by reaſon of Cold, therefore ſhall he beg in Harveſt*; ſo he that will not take care in time, ſhall want when others have. But we have ſuch ſtore, that what the Jack-Daws, Jays, Mag-pies, *&c.* eat, they are not miſs'd with us; and tho the Fowls do begin to eat them as ſoon as they turn blackiſh, yet Nature has tied them on ſo faſt to the Stalk, that they can but take off part of the Fleſh, and leave the Stone and the reſt to feed the Kernel: for the wonderful wiſe God hath order'd moſt ſorts of Fruit ſo, that ſome by their bitter, ſour, or other Taſtes, are ſo well defended, that neither Bird nor Beaſt will touch them till the Kernels be ripe, or near it, and then the fleſhy part and Kernels are alſo pleaſing to their Palates.

When the Fruit is ripe, gather them, and have the fleſhy part eaten off, or taken off, by rolling them

them in Sand that is dry, with ſome heavy Plank upon them, drawing it to and again to take off the Fleſh; when you have ſo done, dry them for three or four days, then put them into pretty moiſt Sand, and ſo keep them till the beginning of *February* in houſe, and then ſow them in a Bed of light gravelly Mould: if your Bed be not naturally ſo, make it ſo: keep them clean from Weeds for two Years, and then you may plant them in Woods, Coppices, Hedg-Rows, *&c.* or in your Nurſery, to raiſe other Kinds of, or there to ſtand till they be fit for Walks; for where the Ground is natural, they are very proper for Walks. The Ground they like is a dry Soil, the bottom Gravel, the ſurface mix'd with Loom.

Or you may ſow them on Beds as ſoon as you have taken the Fleſh off, and they will do very well, and come up the Spring following, and then you may plant them at two Years Shoot where you pleaſe; but if you keep them too long out of the Ground before you ſow them, they will lie two Winters in the Ground before they come up.

Note this, that all ſorts of Stone-Fruit ſhould be committed to the Earth as ſoon as the Fruit is ripe, the Fleſh taken off, and the Stones a little dry; for all ſorts of Stone-Fruit, if well kept, and ſown or ſet in time, will come up the Spring after: but if you keep them too long out of the Ground, they then will ſtay till the ſecond Spring, and ſometimes never come up at all.

At any time when you remove a young Cherry-Tree, you may prune off his Head cloſe, if you pleaſe, to one Shoot; for they naturally grow taper and ſtreight: They are ſubject to increaſe from the Roots of another Tree, but if you would help Nature in raiſing of them that way, ſee *Chap.* 7.

It is a good Wood to plant in Coppices, for it produceth a ſtrong Shoot, and it is (like the Elm) apt to put forth ſeveral young Trees from the Roots of other Trees; but eſpecially if you fell a Tree that

is not too old, and it be in a light Ground: for then it will bring many from the Roots of one Tree, and ſo thicken your Wood much. It produceth great Trees in a light Ground, that being the Soil it liketh; but in a ſtiff cold Ground it is not ſo ready to grow, nor bring ſuch fine high taper Trees, nor increaſe ſo from the Roots, as it will on light Ground. Once I meaſur'd a Cherry-Tree in *Caſhioberry* Wood-Walk, firſt by the Quadrant, and ſo I found it 85 Foot high; but for more Exactneſs (becauſe the Tree lean'd, by reaſon of another which was blown upon it by a high Wind) I ſaw it meaſur'd by a Line let from the Top-ſhoot to the Ground, and it was 85 Foot 5 Inches: therefore I think ſuch Trees as this might well be accounted among Foreſt-Trees.

When you tranſplant young Cherry-Trees, do not ſet them too deep; nor indeed no other ſort of Tree, but eſpecially thoſe that naturally run ſhallow, as all ſorts do that are ſubject to put forth young Trees from their Roots; ſuch is the Elm, Abele, Sarvice, Cherry, *&c.* This Tree is wanting in ſeveral Parts of this Land; but you that want it, I would counſel you to get it as ſoon as your Ground is convenient for it.

CHAP. XVIII.

Of Raiſing and Ordering the Lime-Tree.

THIS Tree is call'd by moſt Herbals the Line-Tree, or Lindun, but vulgarly the Lime-Tree; but call it which you pleaſe, for I ſhall not trouble my ſelf with the Etymology of the Name.

Of this Tree there are but two Kinds that I know; one of which is the broad-leaved, and this ſhoots with a ſtronger Shoot than the other: the broad-leaved one is much to be prefer'd before the

other, for the aforeſaid Reaſons, and ſeveral others. Of the broad-leaved Lime we have had, of late Years, ſeveral Trees from *Holland*.

I have raiſed ſeveral hundreds of Seeds of this ſort. The narrow-leaved Lime grows plentifully in ſeveral places of this Land, as in ſeveral of my Lord's Woods in *Eſſex*: this latter is harder to remove with good Succeſs than the former; the Reaſon is, becauſe it hath not been ſo much uſed to be tranſplanted, therefore not ſo certain to grow as the great-leaved; according to our old Proverb, *Uſe makes Perfectneſs*.

Some Authors tell you, that they are Male and Female, but there is no ſuch thing in Plants; for both theſe Kinds bear Seed: but it ripens not every year with us in *England*.

You may raiſe this fine Tree by Seed or by Laying, either way with great Facility, and great Increaſe; but of this, as of all other Trees, to raiſe them of Seed is the beſt way: for my Honourable Lord, and the Honourable Sir *Henry Capel*, have ſeen ſuch difference between thoſe raiſed of Seed, and thoſe of Layers, that when they were Trees of eight or ten years Growth, they have often told me which was raiſed from Seed, and which from a Layer; for that raiſed from Seed much out-grows the other, and keeps its taper Shape for ſeveral Years after they are planted out in Walks: the Taperneſs of the Seed-Tree makes it grow as ſtreight as an Arrow. But this I adviſe you, that when you gather the Seed, you mind to gather it off from ſome of the broad-leaved Lime-Trees, and of thoſe which ſhoot with a ſtrong Shoot. But as I told you before, the Seeds do not ripen every year with us; but you may know that by cracking the Husk or Shell of the Seed: for if the Seed be good, it will lie plump and full under the Husk, the Body white, if you bite it in two. But if the Year be not kind for the Seed, moſt of the Husks or Seed-Veſſels will

have

have nothing but a little chaffy Subſtance in them, and ſome few will have ſome ſmall lank Seeds in them.

But to our purpoſe: To raiſe them of Seeds, let your Seed by very ripe, which will be in *October*; gather it in a dry Day, and after you have dry'd it about a Week in an open Room, then put it in a Couch of Sand, indifferent moiſt; ſo let it be kept till about the middle of *February*; then ſow it under ſome Wall on the North or Weſt-ſide, in ſome good freſh, loomy Ground, rather ſtrong than light: if there come a dry Spring or Summer, keep them indifferent moiſt, and ſtick ſome Boughs over them, to ſhade them from the ſcorching Sun, eſpecially if they be much expos'd to it; keep them clean from Weeds; there let them ſtand two Summers, and afterwards you may tranſplant them into your Nurſery, and ſet them in Rows, as you are directed of the Walnut and other Trees before. Prune them up to one Shoot, unleſs you find ſome Shoot or Shoots that are fit to lay; and then, if you would increaſe a Stock, lay them. This Tree is very apt to put forth Shoots a little above the Ground, and Suckers a little within; ſo that it is very readily increaſed by Laying. Lay your Layers betimes, any time between *Midſummer* and *November*, as they be ſtrong and fit to lay; and in a Twelvemonth's time, or little more, they will have drawn Root fit to be tranſplanted into a Nurſery. Thus by Seed and Layers you may in a little time encreaſe enough for a County, which when you come to have great ſtore, you may plant ſome of your crookedeſt Layers in your Woods; they will produce a large Stub, ſtrong Shoots, grow well almoſt of any Ground, and are very good Fire-wood.

It is a Tree that loves pruning up well, for it naturally grows taper, eſpecially thoſe which come of Seed; but if it ſhoot much, and thrives apace in your Nurſery, then leave ſome Side-boughs to check

the

the Sap, leſt by forcing it all into the Head, it ſhoot out ſo much there, that it make the Head too big for the Body, and ſo (being top-heavy) make the Tree crooked. Now if ever you ſee your Trees in ſuch a Condition, then immediately cut off the leaning ſide of the Head; which, when it is lighten'd of its Heavineſs, and hath not long ſtood crooked, will then come ſtreight again. *Midſummer*-time is the time of this pruning, but do not force the Sap too much into the Head, leſt by high Winds you have many of your Heads broke off: But of this I have ſpoken before.

My ingenious Lord was once too free in pruning up a parcel of thoſe Trees, which I the rather acquaint you with, that you hereafter may avoid the like; for the Ground was freſh and good, ſo that ſome by their great Heads loſt them, and ſome grew crooked: but deſpair not, for if you obſerve what I have ſaid before to make a crooked Tree ſtreight, you may eaſily bring them to be ſtreight again, for they naturally delight to grow as ſtreight as moſt Trees; and if the Head ſhould be broken off (as very ſeldom it is, becauſe the Bark is ſo tough) they will yet ſhoot with ſuch a ſtrong Shoot, that they will in a little time make a fine Tree again.

You may (if occaſion be) tranſplant them pretty large, as big as your Leg; but the ſureſt Size is about two Inches Diameter, and eight or ten Foot high.

But if the Tree was never remov'd from the place where it was firſt ſow'd, then remove it the ſooner; for if it be great, there's the more danger in removing it, and the topping of the Roots, when removed young, makes it break out near home, with many young feeding Roots like a Maple. Therefore my Advice to you, that delight to raiſe Trees, is, to tranſplant any ſort of Tree while young, and to top the Roots a very little; they will be much the better, and certainer to grow when they are again remov'd,

remov'd, and will come forward much the better. They that take this Advice, will find the Profit of it in Trees, which will the better encourage the Practice of it.

They will grow as well on any ſort of Ground, as any Tree I know, but they like beſt a feeding loomy Ground, which is not too wet, as is ſaid before in *Chap.* 8. where I have ſpoken ſomewhat of this fine Tree for Walks, Avenues or Lawns; this being a Tree I fancy for the aforeſaid Uſes, before any Tree we have in *England*, tho I know many do not love it that are Planters, becauſe it is not good Timber; and I grant it is not: but to vindicate what I have ſaid of it for Walks, I ſhall lay down theſe following Reaſons.

1. I do ſuppoſe with my ſelf, that whoſoever is a Lover of Walks, will not fell the Timber-Trees in a ſtately Walk, while the Timber is in its prime; for moſt Trees will continue many Years very ornamental, after they be in their prime, even while they be fit for no uſe but Fire-wood: And why not the Lime then for Walks as well as any ſort of Timber-Trees?

2. It will grow as well on different Grounds as any Tree I know, which is a conſiderable Encouragement to the ingenious Planters, to ſee their Labours proſper.

3. It will grow as great and as high, if kept with pruning up, as moſt Trees we have; for the Greatneſs of it, I ſhall borrow the Words of the Learned Dr. *Brown*, which he writ to Eſquire *Evelin*, as he hath it in his *Diſcourſe of Foreſt-Trees*, Chap. 29. p. 82. His words are theſe: *An extraordinary large and ſtately* Tilia, Linden *or* Lime-tree, *there groweth at* Depenham *in* Norfolk, *ten Miles from* Norwich, *whoſe Meaſure is this: The Compaſs in the leaſt part of the Trunk or Body, about two yards from the Ground, is at leaſt eight Yards and a half; about the Root nigh the Earth, ſixteen Yards in Circuit; the Height to the uppermoſt*

moſt Boughs, about thirty Yards, &c. This is one of the broad-leaved Limes, which how great and ſtately they grow, you may obſerve out of this Wiſe and Learned Doctor's Diſcourſe, who commends this Tree with the Epithets of *Large* and *Stately*.

4. It will laſt ſound long, as appeareth by the Greatneſs of its growing.

5. It is a Tree will ſoon grow over the Places where you cut off Side-boughs, and is not ſubject to put forth many.

6. It is a Tree that naturally groweth taper and ſtreight.

7. No Tree keeps ſuch a conſtant Pyramid-ſhape as this; the Heads of other Trees growing of ſeveral Shapes and Forms, tho all of one Kind, this keeps its Head as if it were cut, and the Body ſtreight.

8. For Shade few better, having a thick Head, and large Leaves, only it droppeth its Leaves too ſoon.

9. The Bark of this Tree being tough, keeps its Head from breaking off by great Winds.

10. It is a Tree that as ſeldom blows aſide as any Tree whatſoever, for its matted Root and taper Body preſerve him upright all his Life-time.

11. The Flowers are beautiful, the Scent counted healthful, and breaketh out ſtrangely on the ſide of the Leaves, much different from other Flowers of Trees or Plants.

12. The Shoots being of a fine red gloſſy Colour, are very pleaſing to behold in the Winter Seaſon.

13. It is a Tree that ſeldom grows hollow in the Body, for it ſoon overgroweth the Wound, and ſo keeps himſelf ſound, both Body and Limb.

14. It is the beſt Wood for Carving that is known.

15. At laſt, when he is dead, his Bark will make you Mats and Ropes, uſeful for ſeveral things.

16. And laſtly, its Wood is a good, ſweet, free-burning Fire-wood: the Charcoal made of it is commended before all others for Gunpowder.

Now put all theſe together, and judge if this be not a fine Tree for Walks; but if you would have them ſhape themſelves finely, ſet them two Rod aſunder: if for a ſhady Walk, what diſtance you pleaſe.

I fancy that a ſingle Row, to bound a Lawn round, ſet two or three Rod aſunder, would be mighty obliging to the Nobleſt Senſe; for then they would ſhew themſelves more clearly than when ſet in double Rows to make Walks: or they would ſhew mighty well ſet thin on the ſide of a Hill, one topping another, with their curious natural Shapes. And ſo adieu, my beloved Lime-Trees.

If treating of the Lime *I've wrote amiſs,*
I'll thank you if you'll ſhew wherein it is;
But if you meet with any thing done well,
Say nothing on't, but ſtudy to excel.

CHAP. XIX.

Of Raiſing and Ordering the Maple.

THE Maple-Tree is very plentiful in moſt places of *England*, where there are any Hedges or Woods; but as for the Kinds, I know but one ſort, tho Authors tell you of more.

It is increaſed, and doth increaſe it ſelf by Seed and Layers, and from the Roots of Mother old Trees, and by Suckers, which makes it ſo plentiful.

The Seeds will lie a year in Ground before they come up, therefore you may order them as is before ſaid of the Aſh; you may increaſe it by Laying (as is directed in *Chap.* 5.) for to thicken your Woods or Hedges: but if you let it grow into Trees, it deſtroys the Wood under it; for it receives a clammy Honey-

Honey-dew on its Leaves, which when it is waſhed off by Rains, and falls upon the Buds of thoſe Trees under it, its Clammineſs keeps thoſe Buds from opening, and ſo by degrees kills all the Wood under it: therefore ſuffer not high Trees or Pollards to grow in your Hedges, but fell them cloſe to the Ground, and ſo it will thicken your Hedge, and not ſpoil its Neighbours ſo much.

You may increaſe it from the Roots of an older Tree, as is ſhew'd in *Chap* 7. it is a good Wood to plant for Under-Wood in Coppices and Woods, for it produceth a good Shoot, and thickens your Wood: it loves a dry Ground or Bank beſt.

CHAP. XX.

Of Raiſing and Ordering the Sycomore.

THIS fine Tree is much out of favour with a great many, for theſe Reaſons: *viz.* becauſe the Leaves falling upon their Walks, turn into Soil ſoon, and ſo ſpoil them, breeding Graſs and Weeds.

And alſo that notwithſtanding its fine Shade, it is not good to plant them near dwelling Houſes; for the Leaves in Summer-time being ſubject to catch and hold the Honey-dew, do draw together ſeveral ſorts of Flies, and (ſome ſay) amongſt them the Moth: if ſo, they be not fit to be planted near Houſes and Gardens. The ſame Fault has the King of Trees, the never-enough admired Oak, and the Maple and others.

But granting this, yet let me deſire thoſe that have Woods and Coppices in Parks, where Deer are eſpecially, to ſet ſome of this Tree every Fall, in the open places, and that for theſe Reaſons: Firſt, it is a Wood the Deer will not ſoon harm; then it

is a Wood that bears Keys ſoon, and many, which will fall early, and come up the next Spring, and being armed with a large Leaf, the Weeds will not ſoon choak them; on ſome Grounds that are dry and light, it groweth faſt: it produceth tall, tough and good Timber for ſeveral Uſes; it groweth apace from a Stub, and is good Fire-wood.

It may be raiſed of Seed, which is beſt, or by Laying, or by Roots: ſow the Seed (not on too wet or ſtiff Ground) as ſoon as it is ripe, and the next Spring it will come up, whereby on a little Ground you may raiſe a great many Plants to ſet in your Nurſery; keeping them clean from Weeds, by digging and pruning up every year, till you have got them big enough for Walks, Woods, or what you pleaſe. Thus much at this time of the Sycomore, only remember (as I ſaid before) that it is a good Wood to plant in Coppices and Woods.

CHAP. XXI.

Of Raiſing and Ordering the Hornbeam.

I Told you but now of the Sycomore being fit to be ſet in Parks, becauſe Deer do not often bark them; but of all Trees that I know for that purpoſe, this is the beſt: for a Deer will ſtarve before he will ſo much as taſte the Bark of the Hornbeam; they do not love much the very ſmall Tops.

This Tree may be raiſed of Seed, or by Laying; but by Seed is beſt, tho the young Seedlings are tender. The Seeds may be ſown at the time directed for the Aſh, for it lieth a year in the Ground before it comes up, and then you muſt look to keep it well ſhaded, or elſe it will ſooner be gone than you think for; it naturally loveth to grow on ſtiff Ground,

where it will grow, and bring great Lops to the Owner, when the Tree is but a very Shell, as indeed moſt old Trees are hollow within; which I judge not to be the Nature of the Tree ſo to grow, but the Fault of thoſe that look to them: for they have too many Maſters which are bad Husbands, and no Friends to this Tree and many others, as the Elm, Aſh, *&c.* who let the Lops be great before they lop them, perſuading themſelves that they have more great Wood, which is moſt uſeful; never conſidering that great Lops do endanger the Life of the Tree, or at beſt wound it ſo much, that many Trees decay more yearly in their Bodies than the yearly Lops come to; and ſo indeed they do provide themſelves with more great Wood, tho it be much to the Owner's Loſs: tho this Tree will bear great Lops when there is nothing but a Shell of a Tree ſtanding, yet the Aſh, if once come to take wet at the Head, rarely bears more Lop after the Body of the Tree decays. Therefore if once a Tree decays much at the middle, it will ſoon be little worth elſe but for the Fire: but in caſe you find a Timber-Tree decay (as is aforeſaid) down with it in time, for fear you loſe your Timber, and alſo the Fire-wood be ſpoil'd: But of this I have ſpoken before, and would alſo ſpeak more, could I with Words but perſuade Men out of this great Error. But our ordinary Husbandmen will vindicate their Country-Husbandry to be better than the next, for indeed Countries do differ much in the ordering of Trees and Hedges, and they as much condemn ours; for it is as hard to perſuade them out of their ſelf-conceited Opinion and Tradition, as it is to make a *Jew* turn *Chriſtian.*

This Tree makes the very beſt Hedges of any Tree we have in *England* that ſheds Leaves, (I mean for Ornament;) for you may keep it in what Form you pleaſe, and it will grow very thick to the very Ground. Therefore to make a private Walk, or to

ſence in Avenues, at a convenient diſtance, without the Bound-Range of Trees or Walks; or to hedge in Ridings, Cauſeways, or to make cloſe Walks or Arbours, this Tree is much to be commended; eſpecially on ſuch Ground which it likes. You may be better ſatisfy'd about this Tree at *Hampton-Court*, in his Majeſty's Garden, which is kept by the ingenious Artiſt, and my good Friend, Mr. *Tobias Gatts*. It is good Fire-wood, and yieldeth good Increaſe both from Stubs and Pollards.

It increaſeth much by ſowing it ſelf, therefore you that love planting, get a few into your Plantations, and try whether they will thrive with you or not; which doubtleſs it will on many Grounds where now it is not; and ſo would many other Trees do mighty well in Woods and Coppices, to thicken them, and make them the more beautiful, eſpecially thoſe that increaſe from the running Roots, as the Noble Elm, Cherry, Sarvice, Abele, Popler, *&c.* and ſome others, for to ſeed; if you have them not, as Aſh, Sycomore, Lime, Hornbeam, Maple, Quickbeam, *&c.* and with thoſe which you ſee thrive beſt, you may at every Fall furniſh your Woods where they are thin; and I do aſſure you it will pay you for your Pains with Intereſt.

CHAP. XXII.

Of Raiſing the Quickbeam.

THE Quickbeam, Whitchen, or Wild-Aſh, tho very ſcarce in the South of this Land, is pretty plentiful in ſome parts of the North, as in *Nottinghamſhire*, &c. and would be there more plentiful, were it ſuffer'd to grow great, to bear the greater quantity of Seed; for I think it increaſeth (as

the

the Aſh doth) only from Seed: It produceth ſtreight, ſmall and long Shoots, which in that Country they cut off while they are young, to make Goads (as they call them) or Whips to drive their Oxen with, for it is as tough a Wood as moſt is.

I do gueſs the Seeds lie a year in the Ground before they come up; I am now about trying to raiſe ſome. Let me deſire ſome kind Planters to get ſome of this Wood into their Bounds, where it is not; that it may be try'd whether it will grow in the South or not, as no doubt it will if you try. I ſhall ſay no more of this Tree, becauſe I cannot yet ſpeak much on my own Knowledge.

CHAP. XXIII.

Of Raiſing the Birch.

THIS Tree increaſeth from the Roots or Suckers, and for ought I know it may be raiſed of Seeds; for I do ſuppoſe there are Seeds in that which it ſheds in the Spring, tho I have not yet try'd.

It delights to grow on your hungry Gravel, as it doth about *Caſhioberry* in ſeveral Woods; therefore you that have barren Ground where your Woods be, get ſome ſet of this Wood, to help thicken your Woods: for tho it be one of the worſt of Woods, yet it is very uſeful, and the great God hath order'd it to be contented with the worſt of Grounds; and beſides, that it ſhould not be deſpiſed by his Servants, he hath endow'd it with a Faculty of attracting and preparing from the Earth a very Medicinal Liquor, which is both pleaſant and healthful to Man: which to take from the Tree, and alſo to prepare this Water, and to demonſtrate what Diſeaſes it

is good for, I ſhall make bold to borrow out o Eſquire *Evelyn's Diſcourſe of Foreſt-Trees, p. 32, &c.*

About the beginning of *March*, with a Chizzel and a Mallet cut a ſlit, almoſt as deep as the very Pith, under ſome Bough or Branch of a well-ſpreading Birch; cut it oblique, and not long ways, inſerting a ſmall Stone or Chip to keep the Lips of the Wound a little open: faſten thereto a Bottle, or ſome other convenient Veſſel appendant; out of this Aperture will diſtil a limpid and clear Water, retaining an obſcure ſmack both of the Taſte and Odour of the Tree: Thus may you obtain this Water. I will preſent you a Receipt how to make it, as it was ſent me by a fair Lady (ſaith he.)

To every Gallon of Birch-water put a Quart of Honey well ſtilled together, then boil it almoſt an hour with a few Cloves, and a little Lemon-peel, keeping it well ſcum'd: when it is ſufficiently boil'd, and become cold, add to it three or four Spoonfuls of good Ale, to make it work, which it will do like new Ale; and when the Yeaſt begins to ſettle, bottle it up as you do other winey Liquors, it will in a competent time become a moſt brisk and ſpirituous Drink, which is a very powerful Opener. This Wine may (if you pleaſe) be made as ſucceſsfully with Sugar inſtead of Honey, one Pound to each Gallon of Water; or you may dulcify it with Raiſins, and compoſe a Raiſin-wine of it. I know not whether the Quantity of the ſweet Ingredients might not be ſomewhat reduc'd, and the Operation improv'd; but I give it as receiv'd.

For Diſtempers in Man, it is good for Cure of the Ptiſick, moſt powerful for diſſolving the Stone in the Bladder, curing (as I am told) Conſumptions, and ſuch interior Diſeaſes as accompany the Stone in the Bladder and Reins. This Liquor is ſo ſtrong, that the common ſort of Stone-Bottles cannot preſerve the Spirits, ſo ſubtile they are and volatile; and yet it is gentle and very harmleſs in Operation within

the

the Body, and exceedingly ſharpens the Appetite, being drunk *ante Paſtum*. This from the Learned Author; and thus much for the Birch: And now I proceed.

CHAP. XXIV.

Of Raiſing the Haſel.

OF the Kinds there be many, and ſome very good Fruit; as the Red and White Filberds, the great *French* Nut, *&c.* alſo your wild Nuts do differ much in Shape and Goodneſs. My Lord had once a Quantity of very good ſorts ſent him from beyond Sea; they had a very tender Shell, therefore I took care to raiſe ſome of them, and did ſeveral, but when they came to bear, they were no better than our Hedg-Nuts.

When they be ripe I need not tell you, for every Boy can; order them all Winter as you are adviſed to keep your Walnuts, and ſow them at the ſame time in the Spring: they will grow almoſt on any Ground (provided not too wet) but beſt on your dry Ground; therefore ſet them on your high and dry Banks, between your Fences, but early in Winter: if they hold but the firſt Year, they will produce good Stubs; you may increaſe them by Suckers, or Laying, but the beſt way is from their Nuts. I would have you to benefit your ſelf by Laying this and other Woods in your Woods, that are thin of Wood: I dare aſſure you, that for every Shilling you lay out in this Husbandry, in a few Years time every Shilling ſhall be paid you yearly, for many Years after.

CHAP. XXV.

Of Raiſing the ſeveral Sorts of Poplers.

THERE may be many ſorts of this Wood, but I know but four; the beſt is that large, white Popler, a great Leaf white on the lower ſide: it ſhoots with a ſtrong whitiſh Shoot, which the *Dutch* call *Abele*.

The ſecond is a ſort much like to this, both in Leaf and Shoot, which grows in many places of this Land, and is in moſt places call'd the white Popler.

The third is a ſort that hath the Leaves and Shoots more ſmall, and not ſo white; it groweth in many places, and in moſt of them is call'd the Aſpen or Aſp-Tree. Theſe three ſorts are to be order'd all as one; the other differs much both in the Nature of growing and ordering: Therefore a word or two of theſe,

I never yet did raiſe any of them of Seed, but I do believe they have a Seed in that downy Subſtance they ſhed in the Spring; they increaſe naturally very much from the Roots, but they may be helped much by the Rules in the Chapter before, which ſheweth you how to raiſe Trees from the Roots of another Tree: by which Rules, from two of the *Abele* Trees my Lord had from *Holland*, I have rais'd above a hundred. But if you fence in a place round the Tree, to keep Cattle off, and keep down the great Weeds a little, they will put forth many young Trees from the Roots of an old one; eſpecially if you prune up, or thin the Heads of any of theſe ſorts, they will then yield the more: but if you do not value your Mother-Tree, but deſire to get a great ſtock of young ones, then you may fell the

Mother-

Mother-Tree at the Ground; and if it be not very young, or old, the Roots will put forth in young Trees, the Quantity of the Body and Head of that Tree; and ſo will the Elm, Cherry, *&c.* Then how uſeful ſuch Trees are to ſet in the places of Woods that are thin, I leave you to judge.

Tho this Tree is none of the beſt of Woods, beſides the aforeſaid Properties, I can ſatisfy you it will grow and increaſe in the very worſt of your Grounds, as well dry as wet.

You muſt forbear to head any of theſe three ſorts, unleſs young, or that you leave ſome young Shoots to draw up the Sap, except you are minded to deſtroy the old one you head; for if the Lops be very great, it many times kills, or makes the Tree hollow: therefore lop young. Some will tell you they grow of Chips, but that is falſe; they rarely will grow of Cuttings.

They are beſt in Woods, tho ſome adviſe you to plant them in Walks; but they are not good for Walks, for the Suckers they produce from the Roots will be troubleſome: the greater ſorts are proper to ſet on the Eaſt, Weſt, or North Proſpect, at a diſtance, in or by the ſide of a Wood; for their white Leaves ſhew finely when the Sun ſhines upon them, and make fine Variety with other Trees that have dark green Leaves. I commend them to you to plant in Woods of barren Ground, for there they increaſe much, and yield much Wood; and ſo I leave them, and come to the other, which differeth from theſe both in Leaf and Shoot, and Manner of growing.

This laſt kind is in moſt Places called the Water-popler; its Leaf is a pale green, ſhaped ſomething like the other, but it is not white below; the Shoot is of a yellowiſh green, this loves to grow by Rivers ſides, or in Ground that is wet, or ſuch as holds Water much: therefore you that have ſuch Grounds, get ſome of theſe Trees to ſet in them. It will

grow

grow of Truncheons from two Foot long to eight; the firſt being the beſt to ſet for Stubs, the other you make Pollards of, for it is a good profitable Wood, bringing a good Lop in few years, and that on ſome Ground better than the Willow.

For your Inſtruction in ſetting the ſmall Sets, ſee *Chap. 6.* and for ſetting thoſe of ſix, ſeven, eight or nine foot long, for to make Pollard-trees, keep the lower end of your Set, and alſo the upper, free from Cracks, and cut each ſloping off: as for the Bigneſs, let it be about two or three Inches Diameter. If you make your Hole with an Iron Crow, make it big enough, that you do not thruſt up the Bark when you thruſt them into the Hole; or if you make them with a Stake, obſerve the ſame: but if you fear the Bark to part from the Wood, tie it about the lower end with a piece of Wire, *&c.* Set them about one foot and a half deep; if great, deeper: or if you have a quantity to ſet, and would ſet them well, then have an Auger made, ſomewhat like to a Pump, a little bigger than your Sets, ſo may you ſet your Sets in, and ram the Earth cloſe to them; but however you ſet them, be ſure to ram the Earth cloſe to them. I prefer the beginning of Winter for the beſt Seaſon, unleſs your Ground be very wet, then defer it till *February*.

But if you have Ground that is wet and barren, and that you are minded to plant, make Drains two ſpade deep, and a yard wide, and at every two yards aſunder caſt up the Earth upon the two yards of Ground you left, and ſow it the firſt year with Oats to mellow the Ground, which may pay a good part of your Charge, if not all; the next Winter ſet it with theſe ſorts of Woods, Water-popler, and others, Alder, Willow, Withy, Sallows, *&c.* and in four or five years after you may have a good Fall of Wood; ſo may you have every fifth or ſixth year after for many years.

To encourage you, Squire *Evelyn* tells you of an Abele that did ſhoot in one year ſeventeen foot in length, and as thick as your Wriſt; and alſo informs you of ſome Willows that have ſhot no leſs than twelve Foot in one year. Therefore to thoſe Gentlemen that have wet or mooriſh Ground, which is as bad and will not graze well, do I direct this good Husbandry, eſpecially where Wood is ſcarce, and ſells well. The Charge to do this will not be great: and to ſatisfy you the more, I ſhall here ſhew you, if you dig two Spade deep, then there will be but one third part of the Ground to dig; that is, to dig your Trenches one yard wide, and leave two yards there to lay the Earth, and to ſow one year, or to ſet the Sets as ſoon as you have made the Ground ready.

160 Rod in one Acre, divided by 3 gives one third of 160, which is 53 and $\frac{1}{3}$. This 53 doubled (neglecting the $\frac{1}{3}$ as needleſs in ſuch a buſineſs) is 106. Now if I allow 3*d.* a Rod for one ſpade deep, that is 6 *d.* for two; and then 2 *d.* a Rod for ſetting, is 8 pence the Rod, leaving the Sets out, and not counting them, becauſe I do not know the Scarceneſs or Plentifulneſs of them where you intend to plant, tho they will coſt but little.

Now if I divide 106 by 2, being two Sixpences is one Shilling, it gives 53 *s.* and then divide 106 by 6, being 6 twopences makes one Shilling, is 17 *s.* 8 *d.*

By this it appeareth that if the Ground be planted this way, having the Trenches digged two foot deep, which is the beſt way to plant any ſort of Ground if the Soil be ſhallow, (as I ſhall ſhew fuller hereafter) the Charge (excepting the Sets) is but 3 *l.* 10 *s.* 8 *d.* where Men can dig ſuch Ground for 3*d.* the Rod.

	1 ($\frac{1}{3}$
160	(53
	33

	106 (53 *s.*
	2
	4 (4
2 : 13 : 0	106 (17
0 : 17 : 8	66
3 : 10 : 8	

But

But if the Ground be not very wet, or the Soil's Surface very ſhallow, then you may dig one yard and leave another, throwing half your Earth on one ſide, and half on the other. Suppoſe you was to plant an Acre of Ground this way, there will not be half digged, eſpecially if the Ground be an oblong ſquare; but if you count it at half, that is 80 Rod, this at the ſame price, 3 *d.* the Rod, is 20 *s.* for if you divide 80 Three-pences by four (the Thirds in a Shilling) the Quotient gives 20: then 80 Two-pences for ſetting is 13 *s.* 4*d.* for if you divide 80 by 6, (the Two-pences in one Shilling) it gives 13 in the Quotient and 2 over, which 2 Two-pences is 4 *d.* that is then 13 *s.* and 4 *d.* and 20 *s.* is 1 *l.* 13 *s.* 4 *d.* charge. Yet as I told you, the more oblong the piece is, it will coſt ſomewhat the leſs, provided you divide your Ground into Yards, or as near it as you can, and leave a yard next the Side where you begin, and one at the Side where you end.

```
80 (20
44
----
2 (2
80 (13
66
```

Having ſhew'd you the Charge, or pretty near it, and alſo two ways how to prepare your Ground, you may ſet Truncheons of Water-popler, all ſorts of Sallows, Alder, Willows, Oſiers, *&c.* of Roots, Abele, Popler; and if not too wet, Elm, Aſh, *&c.* Let none of theſe ſoft Woods ſtand too long unlopt if Pollards, or unfelled if Stubs, for the Reaſons before mention'd. Of all the Poplers, Water-popler indures beſt lopping when great, then the Abele, the Aſp worſt when the Boughs are great. This Water-popler doth not increaſe of a Runner, as the other doth; I ſuppoſe this is the ſame which ſome call the Black-popler. It grows in ſeveral Places about *Ware*, by their Ditch-ſides, and brings them good Profit: and therefore you that have wet Grounds, get ſome of this to ſet by your Ditches, one Row of this, and one of Willows; for if you ſet one of theſe worth a half penny, if they grow they will bring you that yearly

yearly for twenty years or more. Prune all ſoft Woods at the latter end of Winter, *&c.*

CHAP. XXVI.

Of Raiſing the Alder.

THIS Tree may be raiſed of Truncheons as the other I laſt writ of; ſome ſay of Seeds, but if you cut them about two foot and a half long, and ſet them two foot in the Ground, if the Ground be proper for them they will certainly grow, and yield you good Profit. They love a wet mooriſh Ground, and will not grow on dry Ground: they will grow well on your boggy Grounds, which ſeldom yield good Graſs.

Some adviſe you to fell them every third or fourth year, which is good Counſel; but do not defer above five or ſix years, the wounded Place will be too great if you ſtay longer, and with Wet will grow hollow (if it be great) before it can over-grow the Wound. As for ſoft Woods, or Aquatick Trees, fell or lop none till towards the Spring, *viz. February* is the beſt Seaſon, and the Moon encreaſing.

CHAP. XXVII.

Of Raiſing the Withy, Willows, Sallow, Oſiers.

THE Withy doth beſt grow on Ground that is not very moiſt, but yet the Moiſture muſt not be far from him; as on the weeping ſide of a Hill, where ſome Spring breaks out, or on Banks by Rivers or Ditches ſides, or on Banks in your mooriſh Ground, *&c.*

The Willow loves to grow on ſuch like Ground; both this and the former are ſet in ſuch Places as the Water-popler is, and of ſuch Sets as it is. To make Pollard-trees, ſee the Chapter before of the Water-popler, and Chap. 6. which teacheth how to ſet all ſorts of Cuttings. Remember to keep them well fenced for two or three Years, and to cut off all the Side-ſhoots, which they will be ſubject to put out below the Head; and thin the Head, as you ſee it convenient, leaving not above ſix or eight for Arms; ſo doing will make the Body of your Tree ſwell, and lay hold on the Ground the better.

And as for the Variety of Kinds of theſe and the following, I ſhall not trouble my ſelf to inquire after; for I intend only to ſhew you how to raiſe them, not to deſcribe them; and if you know how to raiſe ſome, you may then ſoon be able to raiſe them all. But there is one ſort more which is called the ſmelling Willow, which deſerves to be taken notice of; it ſhoots a great Shoot, bears fine, broad, ſhining, green Leaves, and will grow on moſt Grounds that are not too dry. It bears a ſweet beautiful Flower, and worthy to be ſet in Orchards: you that have

Rivers

Rivers run by your Orchards, plant ſome of this; if you have not, yet if your Ground be moiſt, and pretty good, it will grow mightily, and yield Ornament and Profit.

It is eaſily increaſed of Cuttings, which if ſet as is ſhewed in *Chap. 6.* will grow every one: only mind if your Ground have a dry Bottom, then ſet them on the North ſide of a Wall; beſide the Beauty and the Smell, the induſtrious Bees love it much. It is as eaſily increaſed as any Sallow, and bears as good a Lop, then endeavour to make it as common: From one ſmall Plant I have raiſed ſome hundreds, and have ſet ſeveral in our Wood-walks at *Caſhioberry*, where they grow well, notwithſtanding our dry Ground; but they were rooted before I ſet them there. I commend the like Husbandry to the Lovers of Planting, and to thoſe that are Lovers of that buſy Martial Creature, for it is an early Relief to them. It may alſo be very plentifully increaſed by Laying; for if it be but cover'd with Ground, it will root.

Of Sallows there be three common ſorts; all of them love a moiſt hollow Ground, but that with the round Leaf will grow on Banks, as in Hedges: for if you ſet them for Stakes, they will take root; and tho they be no very good Fence, yet they will yield good Profit. The two other grow beſt on mooriſh Ground, and there will yield great Shoots: they will grow of Cuttings much, and may be encreaſed well by Laying; both which ways you may thicken your Woods very much: but then you muſt keep out Cattel, eſpecially all Deer, for two or three years and above. They may be raiſed by Seed, as the Elm is, ſome years, for the Seed is not all years good with us; no more is the Elm and Lime: I have raiſed many of them of Seeds in the downy Subſtance, but they are ſo eaſily increaſed by Cuttings and Layings, that you need not trouble your ſelf to raiſe them of Seed. It is as profitable a Wood for Under-wood in Woods, as any you can ſet in them,

for Fire, producing ſtrong and great Shoots: Therefore, where you ſtock up Trees in your Woods, ſet two or three Sallow Truncheons with ſome other Wood that is ſubject to run, as Elm, Cherry, Abele, *&c.* ſo you may have a thin Wood made a thick good Wood; or if you have a Ground that is mooriſh, and will not yield good Graſs, then plant (as is before ſhewed) of the Water-popler, and it will yield you quick and great Profit.

If you would ſee more largely of theſe Sallows, *&c.* ſee Squire *Evelyn's 19th Chapter.* He tells you you may graft Figs and Mulberries on them, and that they will thrive exceedingly: the firſt is true, you may graft on them, but you had beſt try the other; for I fear 'tis borrow'd of *Pliny*, &c. but I forbear.

Of Oſiers there are ſeveral ſorts, and are all raiſed of Truncheons, as the Sallow: They love a moiſter and more mooriſh Ground than the Sallow or Willow. The Basket-makers know beſt the time to fell them, which may be done any time in Winter; they muſt be kept well fenced from Cattle: and thus I ſhall conclude with the Aquatick Trees.

Only let me deſire all thoſe that have mooriſh Ground, and ſuch as yields little Profit (eſpecially where Wood is ſcarce) to make uſe of theſe ſure Directions, and I do engage you a great and certain Profit.

CHAP. XXVIII.

Of the Pine, Fir, Pinaſter, &c.

THESE ſtately Trees want more Reſpect with us than they have; and there are three things which make it ſo: The firſt is Ignorance in planting them; and that is, they miſs the right Time or Sea-

ſon

ſon of the Year to ſet them, planting them when other Trees are planted, as from *November* to *March*, which is the very worſt time in the Year: but the beſt time to remove theſe or moſt ſorts of Greens, is from Mid-*March* to the latter end, or from Mid-*Auguſt* to the laſt; which are the very beſt times, unleſs for tender Greens, and I ſhall not ſo much as name any of them.

As to the Ground, they love not Dung, but a freſh gravelly Soil mix'd with Loom; alſo mind but the Roots, and they will tell you, that theſe ſorts of Trees muſt not be ſet too deep, therefore take heed you commit not that Fault to them: for if you look into *Gerrard*'s Herbal, with *Johnſon*'s Additions to it, *p.* 1364. you are there inform'd by that laborious Author, that Firs grow on the tops of Rocks in great plenty, and alſo large Trees in the cold Countries of *Norway*, *&c.* and of Pines that grow in the cold Countries beyond *Denmark*, as in *Ruſſia*, &c. then certainly they may and will grow here in *England* very well, if you will but mind to ſet and preſerve them.

Then a ſecond Reaſon why Men do raiſe but few of theſe, and plant but few, may be becauſe they love them not; and it is with other Men, becauſe they many times die, or do not grow well with them, and this makes them not fancy them: But ſuch Men want good Inſtructions, and I hope I ſhall give them ſome that will make them again in charity with theſe fine Trees. But others there be that have Ground and fit Places to plant Trees in, yet mind them not: theſe Men do not love Trees, no nor themſelves, nor their Poſterity.

The third great Hindrance of planting theſe and other Trees, is, there are many Men that love planting and improving of Trees, but are hindred by not having Ground of their own convenient to plant in; and if they nurſe up or plant Trees for their Landlords, they many times meet with but ſmall Encou-

ragement for ſo doing; for many times they are turned out of their Farm before they come to Perfection, or if there be any that are come to be fit to fell, many times another Man ſhall have them as cheap as he that nurſed them up in his Hedg-Rows, *&c.* or his Predeceſſors.

But I could and do wiſh that Owners would encourage their Tenants, by allowing them ſo much Money for every Fruit-Tree, and ſo much for every Foreſt-Tree they plant in their Grounds, and look to them well till they are paſt Cattel's ſpoiling them; this would help both the Owner and his Tenant, and many a good Tree might be in waſte places where now none is: this would make the Farm much better and pleaſanter; and ſo we might have more Plenty of Fruit and Timber, and Knowledge in Planting would be greatly improv'd.

Now ſuppoſe you ſhould plant on good Land, and in open Fields, you would be no loſer by it; as if you ſhould plant Oak, Aſh, or Elm, in Paſture-Ground, at three or four Rod aſunder, they would do your Land no harm, nor would you loſe any Ground, ſave only juſt where the Trees ſtand. Now it muſt be a good Tree that takes up one Yard ſquare, nay the Leaves and Shade may do your Cattel as much good as may countervail the Loſs of that Land: as if your Land be worth 20 *s.* an Acre, that is not a Penny a Yard, as here I ſhall ſhew; 160 Rod ſquare makes an Acre, and five Yards and a half ſquare is a Rod.

5.5
5.5

275
275
---
30. 25

You ſee that in one Rod ſquare there are 30 Yards and a quarter; for the Decimal Fraction 25 is $\frac{1}{4}$ of a 100; or thus, 5 times 5 is 25, and 5 halfs and 5 halfs make 5 whole Rod, and a half and a half make but one $\frac{1}{4}$, which is 30 Yards and a quarter.

30.25 Yard in a Rod.
160 Rod in one Acre.

181500
3025

4840.00 yard in one Acre.

x (4 *d.*
4840 (403 *s.*
x222
xx

Here you ſee that 4840 (the Yards in one Acre) divided by 12, (the Pence in a Shilling) gives 403 Shillings, and 4 remain; that is, one Acre at a Penny a Yard comes to 20*l.* 3 *s.* 4 *d.* But it may be ſixty Years before a Tree takes up ſo much Ground, then at half that Age it takes but half ſo much Ground; then 60 Half-pence is but 2 *s.* 6 *d.* and your Tree at that Age, and on ſuch Land, may be worth 30 *s.* or more, which is Profit and Pleaſure, *&c.* to the Planter.

But to our Buſineſs: *Johnſon* tells you of ten ſorts of Pines, but I know but two or three in *England*; one is common, and is raiſed of the Seed ſown in good Ground, and in the Shade, in the Month of *February*: If it be froſty, put it into Earth or Sand, and keep it in the Houſe till the Weather be ſeaſonable; they will not grow of Cuttings, nor Layings well: they are bad to be remov'd when old, becauſe the Roots run far from the Body in a few Years, and if broke or cut off, they will not readily break out at ſides and ends: therefore remove them young, at two or three Years old, and at the times beforeſaid, and then you may expect glorious ſtately Trees. None of all our green Trees in *England* may compare with them; prune them as the Fir: they are fine to ſet round a Garden, or Bowling-Green, for the Leaves will not do any harm.

Of Fir-Trees we have two ſorts, they are eaſily raiſed of Seeds ſown as the Pine; one ſort will grow of Laying, or of Slips ſet about *Bartholomew-tide*: but then you muſt cut them one Inch or two from the Body, and cut that Stump cloſe off the

March following; and cut all other Boughs that are needful at that time, and you need not fear hurting your Tree, though my *French* Curate be againſt it.

The beſt way to keep them is in Stories, about a Yard between one another, but do not cut their Ends as ſome do, neither let them grow thick on a heap; but if you keep them in Stories, they will grow taper, and you may take off ſome when you ſee cauſe, and ſo help them up to a great height, and ſtreight as an Arrow; for they naturally grow in a good Shape.

Lay the Clogs before the Fire, and they will gape, ſo may you take out the Seeds the better. *Pliny* calls one ſort of Pine the Pinaſter: *Johnſon*'s *Herbal*, p. 1350.

CHAP. XXIX.

Of Raiſing the Yew, Holly, Box, Juniper, Bays and Laurel, &c.

THERE are a great many more Trees, ſome of which ſhed their Leaves, and ſome keep them all the Year, beſides thoſe I have ſpoken of before; but theſe are the moſt of our Foreſt-Trees: and as for thoſe that do belong to the Garden, I ſhall not ſo much as mention them.

The Yew-Tree is produc'd of Seeds; rub the fleſhy Subſtance off, then dry them, and when they be dry, put them in Sand a little moiſt, in a Pot or Tub; let this be done any time before *Chriſtmas*: keep them in houſe all Winter, and under ſome North-Wall abroad all Summer. The Spring come Twelvemonth after you put them in Sand, ſow them on a Bed, the Ground not too ſtiff; keep them clean, and prick them out of that Bed into your Nurſery: when they

they have ſtood two or three Years there, you may bring them to what Shape you pleaſe. It is a fine Tree, and worthy to be more increaſed.

Holly may be raiſed of the Berries, as the Yew, or by Laying; it loves a gravelly Ground, as moſt of our Foreſt-Greens do; it is a curious Tree for Hedges, and will grow under the dropping of great Trees: it well deſerves your Love, yet is ſomewhat tickliſh to remove, but the beſt time is before *Michaelmas*; if your Ground be ſtiff and cold, mix it with Gravel, but no Dung.

Box, the Engliſh and Edged, *&c.* do grow well of Slips, ſet about the latter end of *Auguſt*, or in *March*; it is very pleaſant in green Groves, and in Wilderneſſes, though it hath a bad Smell after Snow.

Juniper is raiſed of the Berries; it is tickliſh to remove; it is a pretty Plant for the aforeſaid places; the Berries are very wholeſome; the Wood burnt yields a wholeſome and pleaſant Perfume; ſo doth the Plant in the Spring.

Bays is increaſed plentifully of Suckers, or you may raiſe them of their Berries; they love the Shade, and are fit to be ſet in green Groves.

Laurel, or Cherry-Bay, is increaſed by Cuttings ſet about *Bartholomewtide*, and in the Shade beſt, or by the Cherries; it is a glorious Tree for Standards on moſt Grounds, but on our coldeſt and openeſt it holds out our hard Winters beſt: it may be kept with a clear Stem two or three Foot high, and let the Head be kept round; ſo that if you have a Row of them, the Trees all of a height and bigneſs, and the Heads all of a ſhape, no Tree is more pleaſant. It is fit for Groves, Wilderneſſes, Hedges, *&c.* It will grow well on any Ground, therefore make uſe of this beautiful Tree.

The Oak at firſt doth like a King appear,
The Laurel now at laſt brings up the Rear;

The one does render Plenty and Renown,
The other offers Pleaſure and a Crown:
The Elm, the uſeful Aſh, and Sycomore,
Together with the Beach and many more,
They promiſe all Content to thoſe that look
To practiſe what is written in this Book.

CHAP. XXX.

General Rules for Planting Foreſt-Trees in Avenues, Walks, or Orchards, as in Natural Ground.

FIRST, as to the Ground: Your Ground that hath been fed for many Years, Winter and Summer, as your common Paſture-Ground, or the like; ſuch Ground (if it be any thing good) is the beſt: The next is your Meadow-Ground; and then your ploughed Land, if your Land be of Soil alike: Thus I prefer them. Several Reaſons might be given for this: but I ſhall inſtance only in theſe few.

As namely, your Ground that is conſtantly fed, hath likewiſe conſtantly a Supply of Cattel's Dung and Urine, with the Variety of Kinds, which adds much to the Strength of the Ground; and likewiſe your Paſture-Ground, though it abound with great Variety of Herbs or Graſs, according to the Nature of the Ground, as alſo your Meadow-Ground doth; yet your Paſture-Ground hath not only a conſtant Supply of Soil by one ſort of Cattel or other, but the Graſs which grows on it doth ſeldom run to Flower or Seed; which, when they do, they draw forth much more of the Salt, or Spirit, or Strength of the Earth; as we find the Herbs or Graſs on Meadow-Grounds moſt commonly do. Therefore

I judge your Commons the beſt, and both common Field-Ground and Meadow better than conſtant ploughed Land; for that being kept with ploughing, to prevent what naturally it would produce, this makes the Ground the better: for 'tis certain, that where your Houſes ſtand, or Highways are, there the Earth is full of Salt and Spirit, or the Life of Plants, not only becauſe there is often ſome Aſſiſtance of Soil, which I confeſs makes it much richer, but alſo becauſe it cannot produce thoſe Plants which naturally it would, were it not reſtrain'd; for ſtill it receives a conſtant Supply from Nature: and as the Holy Scripture ſaith, the Almighty *cauſeth the Sun to ſhine on the Unjuſt as well as the Juſt*; ſo alſo hath the foreſaid Earth the ſecret Influence of the Heavens, as well as any other, unleſs accidentally prevented. But this by the way.

Now as for your ploughed Land, 'tis granted to be much better for ploughing; but this being ſown with Annual Grain, very much draweth out the Strength of the Earth: for I judge that your Annuals are much more drawing Plants than thoſe which will laſt ſeveral Years; it being in my Judgment with your Annual Plants, as it is with a Man who hireth a Houſe for a Year; when his Year is out, he, knowing he muſt remove, cleareth the Houſe, eſpecially of his own; whenas your durable Vegetable (like a Man whoſe Houſe is his own) is favourable to its Situation, having a kind of ſecret Knowledge (as I may ſay) that there he and his may continue many Years.

If this be underſtood, I hope you then will ſay with me, that your common Paſture is beſt to plant on; next to that Meadow, then ploughed Land, that is, if all three be of equal Goodneſs and Soil.

CHAP.

CHAP. XXXI.

Of Planting Foreſt-Trees to make Woods, or to fill up naked Places in Woods, where they want.

TO tell ſome Men of Planting of Woods is very needleſs, for there are too many Men more inclin'd to ſtock up than to plant them; but I ſuppoſe the greater ſort of Men, and I am ſure the beſt ſort, are more inclin'd to preſerve and plant, than to deſtroy and ſtock them up. To thoſe then that love either their Country or themſelves, or eſpecially their Poſterity, and have any Kindneſs for ſtately Foreſt-Trees, do I give this Advice.

Firſt, Let the Ground be of what Soil ſoever, be ſure to plant moſt of ſuch Trees as will grow beſt on that Soil; as if it be Gravel, then Beech, Holly, Hazel, *&c.* if mix'd with Loom, then Oak, Aſh, or Elm, *&c.* if ſtiff, then Aſh, Hornbeam, Sycomore, *&c.* if a light Loom, then moſt ſorts: and withal, have an eye to the adjacent Trees, and which ſort ſoever you ſee thrive beſt, be ſure to furniſh your Ground with ſtore of them.

Secondly, if your Ground be moiſt, then ſet in good ſtore of the Cuttings of Alder, Willow, Sallow, eſpecially the two laſt on any Ground; for if there comes a wet Spring, or a moiſt Summer, many of them will grow, and produce good Underwood, if ſet as is directed in the 26th or 27th Chapters. Though the Ground be dry, and a Gravel-Bottom, yet they will thrive and produce good Shoots in a little time, as I have found true at *Caſhioberry*, &c.

Thirdly,

Thirdly, If you be minded to ſow Seeds, then you muſt prepare your Ground with a good Tillage before you ſow your Seed, as much as you do for ſowing of Barley; and having all your Seeds ready prepared (by being kept ſome time in a Houſe till they be fit to ſpear, or ſpeared a little) then about the beginning of *February* ſow them: the particular Chapter of each Kind will tell you how long it is before they will ſpear. If you plough your Ground into great Ridges, it will make the Earth lie the thicker on the top of each Ridge, and there the Roots will have the more Depth to ſearch for Nouriſhment, and the Furrows will in a little time be filled up with Leaves, which, when rotten, will lead the Roots from one Ridge to another.

If your Ground be very dry, then plough your Ridges croſs the Deſcent of the Hills, not to drain the Water off, but to keep it on your Ground; and if your Ground be very wet, then the contrary.

But be mindful to ſow moſt of thoſe Seeds your Ground is moſt natural for. The moſt of theſe Seeds following may be ſown on your Ground: Oaks, Aſh, Beech, Sycomore, Hornbeam, Crab or Apple, Cherry, Walnuts, Cheſnuts, Holly, Hazel-nuts, Maple, Sarvice, *&c.* Which of theſe you find are not natural for your Ground, neglect them. Some do ſow their Seeds with a Crop of Barley, but the Seaſon of ſowing of Barley is too late for your Seeds, if they be prepar'd before-hand; but if you will be ſo ſaving as to have a Crop of that Tillage, then ſow your Seeds with Oats, for they may be ſown with the Seaſon of your Seeds. Do not ſow your Oats too thick, and they may do well; but the beſt way for your Seeds, is to ſow them without any Crop of Corn.

Fourthly, If you are minded to have a Wood ſoon, then plant it with Sets; and if your Ground be a good natural Ground for Trees, then you may make only Holes two foot wide, and as much deep,

and

and about half a Rod aſunder; ſo there will be four Holes in every Rod ſquare. But leſt my Reader ſhould be at a ſtand, and ask how four Trees may ſtand in a Rod ſquare, or four Holes be made in a Rod ſquare, and yet the Middles be each half a Rod, or eight Foot and a quarter aſunder; I ſhall here ſatisfy him by Example: and it ſhall be of a ſuppoſed piece of Ground, three Rod ſquare; you may make your Holes ſquare if you pleaſe. (*See Figure* 1.)

This is much like to that Queſtion, Whether is half a Foot ſquare, or half a ſquare Foot, moſt? when, as I have heard ſome ſay, they were both alike; but it was their Miſtake.

For half a Foot ſquare is only 6 Inches every way; that is, 6 times 6 is 36, and 6 times 36 is 216 Inches: when as half a ſquare Foot is the half of a Cubical ſquare Foot, the Number being 12, the ſquare Root is 144, for 12 times 12 makes 144, and 12 times 144 makes 1728 the Cube. Now the half of 1728 is 864, which is half of a ſquare Foot; then if you divide 864 by 216, you will find 4 for the Quotient; ſo that half a Foot ſquare is but ¼ of half a ſquare Foot. This I have demonſtrated as plain as I can, that I might be underſtood by every Country-Capacity.

36
6

216

12
12

24
12

144
12

288
144

1728

4
864(
216

Now if you were to plant one Acre of Ground after the aforeſaid manner, the Charge would be as followeth: If it be a good digging Ground, you may have 20 Holes made for 12 *d.* 2 Foot wide, and 2 Foot deep; ſo there would be four times 160 Holes, which is 640 Holes, at 20 for 12 *d.* that is 32 *s.* and then I allow for every Hole 2 Sets, ſo then it will take 1280 Sets, which will

640(32
22

1280(10
120

will coſt you together about 4 *d.* the 120, of any ſorts of Wood, which comes to about 3 *s.* 6 *d.* Then for every Hole 2 Sallow or Willow-Cuttings 3 *s.* then five Men to ſet them, 6 *s.* and then Keys and Seeds to ſow among your Sets next Spring, 5 *s.* 6 *d.*

	l.	*s.*	*d.*
Making Holes	01	12	00
Sets	00	03	06
Sallow Truncheons	00	03	00
Men to ſet them	00	06	00
Keys and Seed	00	05	06
Whole Charge	02	10	00

So that the Charge of one Acre of Ground planted this way, will coſt you about 2 *l.* 10 *s.* where Workmen and Sets may be had at ſuch a price. The Spring after, I adviſe to ſow Acorns, Sycomore Keys, Apple and Crab-ſtampings, *&c.* Let this ſowing be done as oft as you find Stampings and Keys to be had, till you find your Wood very thick. I did ſow all the Stampings of Apples and Crabs at *Caſhioberry* among our young Woods which I had ſet, and the Ground not producing a ſtrong Graſs to choke them, they came up thick, and did well. But take care you let them not lie too thick long, for if you do, the Stampings will heat and kill the Kernels: ſow them therefore as ſoon as they be preſs'd, or elſe lay them thin, or keep them parted with dry Straw.

But if your Ground be bad, and a ſhallow Soil, or that you would help an indifferent Ground, and are willing to be at ſome more charge to do it; then do thus, which in ſmall time will pay you or yours well for your Charges.

Obſerve which is the beſt way to lay out your Ground, and then divide it into four yards diſtance at both ends, by little ſtakes; and make Rows of ſtakes, by ſetting up ſome few between the two at each end, which are only to direct you to lay your work

work ſtreight, by ploughing one yard of each ſide your ſtakes. If your Ground be Green-ſorde, then plough it as is aforeſaid, which will make the better for the Roots of your Trees to run in.

Thus having plough'd two yards, and left two yards unplough'd all over your Ground, a little before the Seaſon for planting, and when the Seaſon for ſetting is come, (that is, as ſoon as moſt of the Leaves are off) having prepar'd Sets and Workmen, let them dig up the two yards that are unplough'd, laying one half of that Earth upon one of the plough'd pieces, and the other half upon the other; and as you lay up that Earth upon the plough'd pieces, there ſet your Sets about a yard one from another, with ſtore of Sallow Cuttings with them; digging that ground which you lay on your plough'd ground a good ſpade-deep, and then it will be near a foot thick to ſet your Sets in. Thus go from open (that is, unplough'd) to open, till you have ſet all the plough'd pieces in your Ground. One Man having the Sets ready, will ſet them as faſt as four Men ſhall dig; that is, two Men on each ſide the Beds or Ridges, one a little before the other: ſo finiſh Bed after Bed, till you have gone over and finiſh'd the whole Ground which you deſign'd to plant that Winter. And endeavour to get all your planting done by the latter end of *January*, or beginning of *February*; for this reaſon, that is, having provided Keys, Nuts and Seeds, as is before directed, (and is in each particular Chapter more fully diſcours'd) about that time ſow them, *viz.* about the beginning of *February*, unleſs it be a froſty Seaſon, for then you muſt ſtay a little longer. So ſow all your Beds over with Seed, and cover them a little with the Shovellings of ſome neighbouring Ditch.

In doing thus, you may be certain of a good thriving Wood in a little time, tho the Ground you plant on be ever ſo bad. This I do ſuppoſe to be as good a way as moſt are, for planting of Woods.

There-

Therefore, according to the *Latin* Proverb, *Serere ne dubites*, Doubt not to plant. And I wiſh I could perſuade Noblemen and Gentlemen, who have Ground that is not very good for Corn or Graſs, to plant it with Wood; eſpecially in thoſe Countries where Wood is ſcarce: I dare inſure them, that it would be to them or their Succeſſors a very great Benefit, and alſo a great Ornament to their naked Grounds.

Now I ſhall endeavour, as near as I can, to give you an account what the Charge of this may be; which, did I but know your Ground, and what Wages your Workmen in ſuch places have for one Day's Work, I could then do more exactly.

But we will ſuppoſe the Ground to be a good digging Ground, that may be afforded to be digg'd and laid up for 4 *d.* the Rod ſquare; and our Example ſhall be of one Acre of Ground, of which you may well perceive by what is before ſhew'd, there will be but one half plough'd, and that half planted.

Firſt then, for a good deep ploughing of half an Acre of Ground 4 *s.*

Secondly, For half an Acre of Ground digging, at 4 *d.* the Rod (for if 160 Rod make one Acre, then 80 Rod is half an Acre, and then 80 Groats for the digging) comes to 1 *l.* 6 *s.* 8 *d.*

2 (2
80 (26 *s.*
33

Thirdly, If every four Men muſt have one Man to ſet them, then there muſt be near one fourth part more for him; which one fourth is 6 *s.* 8 *d.*

Fourthly, If we allow for every Yard ſquare in this half Acre, one good Set, beſides Truncheons of Sallow and Willow, *&c.*

5.5 — the ſide of a Rod ſq. is 5 yards and $\frac{1}{2}$.

5.5
275
275

30.25 — The Number of Yards in a ſuperficial Rod ſquare is 30 and $\frac{1}{4}$.

$\frac{1}{4}$ 160

160----- { The number of ſuperficial ſquare Rods in one Acre 160.

181500
3025

4840.00 { The number of ſq. yards in one Acre, or 160 Rod, 4840.

Or if you would work this Queſtion by the Line of Numbers, and your Compaſſes, ſet one point on one; extend to 5 and $\frac{1}{2}$, the ſame will reach from 5 and $\frac{1}{2}$ to 30 and $\frac{1}{4}$.

Secondly, Extend your Compaſs from 1 to 30 and $\frac{1}{4}$, the ſame will reach from 160 to 4840. Thus you may prove your Work by two Turns of your Compaſſes.

(40
4840(40
1220

1 (1
40 (13
33

Now finding 4840 Yards in one Acre of Ground, and for every Yard one Set, at 120 for 4 *d.* comes to forty Groats, and forty over, (which is 13 *s.* 5 *d.* 1 *q.* and $\frac{1}{3}$ of *q.* for forty Groats is 13 *s.* 4 *d.*) then to know what the odd forty come to, the Rule ranks it ſelf thus: If 120 coſt 4 *d.* or 16 *q.* what then will 40 coſt?

40
120 : 16 : : 40

240 (40 120 (3
40 14 40
640 (5
640 : 120

So you ſee that theſe 40 will coſt 5 *q.* and 40 over; and if you divide this 120 by 40, then there will be 3 in the Quotient, which ſhews that 40 is $\frac{1}{3}$ of 120. So that 4840 Sets at 120 for 4 *d.* will coſt thirteen Shillings

Shillings five Pence one Farthing, and one third part of a Farthing.

For Truncheons of Sallow and Willow 3 *s.* and for Seed 10 *s.*

	l.	*s.*	*d.*
Plowing	00	04	00
Digging	01	06	08
To a Man to ſet	00	06	08
For Sets	00	13	06
For Truncheons	00	03	00
For Keys, Nuts, and Seeds	00	10	00
Whole Charge is	03	03	10

Thus have I ſhew'd ſome ways for the planting of Woods, and alſo what Charge it will coſt you: tho I have ſpoke of the loweſt Rates that good digging Ground can be done at, and where Men work for 10 *d. per* day, yet if you love planting, and your Ground be a bad Ground to dig, (as a Gravel or ſtiff Clay) and that your Sets be ſcarce, or that you be minded to plant more in your Ground (which will be the better) then if you allow as much more to each Acre, the Charge may be computed accordingly, and you will find it not to be great.

There are more ways to plant Woods, but theſe I take to be the beſt: or thus, inſtead of making your Holes round, you may make them a long ſquare, and the Holes will be the eaſier to make after this way. (*See Fig.* 2.)

This that hath been ſaid, I hope will be ſome ſatisfaction to thoſe that love planting of Woods, and are to ſeek in the ways; which if it be, I then ſhall be well ſatisfy'd, for my Deſign is a general, more than a particular Good.

Now having finiſh'd your Wood, take care to keep it well fenced from Cattel of all ſorts; and when it is about ſeven or eight years growth, then fell it, pruning up thoſe to a head you are minded to leave

for Standards, leaving half as many more as need to ſtand, for Timber-Trees; as Oak, Aſh, Elm, Beech, *&c.* felling the reſt at the ground, not flat off, but well ſloped up. And if you have Popler, Abele, Cherry, Elm, Sarvice, *&c.* they will ſpring much from the Roots, and thicken your Woods; if not, ſet ſome in.

CHAP. XXXII.

Of Planting young Hedges, and how to improve and keep old Hedges.

THERE are and may be made many ſorts of Hedges of one particular ſort of Wood alone, ſome for Ornament only, ſome for Ornament and Profit, and ſome for Ornament, Profit, and a Fence. Juniper I take to be one of the beſt to make a low Hedge, of any Plant or Tree we have growing in *England*; for it grows naturally very thick, is a ſlow Grower, and hath always a fine freſh green Colour, and the ſevereſt of our hard Winters will not make it change its Countenance. I confeſs it is ſomething tickliſh to be remov'd; for it's being not uſed to ſtir far from home, makes it many times loſe its way, and its Life too, if led far from its native place at unſeaſonable times, or by an ignorant Guide, and put into ſuch an Habitation as is not ſuitable for it to live in. I have with good ſucceſs remov'd it above thirty miles, namely, from beyond *Caſhioberry* to *Little Hadham*; there I made my Ground (notwithſtanding it was naturally a ſtiff Clay) by mixing it well with Gravel and Sand. I remov'd it a little after *Bartholomew*-Tide, and I did not loſe one Plant in ten; but they do flouriſh in two little Hedges moſt gallantly

I ſhall not ſpeak of that moſt healthful Aromatick Seed which it beareth, nor of the Uſe of this Cedar; but if you would be further ſatisfied, ſee Eſquire *Evelyn*'s Diſcourſe of *Foreſt-Trees*, or any Herbal. I have not as yet raiſed any of it of Seed, but I am now making a trial; which if they once come to endure removing while young, I doubt not but then they will be better to remove when old.

Holly makes a moſt ſtately and beautiful Hedge; and had we but ſtore of the white-berry'd Holly to mix in the Hedge with the red, it would make it the more ornamental. Its Ground that it moſt delights to grow on, is dry and gravelly; ſee more in the Chapter of Holly. Or had we but ſtore of the ſtriped to make Hedges with, it would be very noble indeed.

Hornbeam may be kept in a good ſhape for a high Hedge, and very thick even to the Ground. It is (alone) one of the very beſt home-bred natural Foreſt-Trees that ſhed the Leaf, to make a Hedge of: and is fencible, unleſs againſt the rudeſt ſort of Cattel.

Box maketh a good Hedge, and laſting; I mean the *Engliſh*, tho the others are pretty for Hedges, both the Gilded and the Dwarf: but theſe two being not proper to name, or to diſcourſe of among Foreſt Trees, I ſhall only name them and many other ſorts, and ſo paſs forward.

Laurel (as we call it) or Bay-Cherry, makes a good Hedge; and if well kept, very fine Standards. Hard Winters do pierce it on ſome Grounds, but on moſt it is durable: it is eaſy to increaſe, and will grow well on moſt Grounds; keep it but down, and it will grow ſtrong below, and thick, and then make a very fine Hedge.

Arbutus, or Strawberry-Tree, is a curious Plant for a Hedge, only it is very tender, eſpecially while young: for the Leaves being conſtant whilſt Life laſteth, and of a fair green, finely dented about the edges, and its pretty white Flower in Summer, with

its Strawberry on, the beginning of Winter; all together add a great deal of Grace to this Plant.

Cypreſs would make fine Hedges, but for two Faults: for firſt, in ſome Grounds it is tender, and will not abide our hard Winters: and ſecondly, it doth not love to be headed, for that makes it ſtill more tender. Cut it not late in Summer.

Mezereon, or Dwarf-Bay, both the red and white together, make a pretty low Hedge, and ſhew very beautifully early in the Spring.

Alaternus, or ever-green Privet, makes a fine thick green Hedge; it ſhould be ſupported with a Frame, eſpecially while 'tis young.

Pyracantha, or prickly Coral, makes a good thick Hedge, and a very fine Shew when it is full of its fine red Berries, which appear like Beeds of red Coral among the dark green Leaves. It likes our Entertainment ſo well, that it will grow well on moſt Grounds; our Winters diſturb it not, and 'tis very eaſy to be multiply'd or increas'd by Laying or Cuttings.

They that have ſtore of Ground, and are Lovers of Plants, I hope will not be without theſe few named, and many more that will be very acceptable; but they are not ſome of them ſo proper for Hedges. Many more there be that would make very fine Hedges for Pleaſure, if well kept; as the double-bloſſom Cherry, the *Laurus Tinus*, or wild Bay, Primme, Savin, *&c.*

Theſe few are only for Ornament, and make (any of them) fine Hedges alone: or you may mix them with Judgment, and they will then be very pleaſant.

Now I ſhall ſhew you a few of thoſe that are for Profit and Ornament; ſuch are the Summer-Pears on Quince-ſtocks, for that makes them the more dwarfiſh. Cherries make a fine Hedge, but eſpecially the ſmall-leaved, as the ſeveral ſorts of *Flanders*, great Bearers, *&c.*

Plumbs,

Plumbs, Quinces, Codlins, Barberries, *&c.* all theſe make fine Hedges, but muſt have Supporters. In the three laſt there is this fault, that the better they be kept, I mean the handſomer, the worſe they will bear. But I am got two ſteps too far into the Garden, and now I ſhall give you an account of ſuch as are proper to fence in your Woods, Orchards, *&c.* which is the Scope of my Diſcourſe; for ſuch are both profitable and pleaſant, tho not ſo ornamental as the other before: and if you would make a Fence of one particular ſort of Wood, the very beſt is your White-buſh, or White-thorn.

Your Crabſtocks make alſo a ſtout ſtrong Fence: and if you leave at every twenty feet one to run up, keeping it with pruning till it is five or ſix feet high, and then graft it with Red-ſtreaks, or other good Syder-fruit, ſuch a Hedge would be very pleaſant and profitable. You may ſo order your Stock and Tree whilſt they be young, that by pruning you may have the Head of your Tree to hang into your Ground, a little over your Hedge: Let me deſire you to make ſuch a Hedge where you have occaſion to make one. As for your Stocks, they are as eaſy to raiſe as Barly, and they are as certain to grow on moſt ſorts of Ground, as any one Wood I know.

For common and publick Fences there is none to compare with theſe two, for certainty of growing, for a thick, ſtrong, and an armed Fence.

Black-buſh makes a good ſtrong Fence, but it hath one Inconvenience, that is, it will not keep within its bounds, but will run very much into your Ground, and there be very troubleſom to keep out: therefore if your Fence be for Wood, it may do well, for the reaſon aforeſaid. Alſo when you plaſh it, it will often be ready to die, by reaſon that it ſhoots ſo much from the Root.

Thus have I ſhew'd you ſome ſorts of Woods to make your Hedges with; I ſhall now give you ſome Directions how to make them: And here obſerve,

that for all thoſe which are for Ornament only, you muſt prepare a Border by good digging and clean picking it from Weeds; adding ſome good natural Earth, ſuch as the Kinds you ſet do moſt naturally grow in, which let be well prepared againſt the Seaſon for planting, and then make uſe of your time. The greateſt ſort may be ſet about a yard one from another, ſuch as your Holly, Laurel, *&c.* the other about two foot or leſs, ſuch as your Juniper, Mezerean, *&c.* Let this be the moſt; but if you have ſtore of Plants, ſet them thicker: be ſparing in heading moſt ſorts of Greens.

For thoſe that are for Ornament and Profit, the Ground muſt be made good, trenched deep, and mix'd well with Dung; they may be ſet about ſix foot aſunder. You may make very curious Hedges of Pears, Cherries, *&c.* But I am too far got into the Orchard or Garden; I muſt retreat to my Foreſt-Trees, to ſhelter me from the Gardiner's Anger.

Of thoſe ſorts that are for Ornament, Profit, and for Fence, I have told you that there are two peculiar ſorts, *viz.* the White-thorn and the Crab; which are indeed the moſt proper to fence in our Foreſt-Trees and Woods, of any I know. I know moſt Hedges, which are mix'd with many ſorts of Wood, are apt to come too faſt without planting Sets of White-thorn, which in moſt places are plentiful to be had; but if you would raiſe them of Haws, order them as is ſhew'd of the Cherry or Yew-berries.

Now to raiſe your Crab or Apple-ſtocks, (tho the Crab-ſtocks are better than your Apple-ſtocks, for the Crab grows more rugged, ſtrong, and is more laſting, but Stocks raiſed of Apple-Kernels will do well) let your Ground be well prepared by digging, and picking it clean from Weeds; mix it with ſome good rotten Dung, then when the time is that they beat their Crabs for Verjuice, or Apples for Syder, prepare your ſelf with ſo many as you think are convenient

venient for your Ground; and as ſoon as they be ſtamp'd, ſow them if you can, for if they lie long in the Stampings, that will heat and ſpoil your Kernels. Therefore if you have them to fetch far, or that you cannot ſow them inſtantly, then let them be ſifted from the Body of the Apple, and ſpread thin, or mix'd with dry Sand, till you have opportunity to ſow them; or you may keep them in Sand (the Kernels I mean) a little moiſt, till *February*, and then ſow them; but be ſure your Ground be well prepared before-hand with good Tillage, and clean picking; cover them about one inch, or a little more, with fine Mould: afterwards, when they come up, keep them conſtantly clean from Weeds; remembring if you ſow at *Michaelmas*, that you take care to keep Traps ſet, for fear Mice rob you of your Kernels. Thus may you raiſe what quantity of Stocks you pleaſe, which at two and three years old you may ſet where you would have them to ſtand, to raiſe Trees, or to make Hedges for fencing in your Ground. Keep them clean from Weeds by digging or hoeing.

Thus having ſhew'd you how to furniſh your ſelves with ſtore of Stocks in a little time, which will make you as ſtrong and good Fences as moſt Wood whatſoever; and are very profitable too, both to yield good Liquor for Drink, and to bring good Fewel to the Fire: I ſhall now ſhew you how to plant theſe Quickſets, both for Hedges with Ditches, and for Stant-hedges (as ſome call them) without Ditches.

Firſt, Strain a Line where the Inſide of your Ditch muſt go, next your Hedge; then mark along by the Line, ſloping, as you would have the Bank of your Hedge to ſlope; then ſtrain the Line on the other ſide of the Ditch, and mark it out ſloping inward to the Ditch, as you did the other ſide. For example, Suppoſe you make your Ditch a yard at the top, and three ſpade or a yard deep; let it ſlope ſo on both ſides, that it may come to a foot wide at the bottom,

but let the Hedge-ſide ſlope the moſt: then if your Ground be Green-ſwerd, and ſtiff Land, with a Turing Iron take all the Turf off the breadth of your Ditch, then cut out a Triangle-piece all along next the Bank; turn that upſide down, for to make the Slope of your Bank. Lay ſome of the Turf you cut off, or all of it, on the backſide of that Triangle-piece; thereon ſet one Row of Quick, covering the Roots with Crumbs of Mould, the Ditch one yard, and the Bank a yard, as you may ſee in *Fig.* 3. where A. is the Triangle-piece cut out of the Ditch, B. the Piece laid on the Bank, with the Turf laid graſs-ſide downward, and the Set on the top of that Piece: then level up the Bank till it comes level with the top of the piece B. and then lay on ſuch another angular piece, and on the top of that a Quickſet, as the other; then level up as before, and ſet another angular piece, with the Quick on the top: So have you three Rows of Quickſet, which let ſtand about one foot from another in each Row, and if your Ground or the Bank be dry, ſet them a foot deep, and if you will, you may ſet one Row on the top of the Bank; but three Rows ſet each againſt other, open, triangular, make an excellent Fence, if ſet as is aforeſaid. (*See Fig.* 3.)

And note, that the higher and larger you make your Bank, the better your Quick will grow; for this Paradox is true in planting, That the more you ſpend, the more you ſhall get. But if your Ground be a light Soil, then you need not take off the Turf from the Triangle-pieces, becauſe the Turf will make ſuch Ground hold up the Bank the better; but then it will grow out at the edge of the Angle, and ſo will trouble you the more to weed your Quick: and beſides, you will want it to lay in the midſt of your Bank, which would feed your Sets much, and make them grow better.

But if you would make a Stant-hedge without a Ditch, the uſual way is, to dig a Trench about a foot

and

and a half wide; therein ſet two or three Rows of Quick, which on good Land may prove indifferent well, but if your Ground be bad, or that you would make it grow and proſper well on any Land, then dig a place where your Hedge muſt ſtand one yard wide, and make a Bank with Earth one yard high, being one yard at the bottom, and narrow'd by degrees to a foot at the top. Set two Rows of Sets on each ſide this Bank, as is ſhew'd before about planting the Bank by the Ditch; or you may make this Bank two feet wide below, and two feet high, ſetting one Row of Quick on each ſide, and one on the top, as is before directed: and ever obſerve, that the larger you make your Banks, the better your Sets will grow, as is before noted.

You may, if your Fence be near to a High-way, have Earth ſufficient from thence to make this Bank, which will be a little Fence of it ſelf, and help the Growth of your Sets much; or you may ſlope off your Ground a foot deep by this Bank, and ſome ten foot off come out to the Level of the Ground: there may you furniſh your ſelf with Earth to make the Bank, ploughing or digging up that ground where you took off the Earth, adding a little Dung to it, which you may ſow in the Spring with Corn or Hay-ſeed, and your Ground in little time will be never the worſe, eſpecially if the Soil be good.

Thus having ſet your Hedge, cut off all the Sets within one inch or two of the ground, and keep them weeded for two or three years; and when they have ſhot two years on good, or three years on indifferent ground, cut them off within three inches of the ground: but if there be ſome places too thin, there lay down ſome into the gaps, and cover them and the reſt over one inch with Mould, leaving the Ends of the Layers out, which will draw Root, and thicken your Hedge. Let this be practis'd at all times, when you make or lay your Hedges.

But note, if your Hedge be ſet with Crab, or Apple-ſtocks, that you leave one ſtanding, uncut up, at every twenty foot, or at every ten or twelve foot, if the Ground be your own on both ſides the Hedge; then may you ſo order them, by pruning or ſtaking, that one may lean into one ground, and the other into another, *&c.* Prune up theſe Stocks yearly, till you have got them out of Cattels reach, and then graft them with Red-ſtreak, Jennit-moyl, or what Syder, or other Fruit you pleaſe: but if your Stocks be of Apple-kernels, you may let them ſtand ungrafted, and they will yield you very good Syder-Fruit; but Stocks ungrafted will be longer before they bear, and alſo when you graft, you may be certain of your Kind: but if you find a very natural Stock, that is likely by Leaf, Shoot and Bud, try it; by ſo doing you may have a new fine Fruit: if you like it not, you may graft it when you pleaſe.

The reſt of the Hedge, when it hath ſhot three or four year, you may lay, for to make a Fence of it ſelf; for you muſt mind to keep it from Cattel till it comes to be laid, and one or two years after. And how to lay it, I ſhall give ſome few Rules, which may direct you when you lay any Fence-hedge, of what ſort of Wood ſoever it be.

Firſt, At every laying, lay down ſome old Plaſhes, or young ones if your Hedge be thin; but let them point with their Ends to the Ditch-ſide of the Bank, keeping the ends low on the Bank: they will the better thicken the Bottom of your Hedge, and keep up the Earth of your Bank.

Secondly, At every Laying lay Earth on your Bank, to heighten it, and to cover your Layers all but the Ends: which Earth well help your Quick much, and make the Fence the better, by heightning the Banks, and deepning your Ditch.

Thirdly, Do not cut your Plaſhes too much, but juſt ſo much as they may well bend down; and do not

lay

lay them ſo upright as ſome of our Work-men do, but lay them near to a level, the Sap will break out at ſeveral places the better, and not run ſo much to the ends as it will when they lie much ſloping. If you have Wood to ſpare, cut up moſt of thoſe that grow near the Ditch; but hang the Bank then with Buſhes, to keep the Cattel from cropping them the firſt year: theſe will ſhoot ſtrong, and ſecure your Hedge well, keep up the Bank, and thicken the Bottom of your Hedge, *&c.*

Fourthly, Lay your Hedge pretty thick, turning the Beard on the Ditch-ſide; but do not let the Beard hang uncut, as the common Workmen do, (tho it doth make a good Shew at firſt making) but cut off all the ſtraggling Boughs within half a foot of the Hedge on both ſides, then will it ſhoot ſtrong at theſe Places, and thicken your Hedge much the more: Of this, Reaſon may inform you, as it did me, and Experience will confirm it.

Fifthly, If you have got a good high Bank, make your Hedge ſo low, as you think it may but juſt ſerve for Fence the firſt year; for it will ſoon grow high, and the lower your Hedge is made, the Quick will grow the better, and the Bottom will be the thicker; but take care to keep out Cattle from the Field-ſide, the firſt year after it is made.

Sixthly, If you would have a good Hedge for Fence, you muſt fell it often, doing as is aforeſaid, and take care at every felling to root out Elder, Traveller's Joy, (that is, Bull-bine, as ſome call it) Briony, *&c.* and alſo leave not too many high Standard-trees or Pollard, in it; the Elm is one of the beſt. Do not uſe too much dead Wood in the Bottom of your Hedges, for that choaks your Quick; but if you have a Gap, make your dead Hedge at a diſtance. Much more I could ſay of Hedges, but I forbear.

Only I cannot paſs by the learned Squire's good Advice, in his *Diſcourſe of Foreſt-Trees*, (pag. 50.) which is this: *I do only wiſh, upon the Proſpect and Me-*

ditation

ditation of the Univerſal Benefit, that every Perſon whatſoever, worth ten Pounds per Annum, *within his Majeſty's Dominions, were by ſome indiſpenſable Statute oblig'd to plant his Hedg-rows with the beſt and moſt uſeful kinds of them; eſpecially in ſuch places of the Nation, as be the more Inland Counties.* Thus far the learned Author; to which I add, that if they did not plant ſo many Trees, and keep ſuch a number planted, they ſhould be compell'd to plant ten Crab-ſtocks for the want of one Tree, *&c.*

If this were but as much in uſe with us as it is in *Herefordſhire*, and once grown to a Cuſtom, we ſhould in a few years baniſh out foreign Drinks by this our excellent and moſt wholeſom one. Beſides, our Trees in ſhallow Ground would thrive better in Banks of Hedg-rows, than in the middle of the Ground.

Again, ſaith he, *Undoubtedly if this courſe were effectually taken, a very conſiderable Part both of Meat and Drink which is ſpent in our prejudice, might be ſaved by the Country-People, even out of the Hedges; which would afford them not only the Pleaſure and Profit of their delicious Fruit, but ſuch Abundance of Syder and Perry as ſhould ſuffice them to drink of one of the moſt wholeſom and excellent Beveridges in the World.*

Old *Gerrard* did long ſince alledge us an Example worthy to be purſu'd: *I have ſeen* (ſaith he, ſpeaking of Apple-trees, *lib.* 3. *ch.* 101.) *in the Paſtures and Hedge-rows about the Grounds of a worſhipful Gentleman, dwelling two Miles from* Hereford, *called Mr.* Roger Bodnome, *ſo many Fruit-trees of all ſorts, that the Servants drink for the moſt part no other Drink but that which is made of Apples: the Quantity being ſuch, that (by the Report of the Gentleman himſelf) the Parſon hath for Tythe many Hogſheads of Syder. An Example doubtleſs to be followed of Gentlemen that have Lands. But Envy ſaith, the Poor will break down your Hedges, and we ſhall have the leaſt part of the Fruit: however, I adviſe you to go forward, in the Name of God;*

God; graft, ſet, plant, and nouriſh up Trees in every Corner of your Ground; the Labour is ſmall, the Coſt is nothing, the Commodity is great, your ſelves ſhall have plenty, the Poor ſhall have ſomewhat in time of Want to relieve their Neceſſity, and God ſhall reward your Minds and Diligence. Thus far honeſt *Gerrard.*

And in truth, with how ſmall Charge and with how great pleaſure this were to be effected, every one that is Patron of a little Nurſery can eaſily calculate. But by this Expedient many thouſands of Acres, ſow'd now with Barley, might be cultivated for Wheat, or converted into Paſture, to the increaſe of Corn and Cattle; beſides the Timber which the Pear-tree doth afford, comparable for divers curious Uſes with moſt: this alſo would make Timber the more plentiful; the decaying Trees and Pruning would be good Fire-wood.

One thing more I do wiſh was practiſed in our Hedges, and thoſe fined ſeverely that did not obſerve it, *viz.* That there ſhould not an Oak in any Hedge whatſoever, be headed; but that the Owner might have Liberty to ſhred them up as ſome do Elms, tho not to ſtock or fell them till ſuch an Age: in ſuch Banks we ſhould have the beſt Timber, and enrich the Owner, *&c.*

CHAP.

CHAP. XXXIII.

Of Planting ſeveral ſorts of Foreſt-Trees, in order to make the beſt Advantage of Ground, as Orchards, or the like.

SUppoſe you were to plant one Acre of Ground, or more, with Walnuts or Cheſnuts, or the like, and would have it planted to the beſt Advantage; that is, to have your Trees ſtand in good order to the Eye, and to have as many Trees as conveniently you can in your Ground (which is ſuppoſed all Men would have) and yet your Trees to ſtand at convenient diſtance.

Now (I ſay) ſuppoſing your Ground to be one Acre, and a Geometrical Square; in ſuch a Ground you may begin your firſt Row on which Side you pleaſe, to ſtake out on your Ground for the Holes to be made: you muſt firſt reſolve what diſtance your Trees had beſt be planted at; remembring that if your Ground be good, and a deep Ground, then you may plant your Trees at ſomewhat the greater diſtance. Of the Ground that moſt Trees delight in, you may ſee in the particular Chapter, ſpeaking of each kind. Your beſt way is to plant them triangular, and not ſquare as ſome do; for you can plant them in no form or order whatſoever, to be more pleaſing to the moſt noble Senſe, than to have every three Trees to make an equilateral Triangle; nor in no other way whatſoever to have ſo many Trees to ſtand in ſuch, or any Piece of Ground whatſoever, at ſuch a diſtance. For Satisfaction, and likewiſe to demonſtrate it more fully, obſerve theſe two following Figures

gures of the aforeſaid piece of Ground, which is one Acre, and is a Geometrical Square.

But before I ſhew you a Draft, or you ſtake out your Ground for your Holes to be made, firſt conſider well theſe few Rules.

Firſt, Obſerve the Diſtance that your Trees ought to be planted at; always remembring that if your Ground be good, and a deep Soil, then your Trees will hold the longer, and by conſequence grow to the greater Perfection; therefore plant at larger diſtance. As for Example: If I were to plant this Acre of Ground with Syder-Apples, (as for inſtance, all Red-Streaks, which is an excellent Syder-Apple, and is likewiſe a great Bearer, and a Tree that doth not laſt very long) my Ground being alſo a ſhallow Ground, I think of 22 Feet aſunder to plant theſe Trees at, or as near that as the Ground will permit.

Then Secondly, I go round my Ground, and obſerving my Fence well, and finding no great Trees in it, I then reſolve to ſet my Trees at ſix Foot from my Fence, (but note, if there be great Trees in your Hedge that fences your Ground, then this is too nigh) then I ſet off ſix Feet at one Corner of my Orchard, and ſix Feet at the other Corner of the ſame ſide, which is the Eaſt-ſide; then I ſet off ſix Foot at one Corner of the Weſt-ſide, it matters not which, only that End which is the levelleſt, is the beſt for meaſuring. Having ſet theſe three Stakes, I ſtrain a Line from one Stake to the other, on the Eaſt-ſide; then I lay a Square to this Line, removing it along the Line till I find the other end of the Square point exactly againſt the Stake on the Weſt-ſide; then laying a Line right ſquare to that Line, till you come at the Stake on the Weſt-ſide, I then meaſure by this Line as many 22 Feet as I can, noting how many times 22 Feet I find; and what you find is over, or more than 11 Feet, then make your diſtance the leſs, to make that up the equal diſtance for one Tree more: but if it be leſs than half the

diſtance

diſtance your Trees are to ſtand aſunder, then add that which is under the 11 Feet, to the number of Trees that are to ſtand aſunder. Obſerve but this, and then you need not fear that your Trees will ſtand too far on one ſide, and too near on the other, it being the ſame Charge to plant in good order as at random, as too many do; nay mnay times leſs Charge: and how much more pleaſing Order is, I leave them to judge to whom the great God of Order hath given a great delight to imitate him in his glorious Works.

But as for this my Piece of Ground, which I pitch on only for Example, *viz.* one Acre, and a Square; I muſt find the ſquare Root of 160 Rod, or as near it as my Chain will give, and then ſubſtract but the 12 Feet out for the Diſtance of Trees from the Fence, and divide the Remainder by 22, the Quotient tells you how many Trees will ſtand in a Row; the Over-meaſure ſubſtracted from, or added to, as your Reaſon teacheth you.

Note this, that it is moſt commonly the beſt way for your Rows to go the longeſt way of your Ground; for tho your Trees ſtand 22 Feet aſunder, yet your Rows in their ſtreight Line will not ſtand ſo far.

Now to find the ſquare Root there are very many Rules, but none that are to my Apprehenſion ſo exact and eaſy as by Logarithms; find but the Logarithm of your Number, then take half that Log. the Number anſwering is the ſquare Root.

Exam. The Log. of 160, is 2.20411998.
The halt of this Log. is 1.10205999.

$\frac{65}{100}$ The neareſt Number anſwering this Logarithm is 12 Rod, that is, 12 Rod 65 Links of a one Pole-Chain divided into 100 Parts.

The Proof may appear by theſe three Examples following.

Ex.

Ex. as 12.65: by 12.65:	*Ex.* as 12.64: by 12.64:	*Ex.* by Log. 12.65: is 1.1020965 Log. 12.65: is 1.1020905
6325	5056	The Number that 2.2041800
7590	7584	anſwers this Log.
2530	2528	is 160.02.
1265	1264	
160.0225	159.7696	

By this it doth plainly appear, that 12.65 is the neareſt Number that can be found: by your Decimal Chain it is but $\frac{225}{10000}$ more, and by Logarithms but 2 of a Link put into 100 parts; therefore exact as need be for this purpoſe, unleſs it were for Calculation in Aſtronomy, or the like. And you ſee that 13.64 multiply'd in it ſelf, amounts to 159 Rod and $\frac{7696}{10000}$; ſo that I take 12 Rod and 65 of 100 to be Length or Breadth: it being a Square, they both are as one.

Now becauſe the Queſtion is propounded in Feet, we muſt turn this 12 Rod and $\frac{65}{100}$ into Feet alſo; but note, you may work the ſame by the Links of your Chain better than by Feet Meaſure: but ſome ('tis poſſible) have not a Chain, therefore obſerve both ways; and firſt by Feet Meaſure.

12 Rod multiply'd by 16 Feet and a half, ſhew the Feet in 12 Rod.

As *Ex.* 16.5 gives 198 Feet:

12	
330	Then for the 65 Links of one Rod, put into 100 parts, or if it be your four-Pole-Chain (as is moſt uſual now) put into 100 Links; then are theſe 65 Links but 16 Links and a quarter by that Chain:
165	
198.0	

then by the Rule of Three ſay, If 25 (the Links in one Rod) be equal to 16 Feet and a half (the Feet in one Rod) how many Feet are equal to 16 Links and a quarter?

The Queſtion ranks it ſelf thus in Decimal Fractions.

As 25 is to 16.50, ſo is 16.25 to 10 Feet $\frac{725}{1000}$ of a Foot.

16.50
16.25

8250
3300
9900
1650

268.1250

x
zz
x462
268.xz50 (10.725
zzzzzz
zzzz

Do you deſire to know what this Fraction $\frac{725}{1000}$ is, in Inches or Barley-Corns, which are the loweſt vulgar Terms in ſurveying? To ſatisfy you, and alſo my ſelf, and likewiſe to inſtruct thoſe that deſire to learn this excellent Rule, the Rule of Three, which rightly (for its excellent Uſe) is call'd the Golden Rule:

Obſerve this; if one Foot, or 12 Inches, be put into 1000 parts, as here it is (and muſt be, becauſe 'tis the Integer, or whole Sum of 725) the Rule orders it ſelf thus: As 1000 is to 12 Inches, ſo is 725 to 8 Inches $\frac{700}{1000}$.

725
12

1450
725

8700

(700
8700 (8
x000

Now to know what this $\frac{700}{1000}$ is in Barley-Corns, do as before; ſay thus, If 1000 be equal to 3 Barley-Corns, what is 700 equal unto? I ſay, as here you ſee it proved, that 700 is equal to two Barley-Corns,

Corns, and one tenth part of one, for 100 is one tenth of 1000.

700
3
2100

2100 (2
1000

By this it doth plainly appear, that if 12 Rod $\frac{65}{100}$ be turned into Feet, it maketh 208 Feet, 8 Inches, 2 Barley-Corns, and one tenth of a Barley-Corn: ſo that you ſee the ſquare Root of an Acre is near 208 Feet, 8 Inches, 2 Barley-Corns, neglecting $\frac{1}{10}$, becauſe $\frac{65}{100}$ is ſomewhat too much. Now from this 208 Feet 8 Inches, I take the 12 Feet for the Trees to ſtand off from the Fence, there remain 196 Feet 8 Inches; then I divide this by 22, the diſtance the Trees are to ſtand aſunder; ſo I find there may ſtand ten Trees, for here you ſee there may be open places, and 20 Feet 8 Inches for one more: ſo there wants but one Foot 4 Inches (or 16 Inches) to make ten Trees in a Row, for there is always a Tree more than the open.

3 (20
196 (8
2

Note, that in planting of Walks, this is of good uſe, that (as I ſaid before) to make one Tree more, this 16 Inches I divide by 9 (becauſe there are 9 Opens between the 10 Trees) the Quotient is near 2 Inches; which ſubſtract from 22 Feet, and there remain then 21 Foot 10 Inches; and ſo much muſt every Tree ſtand aſunder. The Proof is as followeth:

22 Feet: 0
20 Feet: 8 In.
01 Foot: 4 In.

21 Feet: 10 Inches: 189
9 9 (6 In: 7
189 920 (7 Feet: 196 Feet;

12

Here you ſee that 'tis 196 Feet and 6 Inches, it wants but 2 Inches.

Then to know what Diſtance your Rows may ſtand aſunder, the Rule is, if you make an Equilateral Triangle, the Perpendicular of that is the Diſtance between the Rows; which Triangle I have drawn by the ſame Scale of the Orchard. (*See Figure* 4.)

See Chapter 44. The breadth of my Paper 6 Inches, the Plat 196 Feet, and 66 of 100 for the 8 Inches; my Scale is near 33 parts in one Inch, but I take 32 becauſe it is an even Number. (*See Figure* 4.)

145 ($\frac{3}{4}$
196.66 (32.79
6666

If you will try the Perpendicular of this Triangle, 'tis but 19 Feet; ſo that there are 3 Feet between every 2 Rows ſaved by planting your Ground this way, more than thoſe that plant their Ground to have every 4 Trees to make a Square, the Trees ſtanding in both at the ſame diſtance.

But finding that but little Paper beareth the full Breadth of 6 Inches the quarter of a Sheet, and this being leſs ſquare by 12 Feet than my full Draught ſhould be, this being only for the Square of the Trees; I draw and proportion my Scale to the Breadth of 5 Inches and a half: 208 Feet divided by 5 and $\frac{1}{2}$, ſheweth that your Scale muſt be one Inch divided into 37 parts, and better. But for fear this Scale ſhould be too great, I draw my Plat by the Scale of 40 in one Inch: ſo if you divide 208 (the Breadth of the Ground) by 40, it gives 5 Inches and $\frac{8}{40}$; and ſo broad muſt the Plat be, as you may ſee by the Figure. Thus may you enlarge your Draught, or diminiſh it on your Paper, as your Pleaſure is: but 'tis better to draw all your Draughts as large as your Paper will give you leave: the Diſtance of the Trees in the Draught is 21 Feet 10 Inches aſunder. (*See Figure* 5.)

$4\frac{8}{5}$ (15
208.0 (37
5.55
5

By

By this you ſee, that if you plant your Trees triangular, this Acre of Ground hath 11 Rows and 104 Trees; but if you begin either ſide with 10, as before I began with 9, then will there be in this Ground 105 Trees. But to know how many Rows you may have in any Ground, do thus, and you may preſently ſatisfy your ſelf: you ſee the Ground from one out-ſide Row to the other, is 196 Feet 8 Inches, which divided by 19 (the diſtance that the Rows be aſunder, neglecting the Fraction as needleſs now) gives 10 Diſtances. Always remember that there is one Row, or in a Range of Trees one more than the Diſtances; in this Draught the Trees ſtand at the ſame Diſtance, but ſquare. (*See Fig.* 6.)

196 (10
199
x

By this laſt Draught it appeareth, that if you ſet the Trees at the ſame diſtance, and ſet them ſquare, that then there will be but 9 Rows and 90 Trees in this ſquare Acre of Ground; but if you plant them triangular, then will it hold 14 or 15 Trees more: but if your Plat of Ground be a long Square, or any other irregular Figure, then will your Triangle-way hold a great many more, in proportion to the Quantity of Ground; beſides, it makes many more Rows, therefore more pleaſing to the Eye.

Note this well for ſetting your Trees exactly, having found the Diſtance they are to ſtand aſunder, and likewiſe how many Rows, with a Line laid, or Stakes true ſet, where your firſt Row muſt go; the ſaid Stakes will be of good uſe to ſet the Trees by, when your Holes are made. Having reſolv'd on which ſide you will begin, which always let be the ſide you find moſt in ſight, ſet down your two Corner-ſtakes, for the firſt and laſt Holes to be made, then with your Aſſiſtants meaſure exactly in your Row by the Line 21 Feet and 10 Inches; but in caſe there ſhould be odd Meaſure, then proportion it (as is ſhew'd before) by making one Hole more or leſs, as you ſee cauſe; then having two Men to aſſiſt you,

with a Chain (for a Line will reach or ſhrink) meaſure exactly the Diſtance of two Trees, let one hold at one Tree, and one at the next in the Row; you ſtanding at the Angle, with the Chain equally ſtiff, put down a Stake at the Angle, and ſo go on to the next two Trees, pitching down your Stakes perpendicular; and alſo conſidering the Thickneſs of your Stakes: thence let your two Men go to the next, and you ſetting down one at the Angle, till you have ſtaked out the whole Ground. This do when you come to ſet your Trees, being careful to keep your Chain ſtrain'd both ſides alike, and to allow for the Crookedneſs of your Trees; and when you have got two Rows planted, then your Eye will aſſiſt you well enough to obſerve the Rows as you go on.

Note alſo, that if your Ground be large, and a ſquare, then your beſt way will be to find the middle Row, and ſet that off ſquare from that ſide of your Ground you mind moſt, or find to be ſtreighteſt; there begin to mark out your Holes, and alſo to plant your Trees: but if your Ground be irregular, or have an Angle on one ſide, then begin on your ſtreight ſide, and run the odd Meaſure into the Angle, as far as is convenient to plant in ſuch a Ground; you need but find what Diſtance your firſt Row muſt be ſet at: but if your Ground have both the ſides ſtreight, then it will be convenient to ſet the Side Rows at equal diſtance from your Fence. Thus you may well perceive, that it is but meaſuring the Length and Breadth of your Ground; and proportion one to the diſtance your Trees are to ſtand at, the other to the diſtance the Rows are to be aſunder, and you may proceed to ſtake out your Ground. After this Method you may plant any ſort of Foreſt-Trees in Groves.

The beſt way is to ſtake out your whole Ground before you plant a Tree, or make one Hole; by ſo doing you may well perceive where a Fault is, and eaſily mend it in time, (though ſome are of opinion otherwiſe)

otherwiſe) but I ſhall leave them to their own Judgment, and ſatisfy my ſelf with Experience and Reaſon. But for fear any thing ſhould be dubious to you that I have writ, obſerve but the ſetting out of theſe two Rows, and then I hope it will be plainly demonſtrated to you how to proceed; ſuppoſe the Length of your Ground ſhould be the Length of the Line marked at the End thus ⊖. (*See Fig.* 7.)

Having ſtaked out your firſt Row, as before is ſhew'd, and having the Chain exactly the diſtance of two Opens; then bid one of your Men take one end, and the other Man the other end, you holding exactly the middle; bid one hold at the Stake one, the other at the Stake two, then pitch you down your Stake right at the Angles, as the pricked Line ſheweth: ſo let your two Men remove from Stake to Stake, and you from Angle to Angle, till you have ſtaked out your Row, and then let them come to that Row you laſt ſet out, and go on to another; ſo proceed till you have ſtaked out your whole Ground. Thus much for planting Trees in Orchard-faſhion. I have been the larger to ſhew the beſt way for improving your Ground, preſuming, that every Man that fenceth in a Ground, would plant as many Trees as he can in it; let ſuch but mind what I have deliver'd, and what I ſhall deliver in the next Chapter, I hope it will be ſatisfactory to him: if it be, it will be the like to me.

But what Order ſoever you plant your Trees in, make your Holes good before; ſet not your Trees too deep, and keep them ſtaked the firſt Year, covering the Ground over the Roots with ſome Litter or Dung, and over that a little Mould, to keep the Sun from burning the Dung, and exhauſting the Strength. In the Spring walk over the Ground you planted in Winter, and ſet your Trees to right, and tread the Mould to the Roots, eſpecially if the Spring be dry; keep all the Cracks filled with Mould: after your Trees are ſet, keep your Ground with digging

or ploughing, for three or four Years at firſt, but the longer the better; your Trees will run and thrive in the looſe Ground much. But if you do not ſo much mind Order in Planting, but would keep your Land for Corn, and yet would gladly have Fruit-Trees too (which may very well be, and you may have good ſtore of Fruit, and not much the leſs Corn) then plant your Rows about thirty Feet aſunder, the longeſt ways of your Ground, and ſet the Trees in Rows about 15 Feet aſunder, and let the Trees in each Row ſtand exactly ſquare; ſo may you have a very fine Orchard, and little or nothing the leſs Corn. Many Years may you have as much Fruit as is worth a good Crop of Corn, off ſo much Land, and not the leſs Corn; which may well encourage you to Planting, if you dare believe me: but if not, be but ſo kind to your ſelf and me, as to try whether I tell truth or not. Be ſure to keep Cows out of your young Orchards; Sheep will do no harm, provided you whiſp your Trees about with Thumbands whilſt young, which is the beſt way to keep them from the deſtructive Hares and Coneys.

CHAP. XXXIV.

Of Pruning Trees, ſome General Obſervations.

ALthough I have ſhew'd you how to prune moſt ſorts of Trees, in each Chapter, where I ſhew'd you how to raiſe them, yet I ſhall ſay a little more, and all will be too little: for the Curate of *Henonville* tells you, in his Book of the *Manner of Ordering Fruit Trees*, That it is a thing very rare among Gardiners to prune Trees well; for the doing of it well, depends

depends more upon their Ingenuity that upon their Hand. It is alſo very hard to give Inſtructions for it, becauſe it conſiſts not in certain and general Maxims, but varies according to the particular Circumſtances of each Tree; ſo that it depends abſolutely upon the Gardiner's Prudence, who ought of himſelf to judge what Branches muſt be left, and which are fit to be cut away, *&c.*

Indeed that erroneous Cuſtom and Saying (which is among moſt Men) of Timber Trees, not to prune them at all, or if you do, to cut off the Boughs at a diſtance from the Body, hath made many a good Fruit-Tree loſe its Life ſooner by many Years than it would have done, and alſo hath yielded to the Owner much leſs and worſe Fruit than it would have done. Therefore whatſoever Bough you cut off from Fruit or Foreſt-Tree, cut it cloſe and ſmooth, and the loweſt ſide cloſeſt, then will it not hold Water, and every Year the Bark will ſurround and overgrow the Wound by little and little, till it hath quite healed the place; but if you leave a Stump, it's likely that will hold Water, and make a Hole into the very Body of your Tree, and ſo in little time make it ſick and kill it, which before would bear you but little and poor Fruit: or if the Stump hang down, ſo that it doth not not hold wet, then the Tree muſt be as big as that Stump is long, on all ſides, before it can over-grow that place; or if the Stump rots, and breaks off, then many times it leaves a Hole in the Tree, which if it tends much upward, ſo that it takes Water, it certainly kills the Tree; and if the Tree be not a very thriving Tree, it will be very long before it overgrows that Hole, tho it do not take wet. Therefore what Boughs you cut off, cut them off cloſe, unleſs the Tree be very old, and the Boughs great, ſuch I do not adviſe you to meddle with; but if you do, cut them at a diſtance from the Body, always remembring to let the Wound be ſmooth, and to tend as much

much from the Horizon as may be. All Boughs that grow upright, be they great or little, cut them not right croſs over, but cut them ſloping upward, and let the Slope aſpect the South, Eaſt or Weſt, if it may be; and in thoſe Boughs that lean from the Head, cut the Slope on the lower ſide, the Slope tending downward, ſo will they cover over the better: if the Wound be great, cover it over with ſome Clay, well mix'd with Horſe-Dung, to keep it from the Weather, and it will cover over the ſooner.

Many a good Tree is ſpoil'd by grafting of it in bad places, as I have ſeen in ſome hundreds, of which I have not ſpared (as oft as I could) to tell the Owners, but few would believe me; for ſometimes they cut off great Boughs, till they come to *6* Inches (or thereabouts) Diameter: there they put in four or ſix Grafts in the Bark, and ſometimes two in the Clift, and ſaw the Bough right croſs over, tho it grow upright; in which if the Grafts do grow, the Head is ſo great, and they growing round (as it were endeavouring to cover over the Wound) make ſuch a hollow place (like a Diſh) on the Head, as holds Water and kills the Tree, which is many times dead before the Grafts can cover over the Head: or if the Tree doth not thrive very well, they keep that place well cover'd with Loom, or Clay mix'd with Horſe-Dung, and ſometimes they head the Tree very low, and thereby check it ſo much, that it dies in little time after. Sometimes they cut off ſuch great Boughs, and do it ſo ill, that tho the Heads grow, yet in little time theſe Wounds kill the Tree. Tho I ſhall not here teach you how to graft, yet let me adviſe you, when you graft high great Trees, not to cut them too low, but to prune them up till they come to the Thickneſs of your Arm, or leſs; and then graft them, for then will the Grafts ſoon overgrow ſuch places.

Leave

Leave a good many of theſe Heads on, according to the Bigneſs of your Tree, that if ſome miſs, you may take them off the next Spring, and yet have enough for the Head. If you graft in the Bark, you muſt remember to head your Grafts about *Midſummer*, or elſe they will be ſubject to blow off; put your Grafts in alway on the upper ſide, and cut upright Boughs a little ſloping off, they will heal over the better: keep them from Suckers, and then you may expect good Trees and Fruit, of which I wiſh your Hedge-Rows were full.

Of all ſorts of Trees whatſoever, if any Roots be broke, or much bruiſed, or cracked, cut them off till you come to firm Wood, the Slope tending to the Ground like a Horſe-foot; but be very ſparing in cutting the Roots of Greens, and alſo in cutting their Heads off: yet you may proportion the Head to the Root, by cutting off ſome Side-boughs, which cut off (if your Green be tender) the latter end of *March*, or in *April*, and cut the Bough off two or three Inches from the Body; and that time come Twelvemonth take off that piece cloſe, and cover the Wound with a little Wax or Clay well tempered: if your Greens be for high Trees, endeavour to make them taper, by leaving ſome Side-boughs to eaſe the Head.

In all Trees you intend for Timber, be cautious in cutting off their Heads, eſpecially thoſe of great Piths, ſuch as the Aſh, Walnut, *&c.* unleſs your Tree grow top-heavy, or much crooked; and then at the crooked place cut off the Head ſloping upward, and nurſe up one of the principal Shoots to be the leading Shoot; but ſuch as are ſubject to die when headed, or any Tree very great, meddle not with: the Beech is one of the worſt to head, of any Tree I know.

Such Trees as you intend for to grow to a certain propoſed height, you muſt take care to keep taper, by leaving Side-boughs in convenient

place

place and diſtance to make them taper, cutting ſuch Boughs off when you find your Tree is ſwelled enough below; ſtill minding to take off the greateſt Side-boughs, and leave little ones, and to proportion your Head (by keeping it ſmall) according to the Body, and maintaining the leading Shoot, letting it have no Equals; for forked Trees are never ſtreight. Thus do till you have got your Tree to the height you intend, and there let the Head break out, and cut off all the Side-boughs; but if Side-boughs ſtill break out, then give them a Summer-pruning, a little after *Midſummer*, and cut them off cloſe: ſo will you kill them, and have a fine ſtately clear Body, and fine Timber-Tree. See *Chap.* 10.

Obſerve this in all Trees you would have grow with a handſome ſtreight Body, till you have got them to the height you intend they ſhall head at.

Whilſt your Trees are ſmall, you muſt prune them every year; the beſt time for moſt is the Spring, but hardy Trees and Wood may be pruned at any time in the Winter: when they are a little older, once in two Years, then once in three, and then in four, and never ſeldomer then once in five or ſix; ſo will the Bough be ſmall, the Tree will ſoon overgrow the place; the Knot will not be great to vex the Carpenter or Joiner at all; the place will not be very ſubject to put forth Suckers, becauſe the Sap hath had no great recourſe to that place.

Mind always to cut off your Boughs ſmooth, and cloſe to the Body: this if you pleaſe to do, you may have fine Timber, and handſom Trees, which I dare engage will repay you or yours well for your helps to them.

The like do with your ſtandard Fruit-trees, or thoſe you intend for Pollards, till you have got them to the height you deſign they ſhall head at; and at ſetting, if they be tender Trees, or Trees that have great Pith. If you muſt head them, let it be in the Spring, when you find they begin to bud; but then

you

you muſt take care of the Winds in Winter, that they ſhake them not ſo as to let the Air into the Ground to kill the Roots, therefore tie them to good Stocks.

Or this is a good way for Trees that have not great Piths, or are very tender: Cut off ſome of the Tops of the Boughs when you ſet them, ſo let them be till the Spring; and when you ſee the Bud break out, then cut them on every Shoot of the Head, a little above the loweſt Bud or two of each Shoot; ſo will the Head ſhoot but with few Shoots, and they will be the ſtronger: the Head being ſmall, the Root will endeavour to proportion it to its former Greatneſs or near it. But if you have many Shoots break out, then cut them all off but four or five, for ſo many are enough to make Arms for any Tree; but if then you find the Tree to ſhoot too much, and grow top-heavy (as ſometimes they will if well kept on good Ground) then head the Tree again, but not ſo low as you did before; for Reaſon ought to be uſed in all things: this will make your Tree ſwell in Body much, and in time be a fine Tree; ſo that I ſay, endeavour to get a good Body. For in Fruit-trees this is to be noted, that you muſt in the firſt place endeavour to get your Tree in ſuch a condition as to bear you good Fruit, and a quantity, rather than little Fruit early, and then never good Fruit or Tree after. Therefore if you have a Tree that doth not thrive, but is ſubject to blow much (as moſt ſuch Trees are) cut off the blowing Buds in the Spring, as low to a leafy Bud as you can, and ſome Shoots, as near the Place where the Tree headed as you can; but mind to leave ſome Buds on the Head to draw up the Sap, or elſe your Tree may break out in the middle of the Body, or a little above Ground; but if your Buds once ſhoot on the Head but half a Foot, then will your Tree come away. Thus, and by digging about, have I helped many

many a ſtunted Tree forward; which you may do likewiſe, if you pleaſe.

I have many times obſerv'd ſeveral Fruit-trees, as Pears, Apples, *&c.* to be full of falſe-bearing Buds: I call them ſo, becauſe they did not blow; for the Tree having got more head than the Roots could well maintain, had not Strength ſufficient to ſpare Sap for Bloſſom, nor yet for Fruit; which by pruning and thinning the Heads of ſuch Trees, and by ſlitting the Bark on the Body in the Spring, hath made them afterwards to bear well, when they have put forth new Shoots at the Head.

And ſome ſorts of Fruit-trees there be, which will blow and bear themſelves to death, when they be middle-aged; as before I told you ſome young ones would, if not helped by pruning: but the beſt way to preſerve ſuch Trees from death, and to make them bear pretty good Fruit, is to cut off moſt of the blowing Buds, and to thin the Head of ſome Boughs, to make it ſhoot again; then will it live many years longer, and bear better Fruit. Some Trees there be that will run ſo much into Wood, that they will not bear of themſelves till they come to be old; but if you cut off the Head of the Shoots as ſoon as ever the Spring-ſhoot is over, which is near *Midſummer*, and take out ſome great Boughs then; if you mind your time, and do it with diſcretion, you may force that Tree to put forth blowing Buds, and blow and bear the year following.

Thus have I ſhew'd you ſome ways and hints of pruning Trees, though I know ſome that are againſt pruning them at all; ſo are there ſome that are againſt Learning: but 'tis convenient for Trees to be pruned well, as alſo it is very neceſſary for Men to be brought up in Learning; for thereby both produce much the better Fruit: therefore,

Be gone from hence thou knotty-natur'd Turk,
There's nought deſign'd for thee within this Work.

This

This was for Chriſtians made, and ſuch as be
Lovers of Trees and Ingenuity:
This was intended only for the Wiſe,
And none but Ignorants will it deſpiſe.
Let Fools laugh on, and wiſe Men plant as faſt,
And ſee who'll have the better on't at laſt.

I ſhall here ſhew you what the good Squire ſaith in his Diſcourſe of Foreſt-trees, *pag.* 74. which he quotes from an antient Author.

Tis a Miſery (ſaith he) *to ſee how our faireſt Trees are defac'd by unskilful Woodmen, and miſchievous Borderers, who go always arm'd with ſhort Hand-bills, hacking and chopping off all that comes in their way; by which our Trees are made full of Knots, Boils, and Cankers, to their utter Deſtruction: Good Husbands ſhould be aſham'd of it. As much to be reprehended are thoſe who either begin this Work at unſeaſonable times, or ſo maim the poor Branches, that either out of Lazineſs or Want of Skill, they leave moſt of them Stubs; and inſtead of cutting the Arms and Branches cloſe to the Body, hack them off a foot or two from the Body of the Tree; by which means they become hollow and rotten, and are ſo many Conduits to receive Rain and the Weather, which periſhes them to the very head, deforming the whole Tree with many ugly Botches, which ſhorten its Life, and utterly mar the Tree.*

By this Animadverſion alone it were eaſy for an ingenious Man to underſtand how Trees are to be govern'd, which is (in a word or two) by cutting clean, ſmooth, and cloſe, making the Stroke upward, and with a ſharp Chizzel or Bill, ſo as the Weight of an untractable Bough do not ſplice, and carry the Bark with it, which is both dangerous and unſightly; and by endeavouring to keep the Tree taper, by leaving ſome little Boughs on the Sides.

I have here ſhew'd you how to prune Foreſt-trees, with ſomewhat of high Standard Fruit-trees; but if you would ſee more Books, then ſee Squire *Evelyn's* Diſ-

Diſcourſe of Foreſt-trees, and for Fruit-trees the Curate of *Henonville*'s Book.

But here note, that if you ſhould have any Trees that ſhould be ſtunted, or very crooked, or much cropped by Cattel; the beſt way is not to ſtand to prune up ſuch Trees to a head, but firſt to fell them cloſe to the Ground, and then they will put forth young ſtreight Shoots: one of the beſt you muſt nurſe up, if you intend it for a Timber-Tree; if for Under-wood, then let them grow with all the Heads the Roots will put forth: the Spring is the beſt Seaſon for this. And thus much at preſent of pruning Foreſt-trees; for I tell you there are more Trees ſpoiled by bad Lopping or Pruning, or for want of good Lopping or Pruning, than there are of all Diſeaſes belonging to Foreſt-trees, unleſs they be accidental, as ſpoiled by Cattel, *&c.*

CHAP. XXXV.

Of the Diſeaſes of Trees.

THERE are ſeveral Diſeaſes and Caſualties that do ſpoil Trees, that ſometimes happen in the Roots, and ſometimes in the Body or Head.

1. The Roots may be the decay of the Tree; as, if they ſtand in the Ground contrary to its kind, as the Beech on cold Clay, and wet Ground, or the Alder on ſharp dry Gravel, *&c.* which is contrary to each kind, and muſt not thus be ſet.

2. It is alſo a great Fault to the Roots of Trees, to ſet thoſe Trees which naturally love to run ſhallow, too deep; or indeed any other.

3. When Ground is very ſtiff or rocky, it muſt be digged or ploughed to make way for the Roots to run in, and contrary Earth laid round about the Trees Roots.

4. Great

4. Great Weeds muſt not grow round the Tree, for they will rob the Roots of their Nouriſhment; alſo they muſt early be weeded from Seedlings, or ſmall Plants, leſt they choak them.

5. Ivy, and Travellers-Joy, Briony, and ſuch Climbers, muſt be pulled up round your Trees, leſt they pinch or make them crooked, and ſo ſpoil them.

6. Suckers muſt carefully be pulled off, whenſoever you ſee them break out: opening the Earth, ſo that you may well come at the Place of the Root where they grow out, and then pull or cut them off cloſe. If you find them rooted, you may ſet them again, but then you muſt obſerve Winter-ſeaſon; but ſuch Trees as yield Suckers from the running Roots, as the Elm, Cherry, *&c.* if it be in Woods, and they thin, leave ſome of them as you pleaſe, they will do the Tree no harm: Be ſure to take Suckers clean off from the Body the firſt year.

7. The Bodies are moſt commonly in danger, if Deer, Hares, or Conies can come at them whilſt they be young; therefore if you plant where Deer or Conies are, you muſt take care to fence them well with Frames of Wood, and look to keep them ſo, or elſe never plant at all: for in one day or night they will bark round ſeveral, eſpecially the Aſh, Lime, Abele, Poplar, *&c.* And take great care to keep your Apples and Pears from Hares and Conies in hard Winters, for they will ſpoil them all if they come at them. The beſt Fence to ſecure your Trees from them, is to tie Thum-bands of Hay or Straw round them, ſo high as they can reach: keep this renew'd early every Winter.

8. Great Boughs ill taken off, as I have many times ſaid before, ſpoil many a Tree; therefore take them off cloſe and ſmooth, and not parallel to the Horizon. Cover the Wound with Loom, or Clay, well mixed with Horſe-dung, and keep it ſo cover'd: for if the Wet fall perpendicular on ſuch a Place, it will in a little time make the whole Tree hollow, by the Wet

getting in there; which comes by great Lops and bad Lopping, as you may ſee in too many Elms, Aſhes, Hornbeams, *&c.* ſpoiled by ſuch Careleſſneſs.

9. If a Tree be bark-bound, then ſlit thro the Bark with your Knife, from the Head to the Ground: the Spring is the beſt Seaſon. This will do moſt good, and no harm to any.

10. If Worms are got between the Bark and the Body of your Tree, they muſt be cut out, and the Place done over with Loom.

11. Cankered, or galled Places, or Boughs broke, are to be cut ſmooth, and cover'd over with Loom: the Canker muſt be caſt clean out. If a great Bough be broke, and the Tree old, cut it off at a diſtance from the Body; but little Boughs cloſe.

12. If a Tree be blaſted in part, or the whole Head, cut all that is blaſted or dead, cloſe off to the quick, and take out all dead Boughs. Keep Caterpillars from the Heads of young Trees, leſt they eat off the Leaves and Buds, and kill your Trees.

13. Take care to deſtroy Moles and Mice, by Traps or Poiſon; for Moles will make hollow the Ground, and much harm your young Trees. Mice will eat all the Bark off round the Body in hard Winters, and kill your Tree; but mind you in time to prevent them.

14. Rooks do deſtroy many a Tree, both old and young, before their time; to old Trees by pinching off the Tops, and breaking off the Buds; and young Trees by lighting on their Heads, their Weight breaking off their young tender Shoots and Buds, cauſes the Trees to die; and alſo they deſtroy Seedlings where they breed; their Dung brings forth great Weeds, as Nettles, *&c.* and ſo choaks the young Seedlings: therefore kill all of them you can at breeding-time, by ſhooting them, and ſetting Lime-twigs on the Tops of your young Trees. You'll thrive the better if you deſtroy them.

CHAP.

CHAP. XXXVI.

Of Felling and Ordering Woods and Coppices.

IF you love to have a thriving Wood, and to improve it for your beſt advantage, your beſt way is not to let it ſtand too long before you fell: for the oftner you fell Under-wood, the thicker it will be; as at ten or twelve years growth on a ſhallow Ground, and twelve or fourteen years growth on your deep Soil and beſt Grounds: for there are many Inconveniences in letting your Woods ſtand too long before you fell them, or Trees in Woods, that do not proſper.

Firſt, When you let your Woods or Coppices ſtand long before you fell them, you cannot come to ſurvey your Timber-trees, to ſee which are decaying; and in ſo doing you are uncharitable to your Country, no good Commonwealthſman, no good Huſband for your ſelf, and no good Chriſtian: For why ſhould any reaſonable Man let his Trees ſtand in his Woods, or elſewhere, with dead Tops, hollow Trunks, Limbs falling down upon others and ſpoiling them, dropping upon young Seedlings under them, and killing them? The ill Husband, while many of his Neighbours want ſuch Timber (nay poſſibly he himſelf) there he lets his Trees ſtand, which were formerly worth 10 or 5 *l.* a Tree, or more, till they be not worth the half that they were. Here he loſeth the Uſe of his Mony, more then twenty in the hundred; if it be an Oak, he loſes the Bark, with the uſe of the Ground, where 'tis likely ſeveral young Trees might have been, if that had been taken down in time.

I know that ſome Perſons of Quality ſay, that this is a great Ornament to their Ground; but I

think no greater than it would be to their Perſons to wear a Garment very old, with half a Skirt, a piece of a Sleeve, and all the Trimming off: but I ſhall never pronounce ſuch Judgment againſt Trees, having ten times more Mercy. Such as are thriving (unleſs they ſtand too thick) I would intreat you not to cut down; for you do not loſe ſo much by ſuffering the Tree that is decaying to ſtand, but you hinder you or yours as much in cutting down a young thriving Tree.

There are too many Men in this Kingdom, who before they ſell their Eſtates will many times fell off all their Timber that was good, and which would have thriven well for many years; and ſo by the Moneys they make of that, they lengthen out the time before they ſell. I wiſh that my Vote (tho ſingle) could perſuade thoſe Men that are reſolved to ſell ſuch Timber, that they would alſo ſell their Land with it; and I do not queſtion but the Purchaſer (if a Lover of Timber, as moſt Purchaſers are) would then give more for the Timber to ſtand, by at leaſt 12 *d.* in the Pound, rather than have another Man to buy it off from his Ground. I once obſerved an Aſh-tree in the Wood-walks at *Caſhioberry*, which ſtood in the Walk that I made thro the Wood-walks to *Hemſtead* High-way; which Aſh I meaſured as followeth, according to the cuſtomary way of meaſuring by the Line of Numbers: It was a fine ſtreight Tree, tapering a little, ſo that I needed but to girth it in one place; it girthed juſt 72 Inches, and was 58 feet long from the Place where the Root was ſawn off, to the Place where the Head was cut off: The fourth part of 72 Inches, is 18 Inches.

The Rule is: As 12 to 18, the Square in Inches;
So is 58 Feet, the Length, to a fourth Number;
And that fourth Number tells you the Content in Feet, *&c.*

Extend the Compaſſes, one point fix'd in 12, (the ſide in Inches of a ſuperficial Foot ſquare) to 18 Inches,

Inches, the Square of the Tree; keep the Compaſſes fix'd, and ſet one point on 58, the Length of the Tree in Feet, (but it muſt be the 58 on the left hand, or elſe the Compaſſes will go off the Rule) and then turn the Compaſſes twice to the right hand, and the laſt movable point of the Compaſſes will fall upon 130 Feet, and ſomething above a half; but that Diviſion is ſo ſmall, a Man cannot read well how much it is, if it be above half a Foot. This is the cuſtomary way with moſt men to meaſure Trees, tho it makes leſs than there is, which in reaſon ought to be conſider'd in the Price, and not in the falſe Meaſure: but I will here ſhew you how to work both the cuſtomary and true way, by the Rules of Natural Arithmetick; that ſo you may try whether you have meaſur'd right by the Rule and Compaſs or no; and alſo that you may ſee the ſweet Agreement between Geometry and Arithmetick.

And firſt to work it by the cuſtomary way; here we take the fourth part of the Circumference to be the ſide of the Square of the Tree (tho erroneous) and meaſure it as a Cylinder. The fourth part of 72 In. is 18 In. which multiplied in it ſelf gives 324, the ſuperficial Inches of one end.

Then 58, the Length, multiply'd by 12, gives *696* Inches, the Length of the Tree in Inches.

And *696* Inches, multiply'd by 324 In. gives 225504, the ſquare Inches; which Sum divided by 1728, the ſquare Inches in a ſolid Foot, gives 130 Feet and a $\frac{1}{2}$.

18	58
18	12
844	116
18	58
324	*696*

696
324
2784
1392
2088
225504

1.8 (864
2.2.1
1.5.3.7.6
2.2.5.5.0.4 (130-$\frac{864}{1728}$
1.7.2.8.8.8
1.7.2.2
1.7

I thought by the point of the Compaſſes it had been a little above half a Foot, but it is juſt half a Foot.

Thus having ſhew'd you, both by Lines and Numbers, what there was of this Tree the cuſtomary way; I ſhall here ſhew how many Feet of Timber there are in it the true way, ſtill ſuppoſing it to be a Cylinder, that is, a round Figure of equal Circumference in all parts. There are ſeveral ways to meaſure it, as by having the Circumference, or by having the Diameter at the end, or by having the Side of a Square equal to the Baſe thereof; but we having the Circumference, which is 72 Inches, I ſhall proceed that way.

And firſt by the Rule and Compaſſes, the Circumference being 72 Inches, and the Length *696* Inches; how many ſolid Feet are there in ſuch a Tree?

As is the ſtanding Number 147 : 36
To the Circumference 72 Inches;
So is the Length in Inches *696*,
To a fourth Number:

And from that to the Content in Feet *166*, and near a half; that Diviſion being ſo ſmall, it cannot well be read on a two-foot Rule.

Extend the Compaſſes from the $147\frac{5}{10}$ point, to 72 on the left hand; keep the Compaſſes fix'd, and ſet one point on the Number *696* (the Length in Inches;) and then turning your Compaſſes twice from that number towards the left hand, the point will fall upon *166*, and near a half, the ſolid Content in Feet.

Or more eaſily thus:

As is the ſtanding Number 42.54
To 72 Inches, the Circumference;
So is is 58 Feet, the Length,
To a fourth, and that fourth to *166* Feet and near a half.

Extend the Compaſſes from 42.54, to 72 the Circumference in Inches; that Extent will reach from 58 Feet (the Length) to another Nnmber, and from that Number to *166* Feet, and ſomewhat more, but how much more, I ſhall ſhew you with my Pen, and

the

the ordinary way of working; tho Log. is much eaſier, but ſome may not have Tables, or not underſtand them if they have.

Now having the Circumference given, which is 72 Inches, we muſt find the Diameter; and the Rule is,

As 22 is to 7, ſo is 72 to 22 $\frac{9}{100}$ Inches, the Diameter near 23; as here it is wrought:

7	2 (20
	x60
504	504 (2 $\frac{1}{2}$°
	222
	2

Or you may do it by two Turns of your Compaſſes:

Extend your Compaſſes from 22 to 7. the ſame Extent will reach from 72. to near 23; for it wants but 2. of 22.

Or, if you will have it in more exact Terms; then

As 3. 140,
To 1. 000;
So is 72 Inches the Circumference,
To 22 $\frac{28}{100}$ that is near 23, the Diameter.

Now for the Content of the Head, multiply half the Circumference by half the Diameter, and it giveth the Superficial Content.

Half Diam.	11. 5
Half Circum.	36
	690
	345
	414.9 the Content in Inches.

This multiply'd by 696 (the Length of the Tree in Inches) giveth the ſolid Content in Inches: and that Sum divided by 1728 (the Inches in a Cubical Foot) ſheweth you how many Feet and Parts are in the Tree.

The Length in Inches is 696		1
The Content of the Baſe is 414		5.2
		1.3
	2784	2.4. (1296
	696	1.3.6.9.
	2784	5.5.1.4.
		1.1.6.3.6.6.
The whole Content in Inches	288144	2.8.8.1.4.4. (166
		1.7.2.8.8.8.
		1.7.2.2.
		1.7.

The whole Content in Cube-feet is about 166, and a little more; for if you come within a quarter of a Foot in ſuch Sums at this, with the Rule and Compaſſes, 'tis well.

When this Tree was ſawn off a little above the Root, I told juſt 72 Annual Circles; ſome of them were the greateſt that ever I yet ſaw in any Tree, and thoſe were about the middle of its Age; ſome three made above one Inch, ſo that the Tree then did grow above two Inches in Diameter in three Years time: but at firſt and of late, for ſome 6 or 7 Years, it did increaſe but little; for it was near at its full Growth; ſo that if you multiply 12, the Semi-Diameter (for it was 24 Inches at the Root-end) by 6, it gives you 72; ſo that it did grow one year with another two Inches in 6 years, or one Inch in Diameter in three years.

I do not bring this Tree in for its Greatneſs, but for its quick Growth, and fine Length of Timber, which was helped by its Situation, it ſtanding in a Valley, and ſet round with many other great Trees. If this Tree had been ſold alone, it being ſuch a ſtreight Tree, and ſuch a tough Grain (for your great Trees are always the tougheſt) to ſome Pike-maker, *&c.* it had been worth 1 *s.* 6 *d.* the Foot; at which price the very Timber comes to 9 *l.* 15 *s.* 9*d.* then the Head and Roots would well

pay

pay for the ſtocking and making up the Wood, and make up this Sum 10 *l.*

I do not bring this to compare with Trees that are and have been; for the ingenious Author in his *Diſcourſe of Foreſt-Trees*, p. 84. tells you of a Tree worth 50 *l.* as affirm'd by Captain *Bullock:* but I mention it to ſhew thoſe that love Trees, what Profit a thriving Tree brings them yearly: and I dare affirm, that they had better pay Uſe for Money, than cut down a Tree that ſtands in a good place, and is in a good thriving Condition. Therefore if your Trees are growing and increaſe in Shoot, be not too haſty in felling; and when they are decaying, it is too late; therefore let them not decay too long before you fell them.

When your Wood is come to the Growth you intend to fell at, if your Wood be thick of Wood, then fell the Timber-trees, and Under-wood as cloſe to the Ground as you can; but if your Wood be thin, then ſtock up your Trees, eſpecially if great Timber: and the Winter after, into theſe Holes where you ſtocked up the Trees, ſet Elm, Cherry, Poplar, Sarvice, and Sallow-Cuttings: ſo will theſe Trees, which are ſubject to grow from the running Roots, thicken your Woods; the Roots will pay for the ſtocking: you will ſave a foot or two of the beſt of Timber, and the Roots of other Wood will grow the better in the looſe Ground where you made the Holes: whereas the old Roots would keep the Ground from nouriſhing, or any from growing there for many years. If your Ground be a ſhallow Soil, do not fill up the Holes quite, but ſet in ſome running Wood; the Ground being deep by the Hills, will make the other Wood grow better: and the Ends of ſeveral Roots being cut, will ſhoot forth at the ſides of the Hole, and the Hole will receive Seeds which the Wind will blow into them, and there being no Weeds to choak them, they will grow well.

For

For theſe Reaſons I ſtocked up all the great Trees which we felled in our Wood at *Caſhioberry*, and I ſet in an Elm and a Cherry by the ſides of the Holes, and the Spring after there came out of the Side-Roots Maple, Cherry, *&c*, which made good Shoots, and many Sallows came up in the Holes; whereby our Woods were very well thicken'd, to the content of my ingenious Lord, tho many People were much againſt it, becauſe it was not uſed ſo to be done.

If your Woods are thin, at every Felling lay ſome Boughs, which are moſt convenient, into the thin places: and before next Fall you will have them well rooted, and good Shoots from them: a Man will do a great many in one day, for which you will be well ſatisfy'd in time.

December and *January* is the beſt time to fell Timber, but the Oak in *April*; if you would have the Bark, when the Moon is decreaſing, and the Wind not Eaſt.

When the Stubs of your Under-woods are grown great, ſtock them up: This is found to be good Huſbandry with us in *Hertfordſhire*, which they call runting their Woods; it makes way for Seedlings, and young Roots to run the better: do this at Felling-time, whereſoever you have felled Trees at the Ground. When the Roots begin to rot, they then come up beſt, then ſtock them all up, the other Wood will grow the better, and they will pay you well for your Charge; they will coſt you about *6 s.* a Stack, and here they will be worth *12 s*, or more, when ſtocked up.

When you fell your Woods or Coppices, cut them ſmooth and cloſe to the Stub, and a little ſlanting upwards, as I adviſed you about lopping Pollards. The oftner you fell your Woods, Coppices or Hedges, the thicker they will grow; for every Felling gives way to the young Seedlings to get up, and makes the weak Plants ſhoot ſtrong. Thoſe Woods

which

which increaſe by running Roots, are Elm, Cherry, Popler, Maple, Sarvice, *&c.* which thicken your Wood much: and Felling makes the Roots of a Tree to ſwell, as Lopping doth the Body, and ſo it produceth the greater Shoots, and comes ſooner to perfection; whereas great Wood, and old, and ill taken off from the Stub, many times kills all.

When you fell your Woods, leave young Trees enough; you may take down the worſt that ſtand, next Fall, eſpecially near a great Tree that you judge may go down next Fall, for by its Fall it may ſpoil ſome. The Statute ſaith, you are to leave twelve ſcore Oaks at every Fall on an Acre; for want of them, ſo many Elms, Aſhes, Beeches, *&c.* but leave according to the Thinneſs of your Wood, and where Under-wood ſells well, there let your Timber-trees ſtand the thinner; and in ſuch Countrys where Coals are cheap, and Timber ſells well, there let your Timber-trees ſtand thick, and then they will need but little pruning up.

Endeavour to plant in your Woods ſuch ſorts of Wood as the Ground is moſt proper for; if wet, then Alder, Sallow, Willow, Withy, *&c.* if ſhallow and dry, Aſh, Cherry, Beech, Popler, *&c.* if ſhallow and wet, Hornbeam, Sallow, Sarvice, *&c.* but remember that the Oak and Elm be entertain'd in all places. If your Woods or Coppices are in Parks, where you lie open to Deer, then at every Fall plant in them ſuch Woods whoſe Barks the Deer do not much love; ſuch are the Hornbeam, Hazel, Sycamore, *&c.* When a Tree is at its full Growth, there are ſeveral Signs of its Decay, which give you warning to fell it before it be quite decay'd: as in an Oak, when the top Boughs begin to die, then it begins to decay; in an Elm or Aſh, if their Head dies, or if you ſee they take wet at any great Knot, which you may know by the ſide of the Tree being diſcolour'd below that place before it grows hollow; or if hollow, you may know

by

by knocking it with the Head of an Ax, of which you may be ſurer ſatisfy'd by boring into the middle of it with a ſmall Auger; or if you ſee the Nighills make Holes in it, theſe are certain Signs the Tree begins to decay; but before it decays much, down with it, and hinder not your ſelf.

CHAP. XXXVII.

How to take the Height of Trees ſeveral ways, the better to judge the Worth of them, &c.

HAVING ſhew'd you how you may judge of Timber, whether it be ſound or not, in the laſt Chapter; I will now ſhew you how to take the Height, that you may the better know the Worth of it: for where you have a Rule to go by, you may then the better gueſs.

There are ſeveral ways to take the Altitude of a Tree or Building that is perpendicular; as by a two-foot Rule, or two Sticks join'd in a right Angle (that is, ſquare as the Figure A B C.) having at A. a Pin or Hole to hang a Thred and Plummet on.

Suppoſe you were to take the Height of X Y; firſt then hold that end of your Square mark'd with C. to your Eye, then go backward or forward, till the Thred and Plummet hang juſt upon the middle of your Square perpendicular, and your Eye looking through two Sights, or two Pins at A. and C. or over the ends of the Square; thus look to the very top of the Building at X. (*See Fig.* 8, 9.)

Which found, with a Line and Plummet from your Eye at C. let fall to the Ground at D. meaſure

the

the Length of that Line, and add it to the Height, that length to E. then meaſure the Diſtance from E. to the Foot of the Altitude, as at Y. and that (if the Ground be level) is the Height of X Y.

Or take the Level from your Eye to the Height, and add that which is below the Level to the Height, *&c.* as the Line C F. ſheweth.

To find the Height of a Tree, *&c.* by a ſtreight Staff, or by a Line and Plummet, the Sun ſhining, the Altitude perpendicular, and the Ground level; if not, you muſt take the end of both the Shadows level to each Foot, which is ſoon done.

As if I ſhould take the Level of B. at C. finding the very top of the Shadow to end there, I meaſure the Diſtance from C. to B. and find it 60 Feet; then at that very inſtant I ſet up a Stick perpendicular, as E D. 12 Feet long, which I find to caſt a Shadow juſt 9 Feet; and then the Rule orders it ſelf thus: As 9 Feet to 12, ſo 60 Feet to 80; which you will find true, if you work it by Logarithms, or by Rule and Compaſs thus; Set one point on 9, extend the other to 12; that Extent will reach from 60 to 80. Or if you work it by Natural Arithmetick; as 9 is to 12, ſo 60 to 80.

60
12

120
60

720

720 (80
9

(*See Fig.* 10.)

The ſame may be done by Line and Plummet.

To

To take the Altitude or Height by a Bowl of Water, or by a Looking-glaſs placed parallel to the Horizon.

Place on the Ground a Bowl of Water, or a Looking-glaſs, at a convenient diſtance from the Building or Tree, as far as you think the Height is; then go back till you eſpy in the middle of the Water or Glaſs, the very top of the Altitude: which done, keep your ſtanding, and let a Plum-line fall from your Eye till it touch the Ground, which gives the Height of your Eye from the Ground. 2. Meaſure the diſtance from your Plummet to the middle of the Water. 3. The diſtance from the middle of the Water to the foot of the Altitude.

Which Diſtances, if you have meaſured exactly ſtreight and level, by Proportion you may find the Altitude required, thus:

As the diſtance from the Plummet level to the Center of the Water or Glaſs is to the height of your Eye from the Ground, which is the Length of your Plum-line; ſo is the diſtance from the Center of the Water to the Baſe or Foot of the Altitude exact perpendicular, to the very top of the height with gave the ſhadow to the Altitude: for if your Object be not upright, and you meaſure ſtreight and level, and juſt under the top that gave the ſhadow; if you miſs in any one of theſe, you are quite out in taking the height.

Example.

Suppoſe the Altitude A. B. the Glaſs or Bowl of Water imagine to ſtand at the prick in the Square C. you ſtanding at D. your Eye at E. ſeeth the top A. in the middle of the Square; your diſtance from D. to the middle of the Square, is 7 foot and a half.

Your diſtance from your Eye to the Ground E D. feet.

The diſtance from the middle of the Square to the prick at the Foot or Baſe B. is 120 feet. (*See Fig.* 11.)

As

As 7.5 is to 5, so is 120 to 80 feet; or add a Cypher to the 600, and a Cypher to the 7 feet and $\frac{1}{2}$, and divide as before.

```
                 4
                 600(80 : 120
 4               7.5        5
6.0.0 : 0 (80              ———
 7 : 50                     600
```

Thus may you take the height exactly.

To take an Altitude accessible, at one Station, by the Quadrant.

Suppose A B. the Altitude as before, take your Quadrant, and looking thro the Sights thereof, go nearer or farther from the Altitude, till you see the top at A. thro your Sights; and also that your Thred at the same time fall just at the same distance, upon 45 degrees of the Limb of the Quadrant: then measure the distance, upon a level Line from your Eye, to the Altitude from the place where you stood; and if the Altitude be perpendicular, that distance is the height.

But if it happen so, that you cannot take sight at that distance, then go nearer the Altitude, till the Thred fall upon 63 deg. 26 min. in the Limb. This distance being doubled, and your height from your Eye to the ground added, makes the height of the Altitude, if the Ground where you stand be level with the foot of the Altitude; if not you must make it level.

Or if you find it most convenient to take your sight at a greater distance than where the Line or Thred hangs or falls upon 45 degrees, then go to the Complement of the last Examp. of 63 deg. 26: till the Thred hang upon 26 deg. 34 min. in the Limb. The distance being measur'd, and the height of your Eye upon a level to the Altitude added, makes double the height of the Altitude.

These Rules are so plain, there needs no more Example; but the larger your Quadrant, the better.

And

And note, that if the Ground be not level, you muſt find the Level from your Eye to the foot of the Altitude; and alſo meaſure the diſtance upon a level and ſtreight Line, always minding to add what is below the Level of your Eye, to the diſtance meaſur'd.

When you take an Altitude, make uſe of two of theſe Rules: the one will confirm the other: for the Rules are all true in themſelves, therefore be you ſo in working them.

Thus having ſhew'd you how to take an Altitude by the moſt uſeful Inſtrument, the Quadrant, I ſhall now ſhew you how to do it by the Doctrine of Triangles. And if you would be more ſatisfy'd in that moſt uſeful and pleaſant Study, read theſe Learned Mens Works: Mr. *Bridge's Trigonometria Britannica*, Mr. *Gellibrand's Trigonometry*, Mr. *Wing's Aſtronomia Britannica*, his *Geodatus Practicus*, Mr. *Wingate's Uſe of the Rule of Proportion in Arithmetick and Geometry*, or Mr. *Newton's Trigonometria Britannica*, p. 51. whoſe Rules I ſhall obſerve, tho the Examples be my own, and as before, to take the Height of a Tree.

The Angles and one Leg given, to find the other in the Rectangular Triangle A B C. the Leg B C, is required.

Leg A B. 80 feet.
Angles { A C B. 45 deg.
B A C. 45 deg.

The Terms of Proportion are thus:

As the Radius
To the Leg given,
So the Tangent of the Angle, conterminate with the given Leg,
To the Leg required.

Illuſ-

Illuſtration by Numbers.

As the Radius ——————— 10.0000000
To the Leg A B. 80. ——— ——— 1.9030893
So is the Tangent of BAC. 45 *d.* 10.0001515

To the Leg B C. gives 80 : $\frac{28}{1000}$ 1.9032408

(See Fig. 12.)

You ſee the difference is not the 28th part of 1000; and it is worth minding, how it doth exactly agree with the firſt Example of the Quadrant, *&c.*

It may be wrought otherwiſe thus:
As is the Sign of the Angle oppoſite to the given Leg,
To the Sign of the Angle oppoſite to the Leg requir'd;
So the Leg given
To the Leg required.

Or thus:
As the Tangent of the Angle oppoſite to the given Leg
Is to the Radius,
So is the Leg given
To the Leg required.

Thus have I ſhew'd you how to take the height of a Tree, or any other Altitude, ſeveral ways. Now if you would judg the Worth of a Tree ſtanding, firſt take the height to the very top, or near it; then take the height of the Length of Timber, ſo far as your Reaſon tells you you might meaſure it if it were down: ſubſtract the Length of the Timber from the Length of the height of the whole Tree, there then remains the Length of the Head. Thus have you the Length of the Timber and Head. Next of all, ſet a Ladder to your Tree, and girt it in ſuch place as is moſt convenient, allowing for the Bark; then according to the cuſtomary way of meaſuring, you may know the Quantity of the Timber, and ſo conſequently the Worth of the Timber, according to the Price where the Timber is ſtanding.

The Timber of the Tree may thus eaſily, and near to the quantity of the Tree, be gueſs'd at. The Head will be more difficult, becauſe of the different Forms they grow in; and beſides, ſome Timber-Trees head much lower than others, ſo that for want of helping up, either by their not ſtanding near others to draw or help one another up, or for want of pruning up while young, they head low, and run into great Arms of good lengths of Timber: with ſuch Trees you muſt go the higher into the Arms, accounting them with the Timber, as your Reaſon will beſt direct you.

Now then to eſtimate this Head by Rule, I do judge that if all the Boughs of the Heads of moſt Trees were in an intire piece, from the place where they were cut off from the Timber, to the very top; the neareſt (and I ſuppoſe exacteſt) Figure of any would be a Cone, or near to a Conical Form that the Head ends in. For we ſee that when a Tree is headed, it breaks out into a great many Shoots; and as the Tree grows higher in the Lop, ſome of theſe Shoots decay, ſtill the more endeavouring to end in the figure of a Conical Body. And ſo the Head of your Pollard-Trees being greater than the Body, is occaſion'd by the Sap ſwelling that place, which endeavouring to break out neareſt to where it was accuſtom'd to go up the Boughs, it ſearcheth for a Paſſage, till it can contain it ſelf no longer, and ſo ſwells the Head.

This Head commonly goeth with the Boughs, and doth the better help them to be allow'd this Form, whilſt young; ſo that take a Tree headed or never headed, it ſtill ends in this Figure nearer than any other, eſpecially thoſe that never were headed. This being then the neareſt Figure part of the Head can be reduced to, it is as eaſily meaſured; for if you multiply the Baſis by one third of the Altitude, the ſolid Content of the Figure is had, which you may value at ſuch a price as Fire-wood beareth with you.

I will give you one Example, and it shall be of an Ash, which was fell'd in a place call'd the *Old Orchard*, by the Stables at *Cashioberry*. This Tree I observ'd by several of the Rules before, and found it to be 80 feet high from the ground to the top-shoot; I also observ'd the height of the Timber to be 56 feet long: by the same Rules then, setting a Ladder to this Tree about 25 feet high, I girthed it with a Packthread, (which Place I took for the middle Girth, because the Tree did not taper) and it girthed 64 inches upon the Bark. But most Men that buy Timber by the foot, have the Bark taken off at the girthing-place, or an Allowance for the Bark; but you may readily know the Girth of the Tree under the Bark, tho the Tree be standing or lying, without ever taking off the Bark, or making Allowance by guess, as some do: which to perform, find with your Penknife, or Prickers, the Thickness of the Bark, or you may cut a Hole thro the Bark in the girthing-places, or two or three Holes, and then observe the mean Thickness. As on the foresaid Tree, the Bark was half an inch thick, doubled makes one inch; so then the Tree is less by one inch in the diameter when the Bark is off: then by this general Rule, as 22 is to 7, so is the Circumference to the Diameter.

Example by the Line of Numbers.

Extend your Compasses from 22 to 7, the same Extent will reach from 64 to 20 and near a half, for the Diameter of the Circumference of 64.

Example by Arithmetick.

As 22 to 7, so is 64 to 20 $\frac{8}{22}$, the Diameter.

$$\begin{array}{r} 7 \\ \hline 448 \end{array} \qquad \begin{array}{l} 448 \ (20 \ \& \ \frac{8}{22} \\ 222 \\ \ \ 2 \end{array}$$

But the Bark taking one inch off from this Diameter, it is then 19 inches $\frac{8}{22}$; then to find the true

Circumference under the Bark, agreeing to this Diameter, ſay thus, As 7 to 22, ſo is 19 $\frac{8}{22}$ to 61, the Circumference, or near it.

For if you extend your Compaſſes from 7 to 22, the ſame will reach from 19 $\frac{8}{22}$ to 61, very near.

Or you may turn this 8 into a Decimal Fraction; for as 22 is to 100, ſo is 8 to 36 of 100 and near $\frac{1}{3}$.

Thus by four turns of your Compaſſes on the Line of Numbers, you may in a moment find the Circumference under the Bark, which here we find to be 61: then according to the cuſtomary way of meaſuring (tho not the true way) take one fourth part of the Circumference, and ſay, As 12 is to this fourth part of the Circumference in Inches, ſo is the Length in Feet twice repeated, to the Content in Feet or Parts.

Example.

The fourth part of 61 is 15 and $\frac{1}{4}$ inches; extend your Compaſſes from the Point 12 on your Line of Numbers, to 15 $\frac{1}{4}$: that Extent will reach from 56 to 91 Feet and near a half, being twice turn'd to the right hand, which muſt always be, if the $\frac{1}{4}$ of your Circumference be more than 12 Inches; if leſs, then to the left hand.

Thus having found the Timber of this Tree to be 91 Feet and a half, (which muſt be valu'd according to the Worth of Timber in the place where you are) here I will value it at 12 *d.* the foot, (tho it was ſold with coarſer Timber at an Under-price) this at 12 *d.* the foot, comes to 4 *l.* 11 *s.* 6 *d.* Now to meaſure the Head of this Tree according to our ſuppos'd Rule aforeſaid, if you take 56 (the Length of the Timber) from 80 (the Height of the Tree) there remain 24 feet for the Head. This 24 feet, which is the Head, two parts of it I meaſure as a ſolid Cylinder, and one part as a Cone; for if you girth all the Boughs a little above where they break out from the Timber, and add the ſeveral Girths together, they will girth more than the Timber where

the

the Head was cut off. Two parts of the 24 feet is 16, which I meaſure by the ſame Rule I did the Timber, by the Line of Numbers, and the ſame Girt.

As 12 is to 15 ½ (the Square in inches)

So is 26 (the Length in feet twice repeated) to 26 feet ¾ for the ⅔ of the Head.

Now for the ⅓ of the Head, which muſt be meaſured as a ſolid Cone, we muſt find the Baſis, and multiply the Content thereof by one third of the Altitude.

The Circumference of the Baſis was 61, but I will take it now for 60 inches; then as before, As 22 is to 7, ſo is 60 (the Circumference) to the Diameter, which is 19 and a little more; that which is more I neglect, as not worth minding in ſuch a buſineſs as this.

Half 60 is 30, half 19 is 9 and ½.

Example to work it by the Line of Numbers.

Extend the Compaſſes from 1 to 9 and ½, the ſame will reach from 30 to 285, the Content in inches of the Baſis; then ⅓ of 8 feet is 32 inches.

285
32
570
855
9120

Then ſay, As 1 to 32, ſo is 285 to 9120 inches; which divided by 1728 (the inches in one foot ſquare) is 5 feet and ¼, and a little more: this added to 26 feet ¾, makes 32 feet for the Head, which at a Groat *per* foot, is 10 *s.* 8 *d.* But this muſt be valu'd according to the Country you are in.

4
0. 5. 8 (480
4.6.2.0
9.1.2.0 (5
1.7.2,8

So according to theſe Rules, this Tree was worth 5 *l.* 2 *s.* 2 *d.* There was of the Head one Stack and near a quarter, and 12 Faggots; it coſt 3 *s. per* Stack to cut out, and was worth in the place where it ſtood 10 *s.* You ſee how near the Rule agrees with this Tree; but if the Tree ſtands hanging down hill, it will then endanger the Timber in falling; or if you

fear the Timber to be faulty, or ſome of the Arms blown off, you muſt judge accordingly, *&c.*

It is oft found in your great Elms and Aſhes, that they are hollow within, and yet good Timber on the outſides, eſpecially ſome length of them toward or at the lower end. Now I will ſhew you how you may judge very near the Quantity of Timber that is in one of theſe Trees, or a piece of them, according to the cuſtomary way.

Example.

A piece of a Tree 12 foot long, and hollow and decay'd Wood at one end 12 inches diameter, at the other end hollow and decay'd 6 inches diameter. The piece was 26 inches diameter under the Bark. Firſt I meaſure the Piece as if all ſound Timber, then the hollow and decay'd by its diameter; that being deducted from the piece, ſheweth how much ſound Timber there is in feet and parts, meaſur'd the cuſtomary way.

As 7 to 22, ſo 26 to 81 $\frac{5}{7}$ the Circumference; the $\frac{1}{4}$ of it is 20 and $\frac{1}{4}$, and ſomewhat more: as 12 to 20 $\frac{1}{4}$ inches, ſo is 12 (the Length in feet twice repeated) to 39 feet and $\frac{1}{2}$, the Content as if it were all ſound.

Then for the hollow, I take the mean diameter to be 9 inches. As 7 to 22, ſo 9 to 28 and $\frac{3}{7}$, the Circumference of the hollow $\frac{1}{4}$ is 7 inches: then as 12 to 7, ſo 12 feet to 4 and $\frac{1}{4}$ near: which taken from 39 feet and $\frac{1}{2}$, leaves 35 feet and $\frac{1}{4}$ for the ſound Timber of that piece.

CHAP.

CHAP. XXXVIII.

Of making Walks, Avenues, or Lawns.

AS for making of Walks in Gardens, I ſhall not ſpeak of that in this place, becauſe I have reſolv'd to keep my Walk without the Walls. There are ſeveral Books of Gardening that have many Drafts and Knots in them, but they are all done by gueſs, and none of them fitted to a Scale, to inform what Ground they are moſt proper for; ſo that they are as fit for Butter-Prints, as for Knots in a Garden.

Moſt Walks that are made abroad, either terminate, or end, or lead to the Front of a Houſe, or Door, or Garden-gate, or other Gate, High-way, or Wood, *&c.* Now if you would make a Walk from any one of theſe, and have reſolv'd upon the Center or middle Line of the Walk, as the Middle of a Door in the Front of a Houſe, or the like; there pitch up a ſtreight Stake, and then from the Square of the Front, *&c.* raiſe a Perpendicular from this Stake; and at a convenient diſtance in this perpendicular Line, ſet up another Stake: let theſe two Stakes be two little Stakes at firſt, but that at the Center always the higheſt. Theſe two Stakes being thus fix'd, and you fully concluding them to be in the Mid-line, then come to the Center-ſtake, and having in readineſs a quantity of Stakes, according to the length of your Walk, bid one of your Aſſiſtants go as far as you can well ſee back-ſight and foreſight; and there by the motion of your hand or hat, and his own back-ſight, let him fix upright one Stake as exactly as may be in the Line: then take up the two little Stakes, and at the Center fix in a Stake ſix feet high, ſtreight and upright, with paper on the top,

and exactly in the place where the little Stake ſtood. Thus having got two Stakes placed (the Middle-ſtake and the Center-ſtake) you may if your Walk be level, and the Ground clear, and the Walk not above one Mile long, ſet up one Stake at the End, in the Mid-line; looking over the Head of that Stake and the other, moving it till theſe three Stakes be in a right Line; ſo may you have the middle Line of your Walk by theſe three Stakes exacter than by more: for the fewer Stakes you uſe in your Mid-line, the better; becauſe that if you be but once a little amiſs, the more Stakes are uſed, you will be ſo much the further out of the right way.

And note, it is better to take your ſight over the Head of your Stakes, than to look by their ſides; therefore you muſt have the Center-ſtake higheſt, the next a little ſhorter, and ſo the next ſhorter than that, *&c.* but if your Ground be not level, then order your Stakes accordingly; as thus.

And if your Ground be not level, or be of ſuch a length, that you cannot well ſee from end to end; then you muſt place down more Stakes, *viz.* between the middle Stake and Center-ſtake one, and between the middle and end Stake one; or if need require, more. I have oft made uſe of a Sight-ſtake, which I had only to find the Place where my other Stakes ſhould ſtand; this Stake was made with a Slit in the Head half a foot deep, which I looked thro over the heads of the reſt, till I found the Place where to ſet my Stake right in the Mid-line: It is of good uſe, and *Fig.* 13. may ſomewhat repreſent it; you may make it to ſlide up and down, the better to come to the Level of the Head of the Stakes. (*See Fig.* 13.)

When you take ſight, to ſet any Stake true in a Line with others, ſtand at a little diſtance with your Eye from the Head of the Stake, ſo ſhall you ſet it exacter in the Line than when your Eye touches the Head of the Stake; ſet your Stake ſo that you may

only

only ſee three Stakes in a Line: let your Walk be of what length it will.

Having thus ſtaked out your Mid-line, ſtrain a Line in this Mid-line, and lay a ſquare to that Line, ſo ſet off the Breadth of your Walk exactly ſquare to your Middle-line; then ſet up Stakes (as you did) againſt every Stake in the Middle of the Walk, and when you have got the Lines true, where your Trees muſt ſtand, then drive down Oak-ſtakes in the Line to the head, and then it is but putting down high Stakes by theſe when you come to ſet your Trees.

Then having reſolv'd on the Diſtance to ſet your Trees at, and provided good Store of ſmall Stakes, take your Chain (and not a Line, for that will ſtretch and ſhrink) and with your help ſet little Stakes downright in this Line, and ſquare where you would have every Tree to ſtand; theſe Stakes are to make your Holes by, which I would have at leaſt three feet wide, and two feet deep, and the Holes made a quarter of a Year before you ſet your Trees; if it were a year 'twere the better, keeping the Mould turned over now and then, and mixing it with Earth or Dung, if need be; then when the time of Planting is come, begin betimes, eſpecially on dry Ground: Set up Stakes by every Oak-ſtake you left in the Row before, having pruned the Roots and Heads to an equal height, ſet them right one Tree againſt another ſquare.

And if your Trees be not all of one ſize, ſet the greateſt firſt, right one againſt another, and ſo leſſer and leſſer by degrees, minding that both Rows go on ſquare together; and be ſure you mind to let your Trees be at an equal diſtance from end to end: then if you have a Point fixed at both Ends, you muſt run over that diſtance you reſolve to plant your Trees at, before you ſet your Stakes; and if you find it is over or ſhort of equal diſtances, then muſt you add or ſubſtract this odd Open to or from the reſt, to make them all of equal diſtance. See the

Now having your Trees and all things in readineſs, ſet them by the Stakes ſtanding in the Rows, minding to ſet every Tree to range with the Stakes by back-ſight and fore-ſight. Cover and part the Roots with fine Mould; and when they are all cover'd, lay on ſome rotten Dung over that Mould, and then cover that Dung with a little Mould: this Dung will keep them from freezing in Winter, and from drying too much in Summer; and alſo well prepares the Water for the Roots. Thus having ſet them, take care to fence them in at ſuch Places where need is; ſo will you as well as I reap great Satisfaction, if you let not the Dung touch the Roots.

Do not mask a fine Front, nor veil a pleaſant Proſpect (as too many do) by making the Walks too narrow. If you make a Walk that leads to any pleaſant Front of a Houſe, or other Object; if it be but half a Mile long, let it be at leaſt forty feet wide, but if longer more, as 50 or 60 feet wide, or the Breadth the Length of your Front. But if you be for Walks of ſhade, then make three Walks, the middle one 40, the two out-ſide Walks each 20 feet, or 50 and 25 the out-ſide Walks; or divide your Front into two parts, and let the middle be as broad as both the Side-walks; ſo that if you make three Walks together, let the middle one be as much as both the other, ſo will the Trees range much the better, whether you ſet them ſquare or triangular: but however keep to one of them, tho I think the ſquare to be the beſt, becauſe then four Trees in the four Rows end all together, fit to end in either Semicircle, Segment of a Circle, Oval, Triangle, or Circle. For all Walks, of any Length, eſpecially in Parks, ſhould end in ſome one of theſe Figures, or lead into ſome other Walk; but where they do fall into another Walk, there ſhould be a Circle to receive them, or elſe they ſeem much defective.

I ſhall now endeavour to ſhew you how to make a Walk through a Wood, and then I will give you an

Example

Example of ſome of the Figures that Walks ought to end in.

Suppoſe you were to clear a Walk or Line thro a Wood, for to run the Mid-line true about three yards wide; having the Center given, do as before, run your Mid-line as far as you can into the Wood, and at one yard diſtance on each ſide the Mid-line, two other Lines: Run theſe Lines alſo as far as you can into the Wood, keeping them juſt one yard diſtant, and ſetting up Stakes (as you proceed into the Wood) with large whites, all of a Bigneſs; as half a Sheet of white Paper on every Stake ſpread abroad. When any of theſe three Lines come to a Tree, run on the other two till you are paſt the Tree, and then ſet him off again in his place, parallel to his Fellows; and ſo proceed till you be thro the Wood, marking that Wood which muſt go down; then when your Under-wood is ſtocked up, run out your Line again: ſtill when you come to a Tree, ſet off Parallels; and when paſt, ſet off into your true Line again. This way I cut a ſtreight Line thro the Wood-walk at *Caſhioberry*, from the North-front, over one Wall and ſeveral Hedges, near a Mile long; and when I came to ſtake it out true, there was at the very end not four feet difference, as the ingenious *Hugh May* Eſq; can witneſs, and ſeveral others.

This way of ſtaking out a Walk by three Lines is worth your practiſing. In ſetting out of Walks that go thro Hedges or Buſhes, be ſure to carry on the Mid-line of the Walk, and the two Lines where the Trees muſt go, together; now and then meaſuring to ſee if they keep their equal Diſtance, and that which is amiſs you will ſoon find, and may as ſoon rectify it again.

There is another way of carrying the ſtreight Line thro a Wood, which Reaſon taught me, and by Experience I have found true: the Place where the middle of the Walk ſhould point to, being given,

there

there hang up a large Candle and Lanthorn, and having found the Mid-line ſome 20, 30, or 40 yards from that, there hang up another; they muſt both hang pretty high, but let that next the Houſe or Center be the higher. Having thus placed your two Lights, and in a clear calm night (but not too light) go with your Man to the further ſide of the Wood, till you make both theſe Lights in one Line; and then walk on, keeping them ſo, marking the Trees on each ſide of you, quite thro the Wood, order them to be cut down at leiſure; ſo ſhall you have a ſtreight Line cut thro the Wood.

But if you are to make a Walk from Gate to Gate, ſo that you are ty'd to ſuch a Center at each End, if your Walk be ſo that you can ſee from end to end; it is then but ſetting up two Stakes, one at each end, by the ſight of which cauſe a third to be ſet up in the middle. But if you cannot ſee to the far end, for Hill, Wood, or the like, then you muſt cauſe a high Pole, with a white on the top, to be ſet up at the end; by that and your Center-ſtake cauſe your Aſſiſtants to ſet up as many as you think convenient in the Mid-line: but if that Wood be ſo high that you cannot ſee a high Pole at the end, then run it over as near as you can by gueſs, take notice of the Length, and of your Error at the End, and $\frac{1}{4}$ and $\frac{1}{2}$ and $\frac{3}{4}$ each; at a quarter of the Length of your Walk ſet off a quarter of your Error, *&c.* And thus bring your Line till it ranges exactly from one Point to another, from Gate to Gate; then ſet off the two Lines where the Trees muſt go (as is before ſhewed by the Square) and if for three Walks, then the four Rows of Trees: if there be three Walks, let the Middle-walk be juſt as broad as both the other, which is the beſt Form; or elſe all three of equal Breadth: ſo may you ſet your Trees not only ſquare, but they will anſwer one another ſeveral ways beſide, as ſquare from A. to B. and other ways, as B. to C. and to D. ſo that every Tree muſt keep

his

his Row, Range, Square, and equal Diſtance, *&c.* (*See Fig.* 14.)

The pricked Lines ſhew how the ſight will take the Trees as ſquare from A. to B. and Angle-ways from C. to B. or C. to D. *&c.*

Thus have I ſhew'd you how to ſtake out the Mid-line, and the two Side-Lines of your Walk. I wiſh Sir *E. T.* Sir *W. B.* and Sir *R. B.* had ſeen theſe Directions before they had planted their Walks; I do judge they then would have done them better: For Errors in planting make too many worthy Perſons forbear.

Now as for the Figures which Walks ought to end in, I have named them before; and if you obſerve, moſt Plants (eſpecially Trees) which make your Walks, the moſt of them end in a circular Figure; and therefore I will ſhew you ſomeways how Walks ought to end in a Circle: For a Walk ending bluntly without any Figure or entring into another, may be compared to a Tree with the Head off; and what difference there is, let thoſe who well obſerve the Objects of Nature judge. Let the Circle be three times the Breadth of your Walk, if conveniently you can, or bigger if you have room.

After you have found the Mid-line, and reſolved upon the Center, as at A. and of the Bigneſs of your Circle; next conſider of the diſtance of your Trees round the Circle: run that diſtance over firſt, and if you find an odd Tree, let it ſtand in the Mid-line, and in the Circumference, as at B. but if no odd Tree, then let the Mid-line paſs between two Trees, adding or ſubſtracting the odd inches, till you find the equal diſtance your Trees muſt ſtand at, *&c.* (*See Fig.* 15.)

Let the Trees in your Circle ſtand not much above half the diſtance that the Trees are in the Rows, as in the laſt they were almoſt 16 feet, Trees in the Walk 24 feet, but in the Oval thicker; that they

they may ſhew the Figure the better: A fine Tree in the Center of all Circles doth well. (*See Fig.* 16.)

Two Walks meeting in a Point, let that be the Center of the Circle, as at A. and there a Tree.

Two Walks croſſing one another, where the Mid-line meets, let that be the Center of a Circle, as B.

Note, That if your Circle be divided into two parts, by Walks, as the Circle A. find a diſtance, that the Trees in each part may ſtand as near that diſtance as may be; there they are near 11 feet both, and the Circle B. near 10 feet aſunder.

Now the ſmaller parts the Circle is put into, the thicker ſet your Trees round it; as B. is put into four Parts by the two Walks croſſing it; ſet theſe parts the thicker, that they may ſhew the Figure the better.

Of three Walks going up to a Circle, as they do to the Bowling-green at *Caſhioberry* (which Green is 80 yards, or 240 feet diameter, with a border 16 feet wide, planted with three Rows of Spruce-firs ſet in the year 1672. being ſet circular and triangular) ſee the Figure: There are 90 Trees in the outer Row, and 90 Trees in the innermoſt Row, and 89 in the middle Row, which is 269 Trees; I loſt not one of theſe, except one that was ſtolen. (*See Fig.* 17.)

To plant ſuch a Border, firſt with a Line on the Center B. mark out the Circle where the inner Row ſhould go, then ſet two Trees in the Circle, and in the Rows of the Walk, as at A A: then having reſolved on the diſtance to ſet them at, run that diſtance over from A A. and the odd Inches or parts add or ſubſtract, according to the Number of the Opens, to or from the Meaſure you firſt reſolved on, as is ſhew'd before, *&c.*

1. Next I ſhall ſhew you ſome ways how Walks may come into or end in a Semi-circle, or Segment of a Circle, *&c.* as A, being a Gate, B C. is a Hedge or Pale; A. is the Center of the middle of the Walk and Circle. (*See Fig.* 18.)

Or

Or thus: the Center at A. and then three Trees or more to go to the Pale parallel to the Walk, as 1, 2, 3.

2. *How three Walks may come into a Semi-Circle:* (*See Fig.* 19.)

This may be continu'd on with three or more Trees parallel to the Mid-line; as in *Fig.* 19, *&c.*

3. *How three Walks may break into a Semi-Circle at three ſeveral places, and how to make the Semi-circle ſo great, as that you may have juſt ſo much Wood on all ſides of the Walks, as the Walks are broad; or to order it to what proportion you pleaſe.*

Suppoſe the three Walks to be each forty Feet wide, which makes 120 Feet; then there is to be 40 Feet without one Side-walk, and 40 Feet without the other Side-walk, and 40 Feet between each of the Side-walks, and the Middle-walk; which is four times 40 Feet, that is, 160 Feet: ſo that the 120 Feet makes 280 Feet for the Arch of this Semi-circle: then find the Semi-diameter to the Arch of this Circle, and ſtrike the Arch from the Center.

Example.

The Semi-circumference being 280, the Circumference is then 560.

Then as 22 is to 7, or if you will be more exact (as the Learned *Oughtred* in his *Circles of Proportion*, p. 43. ſaith) as 3.1416 is to 1, ſo is the Circumference to the Diameter; but the other is a ſtanding Rule, nigh enough for our purpoſe.

As 22 to 7, ſo 560 to 178 $\frac{4}{22}$ (the Diameter;) if you turn this Fraction into Inches, it will be two Inches and near half of a Barley-Corn: ſo then the whole Diameter will be 178 Feet

560 1.
7 3.2. (4
——— 1.7.8.4.
3920 3.9.2.0.(178:
2.2.2.2.
2.2.

Feet 2 Inches; the half is 89 Feet 1 Inch: with this 89 Feet 1 Inch (being the Semi-diameter) draw the Arch of your Semi-circle, which Arch ſhall be 280 Feet; and from the Center by which you drew this Arch, may be the mid Line of your three Walks; as is deſcrib'd in the Figure.

(*See Fig.* 20.)

Let the Center A. be in a ſtreight Line with the pricked Line B B. and parallel to the middle Walk C. the Line B A B. may be (if Convenience ſerve) 50 or 60 Feet from the Wall, Pale, Hedge, and that to go parallel to that Line; and where the Wall or Pale ends, there may be a Row of Trees continu'd ſo far as you pleaſe or can, *&c.* At the Center A. let ſome fine Tree be ſet, or ſome Figure, *&c.* I once ſaw a Semi-circle ſet out ſomewhat like this, where I ſaw a great deal of meaſuring before they could proportion it exactly to ſuch a place as was intended: I took my Pen, and by theſe Rules I told them juſtly how far they ſhould go. More I could ſay, if I thought it not unſeaſonable now.

Here you ſee how to proportion a Semi-circle, which you may enlarge with three, four, or five Trees on each ſide, and parallel to the middle Walk, as is in the ſecond Figure of Semi-circles; but be mindful to make ſuch a Figure for your Walks to end in, and of ſuch a Bigneſs as is moſt convenient to your Ground: the Arch of the Semi-circle may be one Row of Trees (as in the Figure) or two, three, four or more, as you pleaſe; but three Rows ſet triangular do very well.

4. *How and where a Semi-circle is proper on the ſide of a Walk,* &c.

Suppoſe you have a Walk a Mile in length or more, it is no ways improper, but pleaſant and ſatisfactory to have your Walks ſhew you every $\frac{1}{4}$ of a Mile, $\frac{1}{2}$ of a Mile, and $\frac{3}{4}$, *&c.* to the end; or from each

each end, or from one end back to the other: as if you begin at the Center-tree in the Semi-circle at A. then at ¼ of a Mile at the Figure 1. make a Semi-circle to break out on the right hand, the Center-tree to be exactly in the Row of the Walk, and juſt ¼ of a Mile: as is ſhew'd in the Figure, as well as the Largeneſs of our Paper would bear, by the Semi-circle, Figure 1. Then at the ½ Mile let two Trees ſtand in a Semi-circle, at Figure 2. one to ſtand in the Row that makes the Walk, which two Trees are half a Mile, and at three quarters three Trees; ſtill minding that one be in the Row or Walk the Center-Tree of your Circle, and the exact diſtance: ſo one Tree the Center of the Semi-circle, as at Figure 1. is ¼ of a Mile; two Trees, as at Figure 2. is ½ a Mile: three Trees, as at Figure 3. is ¾ of a Mile. (*See Fig.* 21.)

Tho the Figure doth not ſhew well, becauſe the Smallneſs of the Paper will not allow room to draw the diſtance of Miles, as the Trees are according to Scale, (tho my Scale is here for the diſtance of the Trees 160 feet for one Inch) yet I preſume, where this is really acted in Walks, it will do well: I here begin at the Center-tree in the Semi-circle, and in the right hand Row, ſhewing how the ¾ of the Mile may be ſet out and ſhew'd by the Semi-circles on the ſides: at the other end, I begin at the Center of the Circle, and ſo ſhew the ¼, ½, and ¾, how they may be ſet out on the other ſide.

Or if you pleaſe, you may have a Tree in the Mid-line of your Walk, at every quarter of a Mile, with a Circle to break round that Tree three times the breadth of the Walk; which Tree muſt be pruned up high, or elſe it will hinder the Proſpect of your Walk (I fancy the other way is beſt) as let a Tree ſtand at every ¼ of a Mile; as you ſee in the Figure. (*See Fig.* 22.)

Thus having ſhew'd you how Walks may end in Circles, or Semi-circles; I ſhall now ſhew how

Walks may end or come into an Oval, and how it ſometimes happens that an Oval is the beſt Figure that Walks can end in.

If three Walks meet acutely at one place, then it will be neceſſary to have the Mid-line of the three Walks meet at a Tree in the Side of an Oval; for if you make that Point the Center of a Circle, it will be too large, 'tis poſſible larger than your Ground will permit; as at *Caſhioberry*, where the three Walks meet by *Hemſted* Highway: for if I had made the Circle from the aforeſaid Center, and made the Semi-diameter ſo large as to have in the Circumference the two Trees marked A A. which range for both Walks, then would this Circle have been too great, and beſide could not be made within the Pale. Now I having Orders from my Lord, that the Mid-line of theſe three Walks ſhould meet at a Tree, as in *Fig.* 23. they do at B. and that I ſhould make the Figure ſo large, as that the Wood which is between the middle Walk, and the two out-ſide Walks, ſhould end at a Tree which ſhould ſtand exactly in the range of Trees, for the middle Walk, and alſo for the in-ſide Rows of the two Out-walks; by conſidering, I found the Oval to ſuit beſt with this Ground: ſo I having theſe two Trees, as at A A. and the Point as at B. which I took for the Breadth of the Oval, accordingly I made it. (*See the Figure.*)

Length of the Oval is 205 Feet, Breadth 124 Feet, middle Walk 50 Feet, the ſide Walks each 40 Feet wide, having Wood between the Walks, and round the Oval.

(*See Fig.* 23.)

Now having the two Trees at A A. and the Center-Tree of the three Walks B. from the Mid-line of the middle Walk, and in the middle of that Line, between A A. and B. draw a perpendicular Line, which ſheweth the Length of the Oval; at each end ſet a Tree, as at C C. then divide the Diſtance between the Center-tree at B. and the End-trees at

C C.

CC. which let be at ſuch a diſtance as may beſt ſuit with the ſix Trees between D. and C. on each ſide: here the Trees between B. and C. are ten Feet ten Inches diſtance, and the Trees between D. and C. are ten Feet nine Inches. Let always the Trees that make either Oval or Circle ſtand pretty nigh, they ſhew this or any other Figure the better; for this no certain diſtance can be given, but they muſt be ſet at ſuch a diſtance as the Arch-line can be divided into, *&c.*

I ſhall ſhew you how to know the Length of an Arch-line, and how to make an Oval or other Figure hereafter.

This Oval and Walks are ſurrounded with Wood, and alſo between the Walks ending at a Tree, as at A A. you may make broader at your pleaſure, or you may alter the Oval in Shape or Bigneſs, as your Ground and Fancy ſhall direct you. Your Oval may be ſurrounded with a double or treble Row of Trees, if you fancy it; and indeed if it be in a place where it is not encompaſs'd with Wood, it is very proper. An Oval or a Circle are very good Figures for Ponds, tho they be not in uſe.

Now for making Walks to end in a Triangle; this may be ſeveral ways, according to your Fancy or Ground: but I confeſs I never yet ſaw or heard of any Walk in *England* or elſewhere that ended in ſuch a Figure. But why may not the beſt of Figures be neglected by the ingenious Surveyor, both at home and abroad, as well as we ſee many excellent things known to ſeveral ingenious Men, which are practiſed by few?

Having made at the end of Walks Semi-circles, Circles, and Ovals of ſeveral ſorts; and notwithſtanding that I had at the end of the three Walks, that go from the Garden to the Bowling-green, that end next the Garden, a Figure given me by a worthy Perſon (but how proper for that place, I ſhall not now ſpeak) I nevertheleſs neglected that, and

made the Triangle, as is ſhew'd by *Fig.* 24. The Trees I ſet the cloſer, becauſe this being a Front of the Houſe, intended to be hid at a diſtance all but the Breadth of the Walls; therefore I choſe this Figure, as much properer for ſuch a Deſign.

(*See Fig.* 24.)

This Line, according to Scale, is the Length of the Garden-walk; the Break in the middle againſt the great Walk, is a Grate which is intended to front it.

This Figure might be much improv'd, if it were made a little larger, ſo that the inner Row of the Triangles might range a little without the end of the Garden-wall, and at that end a Walk to take it, to go by the Garden-ſide; ſo might you have a convenient By-way without the Walls, from the 20 feet Walk, along either Walk of the Triangles, to th Walk by the Garden-ſide, *&c.*

There are ſeveral other ſorts of Triangles proper for Walks to end in, but for Shade I prefer this or the next following; if you would have the Trees to ſhew the Shapes of their Heads, then a ſingle Row is beſt, as the Out-Row of the Triangle-Walk.

(*See Fig.* 25.)

For a Court you would have ſhaded with Trees, this Figure will do well.

In this laſt Figure you may let the little Walk end parallel with the Wall, and have no Walks by the Side-walls; or you may make only one Walk on each ſide.

As for making of the Triangle at the end of your Walk, it may be analogically according to your Ground; tho theſe two are made obtuſe, the Perpendicular half the Length of the Baſe. There are ſeveral ſorts of Triangles, or triangular Figures; but theſe we have here made are called *Ambligone*, that is, a Triangle which hath one obtuſe and two acute Angles, *&c.*

Thus

Thus having ſhew'd you moſt of the Regular Figures through which a Walk may paſs, or in which a Walk may end; I ſhall now ſhew how a Walk may paſs through a Square, and ſo proceed.

(*See Fig.* 26.)

You may make your Walks according to this Figure, or you may have the Walks break into the Square in the middle, on every ſide; which Figure will do well with a Tree in the Center, where the prick is, thus.

(*See Fig.* 27.)

How a Walk may end in a Square, may well be perceiv'd by this laſt Figure; beſides, it is common in many places to be ſeen, yet in my Opinion is not ſo convenient for a Walk to end in as the aforeſaid Figures: from theſe foregoing you may make ſeveral others, according to your Ground; for it is a good Rule, to *cut your Coat according to your Cloth*; and to proportion the Figure your Walk ends in, according to the beſt Convenience of your Ground.

Let not your Hand always for Copies ſtay,
But let an active Fancy lead your Way;
Proportion ſtill your Figure to your Ground,
Whether it be Triangle, Square, or Round.

Some of theſe Figures are alſo the beſt to make Lawns, that is, a ſpacious Plain joining to your Houſe; which let be in Largeneſs according as your Ground will permit: as 100 Acres or more.

This Lawn is moſt convenient to be on the South-ſide or Eaſt-ſide of your Houſe; for if it be on the Weſt-ſide, it giveth the more way for the Weſt Wind (which is moſt commonly the greateſt) to harm your Houſe, by its free Paſſage thereto: Alſo if your beſt Rooms front your Lawn, as they always ſhould do, the Afternoon being the moſt uſual time in which great Perſons do ſolace themſelves in theſe principal Rooms, the Afternoon-Sun will then be

offenſive to ſuch Rooms, and the Proſpect will both be hindred, and not ſo pleaſant; for the Sun, by ſhining againſt you and from the Object, doth by both hinder your Proſpect: and moſt Proſpects are moſt pleaſant when the Sun ſhineth on them. Theſe Inconveniencies, which ariſe from your Lawns being on the Weſt-ſide of your Houſe, being conſider'd, I thence conclude, by the Rule of Contraries, that it is moſt convenient for your Lawn to be on the Eaſt-ſide of your Houſe; for there you have your Rooms ſhady in the Afternoon, the Objects which you view from your Houſe much beautify'd by the Sun ſhining upon them in the Afternoon, *&c.*

For the aforeſaid Reaſons your Lawn may do very well on the South-ſide of your Houſe; for the Sun ſhining moſt part of the day on that ſide of your Houſe, doth much add to the Beauty of that Front, which ought to be the beſt Front of your Houſe: therefore a large Lawn on that ſide doth much help the Proſpect to the Houſe, and alſo from it.

A Lawn on the North-ſide is no ways convenient, for that lays your Houſe too open to the cold North Winds, *&c.* wherefore let your North and Weſt-ſide be planted with Woods, Orchards, *&c.*

A Square is no ill Figure for a Lawn, thus; where there may be three Avenues break out at the three Angles, or one at the Angle oppoſite to the Houſe: and if your Lawn be riſing Ground to the Houſe, ſome Trees ſet thin on the Lawn will be very pleaſant. (*See Fig.* 28.)

Your Lawn may be bounded with Walks, if you pleaſe, which in this Figure will do well; or you may have a ſingle Row of Lime-trees to bound your Lawn with, ſet at a good diſtance one from another, they well ſhew the Shape of their Heads the better.

As the Pricks are on the Lawn, ſo may your Trees ſtand; but leave the Front clear, except the Lawn be much falling ground from the Houſe.

Let

Let the Figure of the Houſe be in the form of theſe two, (*Fig.* 28, 29.) or any other, yet let the Lawn be on both ſides the Front alike, making an Angle at the middle of the Front, or at ſome Court-Gate right before it, and breaking off (as you ſee in the Figure) at a convenient diſtance from the Houſe. A ſingle Row of Lime-trees, ſet at four Rods diſtance, as they are in the Figure, will be pleaſant to bound your Lawn. (*See Fig.* 29.)

From theſe two you may make ſeveral, but ſtill mind to make ſuch as will beſt fit your Ground.

A Circle is a good Figure for a Lawn, only it muſt break off before it comes againſt the Front.

A Triangle is alſo a very proper Figure for a Lawn, but let it not be too acute at the Angle which leads to the Front, but rather obtuſe, or right-angled at the Angle next the Front, as in the two laſt Figures. I have often obſerv'd ſome Fields lying in the Form of a Triangle, leading up between two Woods or large Hedges, and ſometimes I have ſeen a Houſe at the Angle: this hath been very pleaſant to my Fancy, eſpecially when it hath aſcended up-hill, and hath had the South, South-Eaſt, or Eaſt Aſpect. Now if Noblemen and Gentlemen that have Ground convenient, would but make ſome ſuch Lawns before their Houſes, it would be very pleaſant, and a great Ornament to their Seats. They may make theſe Lawns, and clear the Wood that is within the Figure of them, as it decays, or as they have occaſion; the Charge would not be great, but the Pleaſure and Profit would certainly be great and laſting.

I do prefer your Lime-Trees to bound in your Lawn, becauſe it is a Tree that will grow well on any Soil, having but care to plant it as it ſhould be, beſide the fine Shape all the Trees will naturally grow in; for they will ſeem as tho they were cut, provided they are not ſet too thick, for then one hinders the Shape of another.

The Elm is a good Tree for this purpoſe, for it hath a fine green Leaf; and if the Ground be natural for it, it will grow to a great Tree, and ſtreight, if kept with pruning as it ought: Theſe Trees you may plant thick round your Lawn.

The Beech, in Ground where it likes, makes a ſtately Tree, ſo doth the Walnut, Cheſnut; black Cherries, where they like the Ground, are quick Growers, and very pleaſant in the Spring, when they are clothed in their white Garments; and indeed any Tree that is not very dangerous to remove, as are the ſtately Oak and Pines, which were the very beſt, were it not for this fault. The Firs and Yews are not ſo difficult: they will do well where they like the Ground, *&c.*

Now where Men have not the Convenience or the Quantity of Ground, if they make but 20 Acres in a Field in ſome good Figure leading to the Houſe, it will be the more pleaſant, and the Charge as little as to do it other ways.

CHAP. XXXIX.

Of ſeveral Superficial Figures, and how they are to be meaſured.

TO ſpeak of all ſorts of Figures will be far beyond my Intention, there being ſo very many irregular Figures which have many unequal Sides and Angles; but they may all be brought into parts of ſome of the Figures following, and meaſur'd like them: I ſhall ſhew you one uſeful Problem, eſpecially to make your Ovals by, whether they be made from two Centers, or four; and then I ſhall touch at ſome Superficial Figures. (*See Fig.* 30.)

Suppoſe

Suppoſe three Pricks or Points given (ſo they be not in a ſtreight Line) to find a Center to bring them into a Circle. This may be done ſeveral Ways, *viz.* either by Circles, or by raiſing Perpendiculars; as if the Points at A B C. were to be brought into a Circle: draw a Line from A. to B. and in the middle of that Line raiſe a Perpendicular, as the Line D E. which you may ſoon do: for if you open your Compaſſes to any convenient diſtance, and ſet one Point in B. draw the Arch 1. and 2. then ſetting one Point in 4. draw 3 and 4. where theſe croſs, draw the Line ED. do the ſame with the Points BC. and where the two perpendicular Lines meet is the Center, as at F. *&c.* Superficial Figures that are irregular and right-lined, are ſuch whoſe Sides or Angles are unequal, of which ſome are Triangles, or triangular Figures; and here note, that there are five ſorts of Triangles, which are thus named and known.

1. *Iſoſceles* hath two of the Sides equal.
2. *Scalena* hath the three Sides unequal.
3. *Orthygone* hath one right and two acute Angles.
4. *Ambligone* hath one obtuſe and two acute Angles.
5. *Oxygone* hath three acute Angles, or equilateral Triangles. (*See Fig.* 31.)

Every Triangle is half of a Square, whoſe Length and Breadth is equal to the Perpendicular, and Side cut by the Perpendicular: as is plain in the firſt Figure ſhew'd by the pricked Lines: therefore to meaſure any Triangle, raiſe a perpendicular from the Baſe to the greateſt Angle.

Then multiply the whole Baſe by half the Perpendicular, or the whole Perpendicular by half the Baſe, and the Product is the Content. Or thus: take the whole Baſe and whole Perpendicular, and multiply one by the other; the half of that Sum is the Content of the Triangle, *&c.*

Square or Quadrangular Figures are theſe following.

1. A Geometrical Square; this hath right Angles, and Sides equal.

2. An

2. An Oblong Square, which hath equal oppoſite Sides and Rectangles.

3. A Rhombus hath equal Sides, and unequal Angles.

4. A Rhomboides, having unequal Sides, and Angles oppoſite, equal.

5. Trapezia are all other four-ſided Figures.

(*See Fig.* 32.)

The firſt is meaſur'd by multiplying one of the Sides in it ſelf.

In the ſecond the Length, multiply'd by the Breadth, gives the Content.

The three laſt may be turned into two Triangles each, and ſo meaſur'd as is before ſaid.

Polygones are theſe Figures following: As the end of a Tree hewed into five equal Sides, this is call'd a Pentagone; of ſix Sides, Hexagone; ſeven Sides, Heptagone; eight Sides, Octagone; nine Sides, Enneagone; ten Sides, Decagone; twelve Sides, Dodecagone. To meaſure any of theſe, take half the Perimeter (that is, half the Compaſs about) and the Perpendicular drawn from the Center to the middle of any one of the Sides, multiply the one by the other, and it giveth the Content.

Circular Figures are theſe, which be thus named:

1. The Circle is near equal to a Square made of half Diameter, and half Circumference.

2. The Semi-Circle, to a Square made of half the Arch-Line, and half Semi-Diameter.

3. The Quadrant, or fourth part of a Circle.

4. The Segment, Arch or part of a Circle.

The firſt is meaſur'd by multiplying the Semi-Circumference by the Semi-Diameter: The ſecond, by multiplying the Radius or Semi-Diameter by a fourth patt of the Circumference of the whole Circle: The third, by multiplying the Radius by an eighth part of the Circumference of the Circle that it was made of: The fourth, by multiplying the Radius by half the Length of that Arch-Line. Thus have you the Content or Area of each.

To find the Diameter of any Circle, or the Circumference, by having one given; the loweſt Number is, as 7 is to 22, ſo is the Diameter to the Circumference; or as 22 is to 7, ſo is the Circumference to the Diameter.

To find the Length of an Arch-Line geometrically.

This Problem is uſeful to be known, for to meaſure the Quadrant, Segment of a Circle, or Oval; for the Oval is made of parts of the Circle.

Firſt, Divide the Chord-line of the part of the Circle into four equal parts; then ſet one of theſe parts from one end of the Chord-line, alſo ſet one of the four parts from the Angle in the Arch-line; then from one Point to the other draw a Line: the length of this Line is half the Length of the Arch-line. (*See Fig.* 33.)

Examp. A B. the Chord-line, divided into four parts, one of the four parts ſet from B. to C. and one part ſet from A. to D. then draw the Line C D. which Line is half the length of the Arch-line A D B. which was to be found out.

Thus may you meaſure this part of a Circle, or the like; but if the part of a Circle be greater than a Semi-circle, then divide the Arch-line into two equal parts, and find the length of one of theſe, as is aforeſaid; which doubled, giveth the length of the whole Arch-line. This Rule will aſſiſt you to meaſure the Oval, whether it be made ftom two Centers or four, *&c.*

There is no regular Figure but may be reduc'd into ſome of theſe Figures aforeſaid, therefore I ſhall ſhew you the Uſe of ſome Geometrical Figures, which are very uſeful, not queſtioning but that you underſtand the firſt Rules in Geometry; as, to draw a parallel Line, to raiſe a Perpendicular-line from another, *&c.* for thoſe things are out of my intended Diſcourſe: therefore if you are to ſeek in them, conſult with *Euclid* and others.

How to raiſe a Perpendicular at the end of a Line, by which you make a Square; very uſeful alſo to ſet off a ſquare Line from a ſtreight Line, in any Garden, Walk, Houſe-end, or the like.

(*See Fig.* 34.)

Examp. If you be deſired to ſet off a ſquare Line at B. from the Line A B. take ſix Feet, Yards, or Rods, and meaſure from B. to C. in your ſtreight Line; then take eight of the ſame Meaſure, and ſet from B. to D. and then of the ſame, holding one end at C. bring the Line B D. till it juſt touch the Line C D. at D. ſo have you an exact Square made by 6, 8, and 10. See *Euclid*, Book 1. Prob. 47. and p. 35. *Math. Recreations*, p. 93.

(*See Fig.* 35.)

This you may do in other Numbers that bear the like Proportion; for *Euclid* tells you, that the Square made of the ſides ſubtending the right Angle, is equal to the Squares made of both the ſides containing the right Angle: for 10 times 10 is 100. and 6 times 6 is 36. and 8 times 8 is 64. ſo 36 and 64 make 100. equal to the ſubtended Square. There are ſeveral other ways to raiſe a Perpendicular at the end of a Line; but this being ſo eaſy, and the moſt uſeful, I ſhall not name any more.

CHAP. XL.

To divide a right Line given, according to any Proportion required; and how to divide Land or Woods: with ſome Uſes of the four-pole Chain.

THE Line A is required to be divided into two ſuch parts, which ſhall have proportion the one to the other, as the Line B. hath unto C.

(*See Fig.* 36.)

Make an Angle of any Quantity, as A B C. and let the ſide A B. be equal to the given Line A. then ſet the Line C. from A. to E. and the Line B. from E. to C. and from the point E. draw the Line E D. parallel to C B. cutting the Line A B. in D. ſo ſhall B D. bear the ſame proportion to D A. as the Line B. hath to the Line C. This is the Golden Rule by Lines.

To divide a right Line in Power, according to any Proportion given.

(*See Fig.* 37.)

Draw the Line C D. equal to the two Lines A and B. then divide the ſaid Line in the point F. in proportion as A. to B. then in the middle of the Line C D. deſcribe the Semi-circle C E D. and on the point at F. raiſe the Perpendicular F E. cutting the Semi-circle in E. From that point draw the Lines E C. and E D. which two Lines together ſhall be equal in power to the given Line, and the power of the Line E C. ſhall be in ſuch proportion to the Power of the Line E D. as A to B.

Many

Many Men, when their Woods are fell'd, ſell their Wood by the Acre, or half-Acre, or ſometimes two or three Acres; and ſometimes Men let their Land to plough by the Acre; and ſometimes Men purchaſe part of a Field by the Acre. I will here ſhew you how you may cut off parts of an Acre, or ſeveral Acres from a Field; or how far you muſt go in a Wood or Field to make an Acre, more or leſs, of ſeveral Figures: which will be uſeful to be known of moſt Men, for ſeveral other Occaſions.

Suppoſe a Wood, or part of it, ſhould be in a Triangle, as the Figure following, which ſhould contain 745 Poles $\frac{42}{100}$. that is, 4 Acres 105 Poles, and near $\frac{1}{2}$. Of this Wood there are ſold 2 Acres, which are to be taken off from the Angle C. and to cut the Line A B. Having meaſur'd your Triangle, and found it as aboveſaid, and alſo the Baſe-line to be 84 Poles, then by the Rule of Three work it thus:

(*See Fig.* 38.)

If 745.42 (the Content of the whole Triangle) have for its Baſe 84 Poles or Rods: what ſhall 320 Poles have for its Baſe? (that is 2 Acres.) See it wrought by Logarithm.

745.42 Log.	2.87240
84. Log.	1.92427
320. Log.	2.50514
	4.42941
Gives 36.06:	1.55701

Here you ſee that this Log. gives 36 Poles and $\frac{6}{100}$, ſo that you muſt go 36 Poles and a little more on the Baſe-line A B. from A. to D. for your 2 Acres: then the Angle ACD. is the two Acres, or 320 Poles, and the Angle CD B. is two Acres 105 Poles, and near half a Pole.

By

By the ſame Rule may you cut off what number of Poles you pleaſe, from the Angle D. to fall upon the Line C B. or to fall upon the Line D B. having but the Length of the Lines given you.

But if it be requir'd to take off a part from a Triangle according to any Proportion given, by a Line drawn parallel to any of the Sides aſſign'd.

As let A B C. be a Triangle containing 5 Acres, and it is deſired to cut off 2 Acres, by a Line drawn parallel to A B. Firſt, on the Line A C. draw the Semi-circle A E C. and the Diameter C A. divide into 5 equal parts, and from the point of 3 of theſe parts of that Line draw the Perpendicular D E. to cut the Arch-line in E. then ſet the Length of C E. from C. on the Diameter-line, and it will reach to the Point F. then from that Point at F. take the neareſt diſtance to the Line A B. and ſet that diſtance off from B to G. then draw the Line F G. exactly parallel to A B. ſo will the Triangle C G F. be 3 Acres, and G B A F. 2 Acres, the thing propounded. (*See Fig.* 39.)

This Rule in it ſelf is exact, but in a large Field or Wood is difficult to be done, becauſe the Semi-circles and other Lines are very hard to be drawn exactly.

But if your Field, or part of it be a Square, and you are to take off ſome parts of it: you may do it to any Number of Rods deſir'd, eaſily and exactly, thus:

Let the Field be ever ſo great, meaſure you only that ſide of the Square whence you are to take off your part exactly. (*See Fig* 40.)

Examp. It is requir'd to cut off 2 Acres, or 320 Poles from a Field, or part of one, that is in form of the Square A B C D. with a Line drawn parallel to the ſide A B. Now finding the ſide of the Square to be 32 Poles, divide 320 (the parts you are to cut off) by 32, the ſide of the Square, and the Quotient will be 10: then ſet off 10 Pole from A to E, and from B to F. and

320 (10
322
3

the

the Square A B F E. is 2 Acres, as was required.

This is very uſeful for ſeveral Men, and readily to be perform'd; but if theſe ſides A C. or B D. do not go ſquare from the end A B. then you muſt find the Mid-line of the Square you are to take, and divide the Sum of Poles you are to take off by that. The firſt Example will aſſiſt you to find this Mid-line, and ſomewhat help you in the working.

This being ſuch an uſeful Problem, I ſhall ſhew you how to perform it another way: as in the laſt Example, the ſide of the Square 32 Poles, and you know 160 Poles make one Acre; then divide 160 by 32, (the ſide of your Square) the Quotient is 5: which tells you, that you muſt meaſure 5 Rods, or Poles, from the ſide of your Square on each end, to make one Acre; 10 Poles for two Acres; 15 Poles for three Acres, *&c.* which you ſee agrees with the former Rule.

But if it be required to take off the parts of a Square, and to have thoſe parts in a Triangle, then the firſt and ſecond Figures will aſſiſt you how to perform that.

To divide an irregular Figure into any Parts required: that is, to take what number of Rods you pleaſe from ſuch a Figure.

As if A B C D E. be the Figure of a Field or Wood, and it is deſired to take off the half of it from the Angle at A. the whole Figure is 705 Poles, then the half is 352.50, and the Triangle ADE. is but 290 Poles, which wants 62 Poles and a half of the half of the Field: therefore take 62.50 from the Triangle A C D. by the Rules deliver'd in the 38*th Fig.* and there will be added the Triangle A D H. which being added to the Triangle A D E. will divide the Figure into two equal Parts, the thing deſired. (*See Fig.* 41.)

Thus may you take half from any irregular Figure, or more or leſs than half, and from what Angle deſired;

ſired; which will aſſiſt you well how to ſell your Woods by the Acre, or to know how far you ſhall go into a Field, to take off any parts. The fourth Rule (which I found by my Practice) I commend for very good.

One Example I ſhall give you more, which ſhall be according to my fourth Rule; I try'd it in a Field near *Caſhioberry-Park*: this I was order'd to do by my Lord's Steward Mr. *Sydenham*, to take off three Acres from a ſmall Field as exactly as I could, at one end appointed by him.

Firſt, I meaſur'd that End, and found it to be 37 Poles and $\frac{3}{4}$; but obſerving the Hedges, I found them to ſplay off a little, ſo that about 6 Rods and a half, or little more, would be the middle: which I ſet off at each end, and found that Line to be 38 Poles long. Then I divided 160 (the Poles in one Acre) by 38 (the Poles of the End of the Field) the Quotient was 4 and $\frac{8}{38}$; which 8 of 38 I muſt turn into parts of my Chain, that is, into decimal parts, thus: As 38 is to 8, ſo is 100 to 21, and 2 of 38, which 2 is not conſiderable. So that if the Chain be divided into 100 Links, you muſt then go 4 Poles and 21 Links at each end, to make one Acre of Ground; but if your Chain be a four-pole Chain, divided into 100 Links, then with ſuch a Chain you muſt go 4 Poles 5 Links and $\frac{1}{4}$, and a little more, to make 1 Acre at 38 Poles long. Then for three Acres, I muſt go in breadth 12 Poles $\frac{63}{100}$, to make three Acres and a little more: ſee it prov'd.

```
 4 ( 8
160 (4
 38
```

```
 1
24  (2
800 (21
388
 3
```

Here you may ſee that 12 Poles $\frac{63}{100}$ multiply'd by 38 Poles, gives 479 Poles and $\frac{94}{100}$; which being divided by 160 (the Poles in one Acre) gives in the Quotient 2 and 159; ſo then if you add but 6 of 100 to the 94, it is juſt three Acres: for whereas I take, in the decimal parts, but $\frac{21}{100}$, I

```
 12.63
    38
 -----
 10104
 3789
 -----
 479.94
```

 ſhould

ſhould take the 21 Links, and the 22d part of one of theſe Links; which Niceneſs may be diſpenſed with.

From what hath been ſaid, you may meaſure any ſtanding Wood, or part thereof, eſpecially if theſe parts be near to a Square or Triangle; if not, you may reduce them to one of theſe.

Thus having ſpoke ſomething how ſuperficial Figures are to be meaſured, I ſhall give an Example or two of the Chain, and it ſhall be of the four-pole Chain divided into 100 parts: as ſuppoſe the Figure A B C D.

(*See Figure* 42.)

This Figure may be meaſured ſeveral ways: as firſt it may be put into two Triangles, and ſo meaſured; or elſe you may meaſure both the ends, and halve them, and ſo meaſure the length in the middle: you may meaſure alſo both the ſides and halve them, and then meaſure the breadth in the middle. But for example: Firſt, I meaſure the ſide A B. and find it to be 15 Chains and 80 Links of the four-pole Chain; the end B C. is 6 Chains 74 Links, the other ſide C D. is 12 Chains 50 Links, and the other end D A. is 6 Chains. Then add the two ſides together, of which take the half; that half is the mean Length: both ſides added together, make 28 Chains 30 Links, half of which is 14 Chains 15 Links: then add the ends together, *viz.* 6 Chains, and 6 Chains 74 Links, the total of both is 12 Chains 74 Links; then half of the ends added together, is 6 Chains 37 Links. Then multiply the mean Length by the mean Breadth, and cut off five Figures to the right hand, and whatſoever Figures remain to the left hand are Acres; and thoſe five Figures cut off, are parts of an Acre.

15.80 *one ſide.*
12.50 *one ſide.*
28.30
14.15

Thus

Thus you may know the Content of a Field without Diviſion; as in the laſt Example, 14.15, multiply'd by 6.37, gives 9.01355: then if you take off five figures, as the fractional parts, there remains 9, which is nine Acres 2 Poles, and above $\frac{1}{8}$ of a Pole. But you may eaſily know the fractional part of any decimal Fraction thus: This belongs to 100000; for if the decimal Fraction have 5 Figures, the Integer is 6, the Fraction 4, then the Integer 5, *&c.*

	14.15
	6.37
	9905
	4245
	8490
	9.01355

Then work it by the Rule of Three, or by your Line of Numbers, thus; As 100000 is to 1355, ſo is 160 (the ſquare Poles in one Acre) to 2 Poles and near $\frac{1}{4}$. But that you may be the better ſatisfy'd in this moſt uſeful Rule, If 100000 be equal to one Acre, or 160 Poles,

Then 50000 to $\frac{1}{2}$ an Acre, or 80 Poles;
25000 to $\frac{1}{4}$ of an Acre, or 40 Poles, which is a Rood.
12500 to $\frac{1}{8}$ of an Acre, or 20 Poles.
6250 to $\frac{1}{16}$ of an Acre, or 10 Poles.
3125 to $\frac{1}{32}$ of an Acre, or 5 Poles.
1250 equal to 2 Poles:
And 625 equal to one Pole.

So that when any Fraction is, repair but to theſe Rules, and you may ſee what number of Poles is equal to it: you may proportion it to Half-poles, *&c.* for,

312 $\frac{1}{2}$ is equal to half a Pole.
156 $\frac{1}{4}$ is equal to a quarter of a Pole.
78 $\frac{1}{8}$ is equal to one eighth part of a Pole, *&c.*

Not only to prove this, but alſo to ſhew you how much readier this way is than the 100 Links, to bring it into Rods or Poles, divide it by 160, to bring the aforeſaid Meaſure to the one-pole Chain

and 100; multiply 14.15 by 4, it gives 56.60; and 6.37 multiply'd by 4, gives 25.48: which being multiply'd one by the other, gives 1442 $\frac{1680}{10000}$. I will neglect the Fraction, as being not $\frac{1}{4}$ of a Pole, and divide 1442 (the Poles in that meaſure) by the ſquare Poles in one Acre, (160 Poles) and the Quotient is 9 and 2 over; that is, 9 Acres 2 Poles and a little more, as before. But how much the other way is readier than this, I leave the Reader to judge.

56.60
25.48

45280
22640
28300
11320

1442.1680

5.0 (2
1.4.4.2 (9
1.6.0

Example the ſecond.

How to meaſure a Triangle with the Four-pole Chain, and never uſe Diviſion.

As in the Triangle A B C. the Baſe A C. is 40 Poles, and the pricked perpendicular Line is 20, the half is 10 Poles: Now when you have even Poles (as in this Example) you muſt add two Cyphers to the length, and two to the breadth; or elſe you cannot take off the 5 Figures, or 5 Cyphers, as is before ſhew'd: then taking the 5 Cyphers off after Multiplication, there remains 40. Which ſhews you that ſuch a Triangle that hath ſuch a Baſe, and ſuch a Perpendicular, containeth four Acres of Ground: And if you work it the common way, you will find it to be true. (*See Fig.* 43.)

40.00
10.00

40.00000

But

But to aſſiſt you yet further to turn Poles into Acres, obſerve this Table: The Denominations of the ſeveral Numbers are known by the Marks under which they are ſet; as all under *ac.* are Acres, under *ro.* are Roods, under *p.* are ſo many Poles: and ſo the firſt Column under M. anſwereth to Thouſands, that under C. to Hundreds, that under X. to Tens, and the odd Poles (if any be) are ſet down under Pole. As *e. g.* in 1442 Poles, to know how many Acres by this Table: firſt, the one thouſand in the Table under M. is 6 Acres 1 Rood, ſet that down as you ſee in the Table; then four hundred under C. and againſt 4, is 2 Acres 2 Roods, ſet that down; then in the Table under X. and againſt 4, is one Rood, ſet that down; then the odd Poles ſet down always under the Poles, as 2 under Poles; then ſum them up, and you ſhall find it is 9 Acres 2 Poles, as before. This Table being ſo plain, there need no more Examples.

	M.			C.			X.	
	ac.	*ro.*	*p.*	*ac.*	*ro.*	*p.*	*ro.*	*p.*
1	6	1	0	0	2	20	0	10
2	12	2	0	0	1	00	0	20
3	18	3	0	1	3	20	0	30
4	25	0	0	2	2	00	1	00
5	31	1	0	3	0	20	1	10
6	37	2	0	3	3	00	1	20
7	43	3	0	4	1	20	1	30
8	50	0	0	5	0	00	2	00
9	56	1	0	5	2	20	2	10

	ac.	*r.*	*p.*
1000 gives	6	1	0
400 gives	2	2	0
40 gives	0	1	0
2 gives	0	0	2
	9	0	2

A Table of ſuperficial long Meaſure, from an Inch to a Mile, according to the Standard of England.

Inch.						
12	*Foot.*					
36	3	*Yard.*				
45	$3\frac{3}{4}$	$1\frac{1}{4}$	*Ell.*			
198	$16\frac{1}{2}$	$5\frac{1}{2}$	$4\frac{2}{5}$	*Pole.*		
7920	660	220	176	40	*Furlong.*	
63360	5280	1760	1408	320	8	*Mile.*

A Table of Square Meaſure.

Acres.	4	160	4840	43560
	Rood.	40	1210	10890
		Pole.	$30\frac{1}{4}$	$272\frac{1}{4}$
			Yards.	9
				Feet.

An

An Example of the Table of Long Meaſure.

Suppoſe you were to find out how many Inches were in a Pole long; look under *Inches*, and againſt *Pole* there is 198: and ſo many Inches are in a Pole long, and 16 ½ Feet, 5 ½ Yards.

And in the Table of Square Meaſure, to know how many ſquare Yards are in a Pole, look againſt *Pole*, and above *Yards* there is 30 ¼, the ſquare Yards in a Pole.

There are ſeveral other ſorts of ſuperficial Meaſures, as Paving, Plaiſtering, Wainſcotting, and Painting; which are to be meaſured by the Yard ſquare, and may be meaſured by ſome of the Rules before ſhew'd: your readieſt way is by the Yard divided into ten parts, ſo will your odd Meaſure come into Decimal Fractions, which are as eaſily caſt up as whole Numbers. Or if you meaſure by the Foot-Rule, have it divided into ten parts; and when you have found the Content in feet, divide it by 9, the Quotient will ſhew you how many yards: and if any remain, they be feet.

Some ſorts of Work are meaſured by the Square of 10 feet the ſide, ſo that ſuch a Square is 100 feet; for ten times ten is a hundred. By this Meaſure is your Carpenters Work meaſured, as Floors, Partitions, Roofs of Houſes; ſo alſo is Tiling and Slating meaſured. This is very ready to meaſure and to caſt up; for if you multiply the Breadth by the Length, ſo many hundreds as you find, ſo many Squares are there; and what remains are parts of a Square.

Board and Glaſs, *&c.* are meaſured by the Foot, which may be divided into ten parts, which will be much eaſier to count up.

But if you would be more fully ſatisfy'd in the Rules of Surveying, ſee the Works of Mr. *Leyborn*, Mr. *Wing*, Mr. *Rathborn*, &c.

Having the Length of a Field, to know what Breadth will make one Acre of Ground, by the Four-pole Chain and Line of Numbers.

Ex. The Length is 12 Chains 50 Links; to find the Breadth to make that Length juſt one Acre, do thus: Extend your Compaſſes from 12.50 (the Length) to 10, that Extent will reach from 1 to 80, which is the Breadth in Links to make one Acre; for if you multiply 12.50 by 80, it yields 100000; from which if you take off five Cyphers, there remains one, which is one Acre, *&c.*

12.50
80
———
1.00000

CHAP. XLI.

Of Meaſuring Holes and Borders that are under a Pole-broad, by which you may the better let or take them to do by the Pole-ſquare, &c. *With ſeveral Tables of Meaſures.*

HOLES to ſet Trees in, are ſeldom made under one foot Diameter, or above eight foot Diameter; the Depth may be reduced to a foot deep.

The Rules to meaſure any Circle by, are the ſame, which is thus: To take the Semi-circumference and Semi-diameter, and multiply theſe Halves the one by the other, ſhews the ſuperficial Content or Area of that Circle.

This you may work either by the Pen, or Line of Numbers. As by the Line of Numbers thus: The Diameter being four foot, extend the Compaſſes from

1 to 41, the Diameter; keep your Compaſſes fixed, and always on the number 7854 ſet one point, and turn twice to the right hand: but if they fall off at the end of the ſecond turn, then muſt you ſet them on the firſt part of the Line when you have turn'd them once, *&c.*

Having taken the Diſtance of 1 to 4, and ſet one point on the ſtanding number 7854: the other Point goes to 31 and near a half, thence if you turn another turn it will go off from the Line: therefore you muſt find the Point 31 and near $\frac{1}{2}$ on the firſt part of the Line, and ſet one point there, the other will reach to 12 and about $\frac{58}{100}$; which tells you, that in a Circle of 4 foot Diameter there are 12 ſuperficial ſquare feet and a half, and better.

Now to work it according to the Rule above, by the Line, if you multiply the Semi-diameter by the Semi-circumference, it giveth the Content, the ſame way I ſhall do it with my Pen.

Example.

Firſt, Having the Diameter I muſt find the Circumference; extend the Compaſſes from 7 to 22. the ſame will reach from 4 to 12.58 (the Circumference) then half of 12.58 is 6 $\frac{29}{100}$, the Semi-circumference; which multiply by 2, the Semi-diameter. Extend the Compaſſes from 1 to 2, the ſame Extent will reach from 6.29 to 12.58, as before, that is, twelve feet and a half, and $\frac{8}{100}$. You here may ſee how eaſily and readily the *Golden Rule* and *Multiplication* may be performed by the Line of Numbers; which I uſe the oftner, that you might take the more notice of the Eaſineſs of it to work any of the Rules of Arithmetick by. Being once perfect in this, you will ſoon underſtand the Sector, with its excellent uſes in the Mathematicks, perform'd by Lines and Compaſſes; but according to the laſt Rule, ſee the ſame Queſtion wrote with the Pen, that you may ſee the Agreement that is between Geometry and Arithmetick.

Example.

Example. 144

To find the Circumference: As 7 to 22, ſo 144 the Barley-corns in four feet the Diameter, to 452.6 almoſt, the Circumference in Barley-Corns——

—— 452.6

		288	3.14
Half-circum.	226.3	288	31.6.80 (452.6
Half-diamet.	72	——	7.7.77
		3168	
	4526		
	15841		
	16293.6		

the Barley-corns in 4 feet Diameter almoſt.

To know how many feet this is, divide it by the Barley-corns in one Foot, which are————

	1296		
Barley-corns in $\frac{1}{2}$ a foot	648	1.7.4	
Barley-corns in $\frac{1}{4}$ of a foot	324	3.9.5	
		4.3.3.1	
		1.6.2.9.3	(12 feet 741
		1.2.9.6.6	parts.
		1.2.9.	

Which 741 Barley-corns is above half a foot, as was ſhewed before; but in finding the Circumference I add a Cypher to 4, which makes it 40; from that I take 6 times 7, which is 42, and ſhould be but 40: then becauſe I took too much, I neglect 6 when I divide it by the Barley-corns in a foot ſquare; ſo that I do not ſay it is exact, neither doth the Fraction $\frac{741}{1296}$ bear the like proportion as $\frac{58}{100}$: for if you extend your Compaſſes from 100 to 58, that Extent will reach from 1296 to 750; and if you will be more exact, work it by Logarithms; 'tis 12 feet 82 inches.

A Table from one foot Diameter, to 8 feet ſuperficial Content.

One foot Diam. is 113 inches.
Two feet Di. is 3 feet 20 inches.
Three feet Di. is 7 feet 10 inches.
Four feet Di. is 12 feet 82 inches.
Five feet Di. is 19 feet 93 inches.
Six feet Di. is 28 feet 41 inches.
Seven feet Di. is 38 feet 72 inches.
Eight feet Di. is 50 feet 43 inches.

Now knowing the Content of any of theſe Circles, you may the better know how to let or take them to do, and reduce them into ſquare Poles, or let them to do by the Pole ſquare, *&c.* for,

	Feet.	
One ſuperficial Pole ſquare is	272 $\frac{25}{100}$ or $\frac{1}{4}$	16.5
Half of a ſquare Pole is	136 $\frac{125}{1000}$	16.5
A Quarter of a ſquare Pole is	68 $\frac{625}{10000}$	
One Eighth of a ſquare Pole is	34 $\frac{3125}{100000}$	825
		990
		165
		272.25

For if you divide 272 $\frac{25}{100}$ by 8, you will have in the Quotient 34 $\frac{03125}{100000}$, which is one eighth part of a Pole. To reduce the Inches into Feet may be eaſily done:

For 144 Inches are a ſuperficial foot ſquare.
72 half a ſquare foot.
36 Inches is $\frac{1}{4}$ of a ſquare foot.
18 Inches is $\frac{1}{8}$ of a ſquare foot, *&c.* for 8 times 18 is 144.

How to meaſure your Borders, if you let them to do by the Rood.

Any under-meaſure is beſt to meaſure by the Decimal Chain, if by the one Pole-chain, and divided into

into 100 Links: If it be the four-pole Chain divided into 100 Links, then every one of theſe Links is four links of the other: ſo that every ſquare Rod is 10000 Links ſuperficial.

One link broad, 10000 in length, makes a Pole.
Two links broad, 5000 long, a Pole.
Two and a half broad, 4000 in length, a Pole.
Three links broad, 334, near a Pole.

A Table of the reſt in Links, from one Link to a hundred.

Breadth.	*Length.*	*Brea.*	*Length.*	*Brea.*	*Length.*	*Bread.*	*Length.*
1	10000	26	385	51	196	76	132
2	5000	27	371	52	192	77	130
3	3340	28	357	53	188	78	128
4	2500	29	344	54	185	79	127
5	2000	30	333	55	182	80	125
6	1667	31	323	56	178	81	124
7	1429	32	312	57	175	82	122
8	1250	33	303	58	172	83	121
9	1111	34	294	59	170	84	119
10	1000	35	285	60	167	85	118
11	909	36	278	61	164	86	117
12	833	37	270	62	161	87	115
13	770	38	263	63	158	88	114
14	714	39	256	64	156	89	113
15	667	40	250	65	154	90	111
16	625	41	244	66	152	91	110
17	588	42	237	67	149	92	109
18	556	43	232	68	147	93	108
19	527	44	227	69	145	94	107
20	500	45	222	70	143	95	105
21	475	46	217	71	141	96	104
22	454	47	213	72	139	97	103
23	435	48	208	73	137	98	102
24	417	49	204	74	135	99	101
25	400	50	200	75	133	100	100

This Table is ſo eaſy to underſtand, that it needs no *Example*; for look but the Breadth, and againſt it is the number of Links that you muſt have in length to make a Pole ſquare ſuperficial. This Table is of other excellent Uſes, which is left to your Practice; tho it is not exact, yet it is as near as can be in whole Links: and the fractional parts are ſo ſmall, they be not worth minding; but you may proportion them if you pleaſe. The laſt Tables of Holes, and this for Borders, I made to aſſiſt me to let my Lord's Work at *Caſhioberry*.

Brick-work is meaſured by the Pole of 16 ½ feet long; and let the Wall be 3, 4, 5, or 6 Bricks thick, the Thickneſs is always reduced to a Brick and a half thick. So that one Brick and a half thick is in proportion to 3, two Bricks thick to 4, *&c.*

The Rule is this, As 3 is to any number againſt the Bricks or Bricks and half, (according as the Wall is thick) ſo is the Length of Poles to the Content in Poles.

Example.

A Wall 7 Bricks and a half thick and 2 Poles long, is 10 Poles of Wall reduced to a Brick and a half thick; the number anſwering againſt 7 Bricks and ½, is 15; then by the Rule of Three, with your Pen or Line and Compaſſes, work it thus; As 3 is to 15, ſo is 2 (the Length of the Wall in Roods or Poles) to 10: ſo that a Wall 7 Bricks and a half thick, and 2 Poles long,

1 Brick ½	thick is in proportion to a Wall of one Brick and a half thick, as three is to any of theſe Numbers	3
2 Bricks		4
2 and ½		5
3 Bricks		6
3 and ½		7
4 Bricks		8
4 and ½		9
5 Bricks		10
5 and ½		11
6 Bricks		12
6 and ½		13
7 Bricks		14
7 and ½		15
8 Bricks		16
8 and ½		17
9 Bricks		18
9 and ½		19
10 Bricks		20

long, is equal to 10 Poles of a Wall that is but one Brick and a half thick.

But if you meaſure the Wall by a 10 foot Rod divided into 10 or 100 equal parts, you may ſoon find the ſuperficial Content in feet, by multiplying the length by the breadth, and ſo turn them into ſquare Poles by the Table following.

Example.

Suppoſe a Wall 272 feet long, and 12 feet high, that is 3264 ſuperficial ſquare feet; which if you divide by 272 and $\frac{1}{4}$ (the ſuperficial feet in one Rod ſquare) the Quotient will be 11 and 269 $\frac{25}{100}$; that is 11 Poles, 269 feet and $\frac{1}{4}$, which wants but three feet of twelve Poles or Rods: For if you take 269.25 from the ſquare feet in a Pole, *viz.* 272.25, there will remain but three feet, as you may ſee it, and the Diviſion here wrote with the Pen.

272
12

544
272

3264

2692
3713
154255
3264.00(11
272255
2722

272.25
269.25

003.00

Where note in Diviſion, that if the Diviſor or the Dividend, or either of them hath a Decimal Fraction belonging to it, add two Cyphers to the other, as you ſee here is done: and alſo in Diviſion of Fractions, ſo many times as you can take whole numbers from whole numbers, ſo many whole numbers have you in your Quotient; but when your whole numbers come under your Fractions, what comes then in the Quotient is Fractions; and you muſt always make a ſtop between the whole Number and the Fractions, in all places. And ſo in Multiplication, ſo many Fractions as there are in the Multiplicand and Multiplicator, ſo many Figures muſt you cut off from the Product.

And note, that if this 272 had been but 272 and $\frac{1}{4}$, then had there been juſt 12 Poles: for every foot high had then been one ſuperficial Pole ſquare.

The

	X M.			M.			C.			X.	
	p.	*q.*	*f.*	*p.*	*q.*	*f.*	*p.*	*q.*	*f.*	*q.*	*f.*
1	36	2	63	3	2	41	0	1	31		10
2	73	1	58	7	1	26	0	2	62		20
3	110	0	53	11	0	05	1	0	26		30
4	146	3	55	14	2	52	1	1	57		40
5	183	2	40	18	1	31	1	3	20		50
6	220	1	35	22	0	10	2	0	54		60
7	257	0	45	25	2	57	2	2	17	1	02
8	293	3	47	29	1	36	2	3	47	1	12
9	330	2	25	33	0	15	3	1	13	1	22

The uſe of this Table is to turn Feet into a Superficial Pole ſquare: if your Sum be 10000, then take the Number anſwering your ten Thouſands under X M; if a Thouſand, under M, a Hundred, under C, and Tens under X.

An *Example* will make it plain: having meaſur'd your ſide of a Wall, and found it to be (as in the laſt *Example*) 3264 feet, look under M. and againſt 3. there is *p.* 11. 0. *f.* 5; then look under C, and againſt 2, there is 0. 2. 62; then under X, and againſt 6. is 60; and then the four odd feet, ſet down as you ſee here, make near twelve Poles, as before.

3000	11. 0. 05
200	0. 2. 62
64	0. 0. 64
	11. 3. 63

272.25 is one Pole, ſquare feet, ſuperficial Meaſure, and 136.125 is half a ſquare Pole and 68.062 ½ is one quarter of a Pole ſquare; but if your Sum be Ten or Tens of Thouſands, then you muſt take that from under X M.

As for Example: In 36542 ſquare Feet, how many Poles, Quarters, and Feet are there? You will find, if you take them out of the Table, as is before

ſhew'd,

	p.	q.	fe.
For 30000 an.	110	0	53
For 6000 an.	22	0	10
For ---500 an.	1	3	20
For the 40 an.	0	0	40
And for the 2 an.	0	0	02
	134	0	57

ſhew'd, and alſo ſum them up, that there will be 134 Pole and 57 Feet. So you ſee this Table will turn your Feet into Poles ſquare, and the other will reduce them into one Brick and a half thick; which is ſoon perform'd, and will be of excellent Uſe.

Theſe Tables will alſo aſſiſt you well in levelling of Ground, that is, if you let your Ground to be done by the Pole-ſquare of 16 foot and a half, which is call'd a Floor, *viz.* 272.25; but in ſome places the Floor is 18 feet ſquare, and 1 foot deep, which is 324 ſolid feet: and in ſome places Ground is let to dig and to carry away by the yard ſolid, that is, 27 ſolid feet; for 3 times 3 is 9, and 3 times 9 is 27, which is near a Cart-load of Earth: ſo that in a Floor of Earth of 16 feet and a half ſquare, and a foot deep (according to this Rule) there is about 10 Loads of Earth, as you ſee it is 10 Loads $\frac{08}{100}$ and $\frac{1}{3}$ or ſolid yards. The Floor of 18 feet ſquare, or 324 ſolid feet, is 12 ſolid yards, or 12 Loads of Earth.

6 (9
272.25 (10.08
27777
222

x
x5
324 (12
277
2

Now all Banks that are made, taking down of Hills in Walks, or filling up of low places, or making Mounts, or Mount-walks, are moſt commonly let by the Rod ſquare, to do; and reduc'd to one foot deep.

The Price for removing Earth is according to the Ground, for ſome Ground is much worſe to dig than others; but that you may not be altogether unſatiſfy'd, I have obſerv'd it thus:

The worſt ſort of Earth or Gravel (ſo it be not a Rock of Stone) may be remov'd, where Men work for 12 *d.* the day, at theſe Prices; the Workmen finding themſelves Barrows or Carts, and all ſorts of working Tools.

For every Rod ſquare at 16 feet and a half the Pole, and one foot deep, to carry it from one Rod to 10 Rods, and to lay the Earth they carry level, 2 *s.* For one Pole or Floor, from 10 Poles to 20, 2 *s.* 6 *d.* From 20 Poles to 30, 3 *s.* From 30 Poles to 50, to carry it in Carts, 3 *s.* 6 *d.* From 50 Poles to 70, 4 *s.* *&c.*

But if it be Loom, Brick-Earth, or Clay that will dig well, that they can ſpeet with a Spade, and fill without the uſe of Pit-axe or Mattock; then one fourth part may be abated, *&c.* This Rule is ſufficient, conſidering but this, that near *London*, where Men have more Wages than 12 *d.* the day, there they will look for more a Floor: and where Men work for leſs, it may be proportion'd accordingly. Thus may you compute the Charge of making Mounts, taking down Hills, making of Ponds, *&c.*

But to aſſiſt you yet further, obſerve theſe few plain Rules, though they may not always be exact: Having found the mean Length and Breadth of your Ground, or Length of your Baſe and Perpendicular, and you deſire to go but a quarter of a Rod in length or breadth, which will content many in ordinary uſes; as if a Man hath digged a piece of Ground by the Pole-ſquare, that is 10 Poles and a half broad, and 21 Poles and a half long; you may count up this, or any the like Numbers, thus: Ten times 21 is 210, then 10 halfs is 5 whole ones, and 21 halfs is 10 whole ones and a half; and a half of a half is a quarter, which you may keep in your Memory, or ſet them down: ſo you ſee here they make both by the Decimal way, and this, 225 Poles and three quarters.

Ten times 21 is	210	*length* 21.5
10 halfs is	005	*bread.* 10.5
21 halfs is	010 $\frac{1}{2}$	
And a half of a half is	00 $\frac{1}{4}$	1075
		2150
		225.75

See here an Example or two more, firſt demonſtrated by Decimals, and then wrought the ordinary way.

Whether are 2 *Rods and* $\frac{1}{2}$ *ſquare, or* 2 *Rods and* $\frac{1}{4}$ *one way, and* 2 *Rods and* $\frac{3}{4}$ *another way, more?*

Example: the Work in Decimals, 2.50
2.50

12500
500

6.2500: 6 Rods $\frac{1}{4}$

For if you work by a Decimal Chain, that is, a Rod divided into 100 links or parts, multiply that into it ſelf, it makes 10000; the half of that is 5000, which is half a Rod; a quarter of a Rod is 2500; and one eighth part of a Rod, or half a quarter, is 1250; one ſixteenth part is 625 ſquare Links; and three quarters 7500: ſo that two Rods and a half are ſix Rods and a quarter of Ground.

Ex. 2 *Rods and* 3 *quarters* 2.75
And 2 *Rods and a quarter* 2.25

1375
550
550

6.1875 which is 6 Rods and
$(\frac{1875}{10000}$ So

So that it appears by this, that two Rods and a half ſquare are more than two Rods and ¾ one way, and 2 Rods and ¼ another way, by one ſixteenth part of a Rod; for if you add 1875, and 625 (the ſixteenth part of a Rod) together, they will make 2500.

But if you work by the four-pole Chain, one Link of it is four of this.

1875
625
2500

The Demonſtration of the preceding Examples.

(*See Fig.* 44, 45.)

See theſe two Squares counted up the ordinary way; and firſt, two Poles and a half, by 2 Poles and a half, is 6 Poles and a quarter: for mind this, if the Number of Poles be even Numbers with half a Pole to each of theſe Numbers, that is, both to length and breadth, that ſuch a Figure comes always off with a quarter.

2 times 2 is 4.
2 halfs is 1.
and 2 halfs is 1.
and half of a half ¼
6 Pole ¼.

But if one of the Numbers be odd Poles, and the other even, with both length and breadth ending in half a Pole, as in the firſt Example, then always ſuch a Figure ends in ¾ of a Pole, as that doth.

But if a Figure be two Poles and ¾ one way, and two Poles ¼ the other, as the laſt was, it ends always in ſuch a Decimal as this, 1875, that is half a quarter, and half half a quarter, that is ⅛ and $\frac{1}{16}$ parts of a Pole ſquare.

This way may you caſt up the Content of a Ground very ſpeedily, and exact, if the middle Length and middle Breadth fall out in ¼, ½, or ¾ of a Pole; and this way you may ſum up a Field before you do it decimally: and then one will be good proof to the other, which with little Practice will make you ſo

perfect, that in ſmall Fields you will readily tell the Content without Pen or Rule only by Memory.

Theſe Rules may alſo be done by two turns of your Compaſſes on the Line of Numbers; and there is no way ſo ready, if once you come but to underſtand that moſt uſeful Line well.

For, as the Diſtance of one of the Numbers to be multiply'd is from one at the end of your Line, the ſame diſtance is the Product from the other Number.

Example of the ſecond Figure.

As one is to two and a half, the ſame Extent of your Compaſſes will reach from two and a half to 6 $\frac{1}{4}$ the Product.

A Table of Board-Meaſure, by having the Breadth of the Board in Inches, againſt which is ſhew'd the Quantity of one Foot thereof in Length.

Breadth of the Board in Inches.	*f. pts.*	*Breadth of the Board in Inches.*	*f. pts.*	*The Quantity of one Foot in Length.*
1	0.083	19	1.583	
2	0.167	20	1.667	
3	0.250	21	1.750	
4	0.333	22	1.833	
5	0.417	23	1.917	
6	0.500	24	2.000	
7	0.583	25	2.083	
8	0.667	26	2.167	
9	0.750	27	2.250	
10	0.833	28	2.333	
11	0.917	29	2.417	
12	1.000	30	2.500	
13	1.083	31	2.583	
14	1.167	32	2.667	
15	1.250	33	2.750	
16	1.333	34	2.833	
17	1.417	35	2.917	
18	1.500	36	3.000	

The Uſe of this Table.

Having taken the Breadth of the Board in Inches, ſee what Number anſwereth it in this Table; and what Number you find againſt the Breadth in Inches, multiply by the Length of the Board or Glaſs, and cut off the three laſt Figures to the right Hand: thereby you ſhall have the Number in feet, and the parts cut off are parts of a foot.

Example.

A Board ten inches broad, and ten feet long; againſt 10 you ſee is 0.833, which multiply'd by 10, gives 8330; then taking off three Figures, there remains 8, that is 8 feet and $\frac{330}{1000}$. But if you would meaſure this Board by the Line of Numbers, then ſet one point of your Compaſſes on 12, extend the other to the Breadth in inches; the ſame Extent will reach from the Length in feet to the Content: For as 12 (the ſide of a ſuperficial foot ſquare) is to the breadth in inches, which here is 10; ſo is the Length in feet (which in this Example is 10) to the Content in feet and parts, which is 8 feet $\frac{330}{1000}$. Note this for a general Rule, that if the Breadth be leſs than 12 inches, then muſt you turn the Compaſſes to the left hand on your Rule; and if more than 12, then turn your Compaſſes from the Length in feet to the right hand.

0.833
10
———
8.330

Learn but to read your Line well, and this Rule, then you may meaſure any Board or Pane of Glaſs as eaſily as tell ten, *&c.*

CHAP. XLII.

Of meaſuring Timber and other ſolid Bodies; with ſeveral Tables uſeful thereunto, &c.

IN Board, Glaſs, Land, *&c.* we only took notice of the Length and Breadth, which was ſufficient to find the ſuperficial Content; but to meaſure ſolid Bodies, we muſt take notice of the Length, Breadth and Depth. Moſt of ſolid Figures are meaſur'd by finding, firſt, the ſuperficial Content of the Baſe, or one End, and multiplying that by the Length, if both Ends alike; but if tapering, then by $\frac{1}{3}$ of the Length: and as ſuperficial Meaſure hath 144 ſquare inches in one foot, and 72 ſquare inches in half a foot, and 36 ſquare inches in a quarter;

So in ſolid Meaſure 1728 ſquare inches make one foot,

And 864 ſquare inches make half a foot,

And 432 ſquare inches make a quarter of a foot.

For every inch ſquare is like a Dye, and ſo is a foot of ſolid Meaſure ſuppos'd to be; for what it wants either in Breadth or in Thickneſs, it muſt have in Length: ſo that in what Form ſoever your ſolid Body is that you meaſure, there muſt be 1728 ſolid inches to make a foot; for 12 (the ſide of a foot) multiply'd by 12, gives 144 for one ſide; and 144 multiply'd by 12 (another ſide) gives 1728, the Cube-ſquare inches in a Cube-ſquare foot.

Now to find the ſolid Content of any piece of Timber or Stone, that hath the ſides equal, firſt find the ſuperficial Content of the End in inches and parts; and multiply that by the Length in inches, the Product is the Content in ſolid inches: then di-

vide

vide that Sum by 1728 (the inches in a foot) the Quotient ſheweth you the Content in ſolid feet, and what remain are inches. If you would work this by the Line of Numbers, the Rule is thus:

Extend the Compaſſes from one to the Breadth in Inches;

The ſame Extent will reach from the Depth to the Content of the End:

Then extend the Compaſſes from one to this Content of the End:

Keep your Compaſſes fix'd, and that Extent will reach from the Length to the Content in ſolid inches.

But if your ſolid Figure hath both Ends alike, and in form of a Regular Polygone; that is, a piece of Timber hew'd into 5, 6, 7, or 8 equal ſides, *&c.* which is call'd by ſome *a Priſm:* then take the Semi-circumference, and multiply that by the *Radius* or Semi-diameter; that Product by the Length giveth the Content.

But if your ſolid Figure be a Cylinder, that is, a round piece of Timber or Stone, having both Ends equal Diameter, as a Roller, *&c.* here take the Semi-circumference, multiply it by the Semi-diameter, and the *Area* of that by the Length, giveth the ſolid Content.

Now many of the Bodies of our Timber-trees will be near this Form of a Cylinder, but Cuſtom hath got ſuch footing, (though very falſe) that Men will not meaſure their Timber the true way, but will ſtill keep their Error; which is, to gird the middle of the Tree about with a Line, and take the fourth part thereof for the true Square, and ſo meaſure it as a four-ſquare piece of Timber; but how falſe that is, may appear by the enſuing Tables. Whoever is pleaſed to try, will find, that there may be four Slabs taken off, to bring that to a Square, and that ſquared piece then will be near equal to the Meaſure they firſt meaſur'd the piece of Timber by; ſo that when they have brought their piece ſquare by hewing or

ſawing, they then have the Meaſure that it was meaſur'd for when it was round.

But ſeveral Men have demonſtrated this Rule to be falſe near $\frac{1}{5}$, as Mr. *Wing*, Mr. *Philips*, and others; yet Cuſtom doth and will keep its Road.

I have already ſhew'd how to meaſure Timber by the cuſtomary way, by the Line of Numbers, in *Chap.* 35, 36. before-going; and for further Satisfaction, I refer you to theſe Tables following.

A Table ſhewing the ſolid Content of one foot Length, of any piece of Timber, according to the ſuperficial Content taken at the End thereof.

The Inches at the End.	*f. pts.*	*In-End*	*f. pts.*
1	0.007	200	1.389
2	0.014	300	2.083
3	0.021	400	2.778
4	0.028	500	3.472
5	0.035	600	4.167
6	0.042	700	4 861
7	0.049	800	5.556
8	0.056	900	6.250
9	0.062	1000	6.944
10	0.069	2000	13.888
20	0.139	3000	20.833
30	0.208	4000	27.778
40	0.278	5000	34.722
50	0,347	6000	41.666
60	0.417	7000	48.711
70	0.486	8000	55.555
80	0.556	9000	62.500
90	0.625	10000	69.444
100	0.694	20000	138.888

Finding the ſuperficial Content at the end of your Timber-ſtick or Stone, *&c.* let it be round or ſquare, ſo it hath but the ſame Compaſs from one end to the other; againſt that Number are the feet and parts of one foot Length: and by multiplying that by the length of your Stick, ſhews the Content in ſquare feet.

Example. The ſuperficial Content at the end being 200 Inches and 5 Feet long, againſt 200 is 1 foot 389 parts, which multiplied by 5 (the Length) yieldeth 6 feet and 945 parts; that is, near 7 feet of Timber:

1.389
5
6.945

But

But if the number that is at the end be not in the Table, then add two numbers together, and then take the number which anſwereth them, and add them together, and multiply the length by that Sum, as before, *&c.*

A Table ſhewing the true Quantity of one foot length in any true ſquared piece of Timber, for inches and half inches, from half an Inch ſquare to 36 Inches ſquare.

I.	f. pts.	I.	f. pts.	I.	f. pts.	I.	f. pts.	I.	f. pts.	I.	f. pts.
	0.002		0.293		1.085		2.377		4.166		6.460
1	0.007	7	0.340	13	1.174	19	2.507	25	4.340	31	6.673
	0.016		0.390		1.266		2.641		4.513		6.890
2	0.028	8	0.444	14	1.361	20	2.778	26	4.694	32	7.111
	0.043		0.502		1.460		2.918		4.877		7.333
3	0.062	9	0.562	15	1.562	21	3.062	27	5.063	33	7.562
	0.085		0.627		1.668		3.210		5.250		7.780
4	0.111	10	0.694	16	1.778	22	3.361	28	5.445	34	8.028
	0.140		0.765		1.891		3.516		5.670		8.263
5	0.174	11	0.840	17	2.007	23	3.673	29	5.840	35	8.507
	0.210		0.919		2.127		3.835		6.043		8.750
6	0.250	12	1.000	18	2.250	24	4.000	30	6.250	36	9.000

If you would enlarge this Table further, the Rule is this;

As the ſquare of 12 inches (which is 144) is to 1000,

So is the ſquare of one number to another.

Example.

As in 36, the ſquare of it is 1296; then as 144 is to 1000,

So is 1296 to 9 feet, *&c.* as is in the Table.

The Uſe of the Table.

The ſquare of a piece of Timber being found in inches, and the length thereof in feet; to know the Content, take the Number anſwering to the ſquare of inches, out of the Table, and multiply it by the length in feet.

36
36

216
108

1296

Example.

Example.

A piece of Timber 18 Inches ſquare, and 25 Feet long; the number anſwering to 18 Inches Square, is 2.250

Which multiplied by 25 (the Length) 25

Which is 56 Feet one quarter. 11250

4500

A piece 18 Inches ſquare at the end, and one foot long, is 2 foot and $\frac{1}{4}$. 56.250

A Table ſhewing by the Compaſs of Round Timber, what is contained in a Foot length thereof.

Co	fo. pa.	Co	fo. pa.	Co	fo. pa.	Co	fo. pa.	Co	fo. pa.
10	0.055	28	0.433	46	1.169	64	2.264	82	3.715
11	0.066	29	0.465	47	1.220	65	2.335	83	3.807
12	0.079	30	0.497	48	1.273	66	2.406	84	3.866
13	0.093	31	0.531	49	1.327	67	2.480	85	3.990
14	0.108	32	0.566	50	1.381	68	2.555	86	4.084
15	0.124	33	0.602	51	1.437	69	2.631	87	4.183
16	0.141	34	0.639	52	1.496	70	2.707	88	4.279
17	0.159	35	0.677	53	1.552	71	2.785	89	4.377
18	0.179	36	0.716	54	1.612	72	2.864	90	4.475
19	0.200	37	0.756	55	1.671	73	2.945	91	4.576
20	0.221	38	0.798	56	1.732	74	3.026	92	4.677
21	0.243	39	0.840	57	1.795	75	3.108	93	4.780
22	0.267	40	0.884	58	1.860	76	3.191	94	4.882
23	0.292	41	0.929	59	1.923	77	3.276	95	4.987
24	0.318	42	0.974	60	1.988	78	3.362	96	5.093
25	0.343	43	1.021	61	2.056	79	3.449	97	5.200
26	0.374	44	1.070	62	2.124	80	3.537	98	5.307
27	0.403	45	1.119	63	2.193	81	3.625	99	5.416

The Uſe of this Table is as followeth:

Look for the Compaſs of the Tree in Inches, and in the Column annexed you have the quantity of Timber in one Foot length; which multiply by the number of feet that the Tree is in length, and the Product is the Content thereof.

Example.

Example.

The Circumference or Compaſs of a Tree 47 Inches, and 12 Feet long; the Number againſt 47 Inches, is 1.220:
So there is ſo much in one foot Length;
Which multiplied by 12, gives the Content;
That is, 14 feet and above half a foot.

1.220
12
2440
1220
14.640

This Table ſhews how many Inches in Length make one Foot of Timber, according to the Compaſs of the piece of Timber, from 10 *Inches compaſs, to* 100 *Inches compaſs.*

Co	In. pts.	Co	In. pts.	Co	In. pts.	Co	In. pts.	Co.	In. pts.
10	217.15	28	27.697	46	10.262	64	5.301	82	3.230
11	179.46	29	25.820	47	9.830	65	5.140	83	3.152
12	150.80	30	24.127	48	9.425	66	4.985	84	3.078
13	128.49	31	22.596	49	9.044	67	4.837	85	3.006
14	110.79	32	21.206	50	8.686	68	4.696	86	2.936
15	94.312	33	19.936	51	8.349	69	4.561	87	2.869
16	84.822	34	18.784	52	8.030	70	4.432	88	2.804
17	75.137	35	17.736	53	7.730	71	4.308	89	2.742
18	67.020	36	16.755	54	7.447	72	4.198	90	2.681
19	60.151	37	15.862	55	7.178	73	4.075	91	2.622
20	54.286	38	15.038	56	6.924	74	3.965	92	2.566
21	49.228	39	14.276	57	6.684	75	3.861	93	2.511
22	44.865	40	13.572	58	6.455	76	3.760	94	2.458
23	40.904	41	12.916	59	6.238	77	3.663	95	2.406
24	37.690	42	12.310	60	6.030	78	3.569	96	2.356
25	34.743	43	11.744	61	5.836	79	3.479	97	2.307
26	32.122	44	11.211	62	5.649	80	3.393	98	2.261
27	29.787	45	10.723	63	5.471	81	3.310	99	2.216
								100	2.171

The Uſe of this Table.

Having taken the Circumference of the Tree in Inches, look that Compaſs in the Table, and againſt it

it you may ſee how many Inches or parts of an Inch make one foot of Timber; then with a Ruler or a Pair of Compaſſes (which are better) meaſure how many times you can find that in the length of the piece of Timber, and ſo many feet is in that piece of Timber. This is a moſt uſeful Table to meaſure your Timber-trees by.

Example.

The Compaſs of a Tree being 84 inches about, then three inches and $\frac{078}{1000}$ make one foot; take with your Compaſſes three inches .078 from off a Scale, and ſo many times as there is that length in your Tree, ſo many feet of Timber are there, *&c.*

If any Tree be above 100 inches in Circumference, then take half that Circumference, and find the number belonging thereto in the Table; then take one fourth part of it, and that makes one foot of Timber. Suppoſe a Tree to be 146 inches about, the half of it is 73; againſt this in the Table is 4 inches .075 parts; one quarter thereof (*viz.* 1 inch .019 parts) makes one foot of Timber at that Circumference.

Theſe Tables, with what hath been before ſaid, will be ſufficient to meaſure any Cylinder by; and how to meaſure a Cone I have ſhewed already. A Cone is ſuch a Figure as the Spire of a Church, having a circular Baſe, and ending in a ſharp Point. It is meaſured by the ſuperficial Content of the Baſe, multiply'd by one third part of the Altitude or Length. A Pyramid, or Pyramis, is ſuch a Figure as hath an angular Baſe, and ends in a ſharp point, which is meaſured as the Cone is. A Sphere or Globe is a ſolid Figure, every where equally diſtant from the Center; it is meaſured by cubing the Diameter, and multiplying that by 11; and dividing that Product by 21, the Quotient ſheweth the ſolid Content of the Sphere.

There

There be ſeveral other ſorts of ſolid Figures, as ſeveral parts of the Sphere, but they all depend on the Proportion of a Circle, and its Diameter.

Alſo the *Hexaedron*, which hath 6 Baſes; *Octaedron*, 8 Baſes; *Dodecaedron*, 12 Baſes; and ſeveral others, which to name I ſhall forbear.

CHAP. XLIII.

Of the Oval, how to make it, and how to meaſure it; with other Obſervations thereon.

HAving the Length and Breadth of the Oval given you, you may take the whole Length and half the Breadth, as is ſhewed before in bringing three Pricks into a Circle: and from the Center of theſe three Points draw half the Oval, and ſo likewiſe the other half, as you ſee the Oval in the Figure drawn: for the Point F. is the Center of the Arch A B C. and the Arch A G C. is made by the ſame Rule; and where the Line F H. croſſeth the Line A E C. as at K. there is the Center of the breadth B G. and the End A. from the Center K. may you make the Ends of your Oval round as you pleaſe: ſo that from four Centers you may make the Ends of your Oval round as you pleaſe; but if they be made from two Centers, as that is, then will the Ends be more acute.

Or you may make your Oval thus: Having reſolved on the Breadth, draw the Sides from Centers in the Mid-line of the Breadth, as before; then ſet up two Sticks exactly in the Mid-line of the Length, at equal diſtance from each end; then hold the Line at one, and turn the Line to the ſide of the Oval, and then on the other ſide the Stick, with the ſame length, ſo may you make the Ends of your Oval as round

round as you pleaſe; for the nearer you place theſe Sticks in the Center of the length and breadth of the Oval, the nearer round your Oval is made, even till you come to a Circle. This way your ingenious Workmen make their Ovals in ſmall Works, as your Plaiſterers, Joyners, *&c.* and it is a good way, and ſo common, that I need not ſay more to teach how to make an Oval of any Bigneſs; but here I ſhall take occaſion to ſhew the Figure of one at *Caſhioberry* now made. (*See Fig.* 46.)

To meaſure this Oval, which is 28 Rods long, and 19 Rods broad, as 'tis now ſtaked out at *Caſhioberry*, intended for a Kitchen-Garden: This Oval being made of 2 Segments of a Circle, whoſe Semi-diameter is 15 Rods, as 'tis found by making the Oval; it being the Center-point of each Arch-line of this Oval, as the Lines F A. F B. and F C.

Now to find the length of one of theſe Archlines, is ſhewed before; which I find to be 18 Rods, the half length of one, which is ſhewed by the Line D D. ſo the whole length of one Arch is 36, and both Arches round the Oval is 72 Rods.

Now, take the $\frac{1}{2}$ of one of the Arch-lines, which is 18, and the Semi-diameter of that Arch, which is 15 Rods: Multiply the one by the other, and it is 270 Rods, which is the Figure A B C F. that is, half of the Oval; and the Triangle A F C. which muſt be ſubſtracted out of the 270, then the Semi-Oval will be 192 Rods.

```
 18
 15
----
 90
 18
----
270
```

For the Baſe A C. is 28 Rods, which is the length of the Oval; and the Perpendicular of the Angle, which is E F. is 5.57.

Now half the Baſe (which is 14) multiply'd by the whole Perpendicular 5 $\frac{57}{100}$ gives 77 $\frac{98}{100}$, which is 78 Rods almoſt: this taken from 270 (the Area of the

the Figure A B C F.) there then
5.57 remain 192 Rods, which is half of 270
14 the Oval; that doubled, is 384 78
—— Rods; which being divided by 160, ——
2228 ſheweth that the Content of this 192
557 Oval will be 2 Acres and 64 Rods. 192
——
77.98 But if your Oval be round at 384
the end, as your Ovals are that be made with four Centres, then they be more difficult to be meaſur'd; how- 1.6(64
ever theſe Rules are ſufficient. 3.8.4(2
1.6.0

An Oval is no ill Figure for a Garden; for if the Garden-wall be an Oval, and the length of the Oval point North and South, as the aforemention'd Oval doth (A being the South point, C the North) then may ſuch a Wall be planted with Trees, both inſide and out-ſide, and have never a Tree ſtand to the North Aſpect; for if you make your going in at the South end of your Oval, then will thoſe 2 Trees or Tree that ſtood on the inſide, or were to ſtand there, be removed from the North Aſpect to the North-eaſt and North-weſt, according to the Largeneſs of your Gate: ſo will every two Trees on the inſide of your Wall tend nearer the South-point, till they come to the point C. which is South: and then the Trees on the out-ſide, every 2 Trees will fall nearer the North point at C. till you leave that point of the Oval between 2 Trees, ſo will not one Tree ſtand to the North Aſpect, and but few near it; the like whereof no other Figure can do, that I can think of.

1. An Oval with the ends pointing Eaſt and Weſt, is no ill Figure for a Garden; for the Walls in this, as in the other, are not ſo ſubject to oppoſe the Winds as ſtreight Walls be; therefore not ſo blaſting, as you may well conceive.

2. Ovals on each ſide the Front of your Houſe, would be no ill Proſpect, but in many things very convenient; theſe being at equal diſtance from the middle

the middle of your Front, and pointing upon your Lawn, *&c.*

CHAP. XLIV.

Suppose you have a Plat to draw on one or many Sheets of Paper, and you would draw it as large as the Paper will bear; to know what Scale you shall draw it by.

IF it be a Sheet of *Dutch* Paper, about 21 Inches long, and the length of the Draft you would draw is 402 feet long, and you would draw it as large as you can on this Sheet, that your Work may shew it self the better, and yet not to go off of the Paper; now to know of what Scale of so many parts in one Inch to draw your Draft by, do thus: Divide the length of your Draft, by the length of your Paper, and the Quotient shews how many parts that Inch must be divided into, to draw this Draft by; as,

Example.

402 divided by 21, gives in the Quotient 19, and 3 over; so then you may draw this Draft on this Paper, which is 21 Inches, by a Scale of one Inch divided into 19 parts.

```
~~11~~ (3
~~29~~
~~402~~ (19        The Inch into 19 parts
~~211~~              and 3/21 over.
~~2~~
```

But if it be a sheet of ordinary Paper, of 16 Inches long, and you would draw the same Draft on it, though in a less Form, then divide 402 by 16.

~~3~~ (2

3 (2
28
400 (25: The Inch into 25 parts will ſuit
266 beſt with this Paper.
2

So that for a ſheet of 16 Inches long, a Scale of one Inch divided into 25 parts, will ſerve to draw your Draft by on ſuch a Paper.

But if it be required to draw the Draft of a Garden, or the like, on a quarter of a ſheet of Paper, then obſerve the enſuing Directions.

As ſuppoſe I were to draw the Draft which is now the Garden at *Caſhioberry*, the length of the Garden is 402 feet, and this quarter of a ſheet of Paper is 7 Inches long; I divide 402 by 7, and the Quotient is 57 and almoſt a half, *viz.* 57 and $\frac{3}{7}$.

7 (3
402 (57
77

But finding this Scale to be ſo ſmall, and alſo a Number (*viz.* 57.) whereof I cannot take the half; I likewiſe finding that my Paper will bear 7 Inches and a half in length, I divide 402 the length of the Garden by 7 and $\frac{1}{2}$, the length of this Paper, and find the Quotient to be 53 and a half, and better.

4
26 (45
378
402.00 (53: 'Tis 53 and $\frac{45}{75}$ wrought
7.500 Decimally.
75

This Scale being yet ſo ſmall, I take the half of 54; which is 27; remembring that every one of theſe 27 parts in the Inch, is two Feet on my Paper.

(See Fig. 47.)

The pricked Lines ſhew the top of every Slope.

The two Mounts A A. are to be ſet with Trees; ſo are the tops of all the Slopes where the pricked Lines be, but being not yet ſet, I ſhall not ſhew them.

The Walks marked with O. are to be Gravel.

The Circle B. is intended for a Fountain.

The Letter C. ſheweth where the Orange-houſe is.

The Letters *g g.* ſhew one Front of the Dwelling-Houſe.

The reſt Graſs.

This is only as it is intended to be, *&c.*

CHAP. XLV.

To find what Scale a Plat or Draft is drawn by, the Content of the Ground being given.

SUppoſe a piece of Ground or Field to be 30 Acres, and I meaſure this Plat by a Scale of 10 in the Inch, and by that Scale it makes but 17 Acres and 3 Roods, or 17 Acres and $\frac{3}{4}$; now the Queſtion is, What Scale was it drawn by? The work is ſomewhat difficult by natural Arithmetick, but by artificial, and the Line of Numbers, more eaſy.

Example, by that excellent Table, the Table of Logarithms.

Firſt find out the mean proportional Number between the true quantity of Acres, (*viz.* 30.) and the quantity of Acres found by the ſuppoſed Scale (*viz.* 17 $\frac{3}{4}$) which you may do thus: add the Logarithms of

of theſe two Numbers together, the half of that Sum is the Log. of the mean Proportional required; as thus:

The Log. of 30 is	1.47712
The Log. of 17 ¾ is	1.24919
The 2 Sums added together	2.72631
The half of the Log.	1.36315
The Number anſwering to this Logarithm is	23. $\frac{8}{100}$

This Number is the mean proportional Number of 30 and 17 ¾.

Having thus found the mean proportional Number to be 23.08, the Rule in the ſecond place is thus:

As the Log. of this 17 Acres ¾, found by the ſuppoſed Scale, is to the Log. of the mean proportional (23.08) of the true quantity of Acres, and the ſuppoſed quantity, ſo is 10 (the ſuppoſed Scale) to the true Scale; as thus:

The Logarithm of 17 ¾ is	1.24919
The Log. of 23 $\frac{8}{100}$ is	1.36315
The Log. of 10 is	1.00000
	1.11396

The Number anſwering this Logarithm is 13; which tells me that the true Scale that this Plat was drawn by, is a Scale of one Inch put or divided into 13 parts.

The way to work the *Golden Rule*, or *Rule of Three* by Log. is, to add the Log. of the third number and ſecond number together, and to ſubſtract the Log. of the firſt number; and then the number anſwering the Log. that remains after Subſtraction, is the fourth number.

But here I have made no Addition, but ſubſtracted the firſt number out of the ſecond and third, which is all one in Operation.

How to work the ſame Queſtion on the Line of Numbers.

Having found the point on your Line, which is 30, and the point repreſenting 17 $\frac{3}{4}$, find out the point which is the midſt between theſe two; and that very point is the mean proportional between theſe two Numbers; which here is 23 and better. For if you ſet one point of your Compaſſes on 23 $\frac{08}{100}$, that Extent from thence to 30 will alſo reach from that to 17 $\frac{3}{4}$.

Then (as before is ſhew'd) ſay, as 17 $\frac{3}{4}$ is to 23 $\frac{08}{100}$,

So is 10 to 13 (the true Scale ſought:)

Therefore extend your Compaſſes from 17.75 to 23 $\frac{08}{100}$, that extent will reach from 10 to 13.

Thus you may ſee how readily this Queſtion is wrought by Log. without Multiplication or Diviſion, and alſo by the Line of Numbers, with two turns of your Compaſſes.

Example Second.

If a piece of Ground, or the ſide of a Houſe be 100 Acres, Rods, or the like, and you meaſure it by a Scale of 12, and find it to be but 56 $\frac{22}{100}$; if you would know what Scale, in proportion to this, the Draft or Plot was drawn by, then work by the aforeſaid Rules thus:

Find the mean proportional number of 100 and 56.22 thus, by taking the half of them 2 Log. and the number anſwering that is the mean proportional number, as thus:

Loga-

Logarithm of 100 is ——	2.00000
Log of 56.22 is ——	1.74989
$74\frac{28}{100}$ the mean proportional	1.87494
Log. of 12 is ——	1.07918
Added ——	2.95412
The number anſwering this Log.	1.20423

Now the neareſt in the whole Numbers is 16, which is the Scale by which the Draft or Plat was drawn.

This alſo you may work by *Gunter*'s Line, as is before ſhew'd; for if you take the middle point between 100 and 56.22, you will find it to be near 75: for if you ſet one point on or near 75, and extend the other to 100, that extent will reach from 75 alſo to 56.22; ſo that 75 is the mean proportional Number between them two.

Then if you extend your Compaſſes from 56.22, to 75, that extent will reach from 12 (the ſuppoſed Scale) to 16, the true Scale. Thus having ſhewed you ſeveral hints of this Line of Numbers, I will here ſhew a few more.

CHAP. XLVI.

The Deſcription of the Line of Numbers, or Gunter's *Line.*

THIS Line commonly on your two-foot Rule is in two parts, and each of theſe two parts divided into 9 unequal parts, which are called Primes,

or Integers, or whole Numbers, and are diſtinguiſhed by theſe Figures; the firſt part to the left hand hath 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. Now this middle 1, which I call 10, is alſo but one, as the Line may be read: and then the ſecond part to the right Hand is alſo 1, 2, 3, 4, 5, 6, 7, 8, 9, 10: So this laſt part I ſhall for diſtinction call the ſecond part, and then each of thoſe Integers from the firſt 1 to the middle, is ſubdivided into 10 unequal parts, and from the middle 1 to 10 at the end of the ſecond part, between every two Figures according to the ſame order that the other were divided into 10 parts; and each of theſe ten parts ſhould be divided into 10 parts more, if the Rule were long enough to bear them: but on every two-foot Rule that hath this Line well made on it, they be from the middle 1, to 2 in the ſecond part, firſt divided into 10 parts, and then each of theſe into 10 other parts: and were the Rule long enough, theſe ſhould be divided into 10 other parts. But to read a Sum of a thouſand, you muſt eſtimate or gueſs at the Unit, ſo that you may read any Sum under a Thouſand, expreſly from the firſt 1 to 10; in the ſecond part you may read 199 expreſly, the middle 1 being 100: then 9 tenths is 90, and 9 tenths of them tenths is 9, that is, 199; which is the Diviſion next to 2 in the ſecond part of your Rule.

By this you may obſerve, that the longer your Rule is, the more exactly you may number or read a great Sum, eſpecially if you underſtand Arithmetick; as may be ſeen more fully in the Rules of Arithmetick following.

CHAP.

CHAP. XLVII.

Numeration on the Line, or to read a Sum on the Line of Numbers.

YOU may obſerve, that the Figures on this Line, as in the preceding Chapter, are 1, 2, 3, 4, 5, 6, 7, 8, 9; and 1, 2, 3, 4, 5, 6, 7, 8, 9, 10. Now the ſame point or diviſion on the Rule, which hath 1, 2, 3, 4, 5, *&c.* may be read 10, 20, 30, 40, 50, *&c.* or they may be called 100, 200, 300, 400, 500.

By this you may perceive, that the larger Numbers you have to number, any of thoſe Figures will admit of a larger Denomination; ſo that if you be to read any Sum from 1 to 10, you have it in the ſecond Part, for then the firſt 1 is one tenth, the middle 1 is one, the end 1 is 10: but if you be to read a number of three Figures, (as any is under 1000) then the firſt 1 is 10, the middle 1 100, the end 1 1000.

Example.

To find 144, I take the middle 1 for the 100; then 4 of the great diviſions forward for 40; then 4 diviſions (forward ſtill to the right Hand) for 4; and that point is 144, which may alſo be called fourteen and $\frac{4}{10}$, or 1450, or 14500: then muſt the middle 1 be 10000, and 4 tenths forward, 4000; and 5 tenths forward, 500. This point wants but five ſmall Diviſions of the long point, which is 15, or 150, or 1500, or may be 15000, according as your Sum is in greatneſs.

Example.

To find the point 12; firſt I read the middle 1 10, then 2 tenths forward for 2, that is the point

12, where (in many Rules) there is a Braſs Pin, becauſe it is a point much uſed, as you will find hereafter: now this point 12, is alſo 120, or 1200; for the firſt 1 being one, then the middle 1 is 10; and two tenths forward is the point 12, *&c.* but if you read this point 120, then the firſt 1 is 10, the middle 1 100, and two tenths forward 20, which is 120; and if it be read 1200, then the middle 1 is 1000, and two tenths forward 200, which is 1200, *&c.*

Example.

To find the number 1728, being the Cube-Inches in a foot of Timber; the middle 1 is 1000, then 7 tenths forward is 700, and two tenths of them forward is 20. Now the Diviſions on the Rule do not ſhew the 8 that remains, therefore you muſt eſtimate the place for 8, which is almoſt one tenth more; ſo having found that place, 'tis the point which is for 1728: ſo in many great Sums, you muſt eſtimate or gueſs at the Unit, but Decimal Sums do ſhew themſelves more plainly, as you may well perceive hereafter, eſpecially when they end with a Cypher or Cyphers.

I hope you now plainly ſee the uſe in reading, or numbering any Sum, under 10000; and that you ſee alſo, that this is a Decimal Line, and is taken from that excellent Rule of Decimals, the Canon of Logarithms; and that you may read any Decimal Fraction, as one tenth, one of 100, or one of 1000, or $\frac{2}{10}$, $\frac{3}{10}$, $\frac{4}{10}$, or $\frac{15}{100}$, $\frac{26}{100}$, $\frac{71}{100}$, *&c.* that is, if the Integer be in 10 parts, you may find out any of theſe parts; or if in 100 parts, you may find out any part from 1 to 100 readily.

Example.

If the Integer be 10, that is, if 10 make one Foot, Yard, Pound, or the like; I would know the point of 1 and $\frac{5}{10}$, or 1 and $\frac{1}{2}$: take either the middle 1, or the firſt 1, extend the Compaſs point to 5, which is the longeſt Diviſion between 1 and 2,

that

that is, the point of one and 5 tenths, or one and a half.

Example.

If it were required to find the point of 100 $\frac{50}{100}$, or 100 and half, 'tis the ſame point, or it is 1000 and a half.

Example.

If it be to find the point of 60 of 100, then the middle 1 is the 100, and the figure *6* in the firſt part is the figure that is 60 of 100, or $\frac{60}{100}$, or as decimal Fractions commonly are writ .60, the prick before ſhewing it to be a decimal Fraction.

Example.

To find 1560, take the middle 1 for 1000, and five tenths for 500, and *6* tenths of them tenths for 60, which is the Point 1560, *&c.* Alſo if it be deſired to find the fraction 1560 of 10000, that is the ſame point, and may be thus writ $\frac{1560}{10000}$; or it is the point that repreſents the fraction $\frac{156}{1000}$, *&c.* Be perfect to read the Line well, then will the other Rules be eaſy.

CHAP. XLVIII.

Addition on the Line of Numbers.

THE Rule is, firſt find one of your Numbers, then count ſo many as the number or numbers are forward, that is to the right Hand, and that is the Sum. Take notice that your Sum or Sums muſt (if they be Fractions) be Decimal fractions.

Example.

In whole Numbers, 55 and 15, firſt find 55, then count 15 forward, and the point is 70; for add 5 to 55 it makes 60, and count 10 forward, the point is 70.

Exam-

Example.

In 3 whole Numbers, 60, 57 and 35; firſt find 60, then 5 tenths forward is 110, and 7 of a tenth, 'tis then 117: then from that point count 35, and the point or diviſion ſheweth 'tis 152.

Example.

A whole Number and a Decimal, as 6 and $\frac{9}{10}$, find 6 on either part of your Rule: then count 9 of the 10 Diviſions, that is between 6 and 7, which is one diviſion ſhort of 7, and that is the point, which is 6 and 9 tenths, or thus $6\frac{9}{10}$, or 6.9; it alſo may be read $6\frac{90}{100}$, for 'tis the point of that alſo.

Example.

Two whole Numbers and 2 Fractions, as 60, 80, and 70.50; I take 60, and count 7 tenths forward, which is at the point 130: Note, here the middle 1 being read 100, then 3 tenths forward are for 30. Then for the 80 and 50, which is 130, I count one tenth more, which then is 131; and becauſe the diviſions on the Line fall ſo cloſe, you muſt eſtimate or gueſs the $\frac{90}{100}$: or 'tis but adding the 2 laſt figures together, and keep the Unit in your mind, to add to your other Sum, and ſo you may be exact. Add 50 and 80 together, it makes 130; keep 30 in mind, as in this *Example*. I neglect the 2 Cyphers, and add 8 and 5 together, which is 13, or add 80 and 50 make 130: now thoſe 2 Cyphers added together make but one Cypher added to 13, is 130; that is, one Integer, and 30 of another: but if the 80 and 50 had been only 8 and 5, then 10 had been the Integer, and the 3 had been $\frac{3}{10}$ of one. And note this, that if the Integer, or whole Sum that the Fraction belongs to in decimal Fractions, I ſay, if the Integer be 10, then from 1 to 10 is the decimal Fraction of that; and if the Integer be 100, then from 1 to 100 is the Decimal of that; if 1000, then from 1 to 1000, the Decimal of 1000 may be; and ſo of greater Sums. So that in Decimals there is no improper Fraction, as in your vulgar Fractions, for there you may find

find the Denominator more than the Numerator, if the Fraction be a proper Fraction; but if an improper Fraction, then the Denominator leſs than the Numerator; as may be ſeen at large in moſt Books that treat of Fractions: ſee Mr. *Wingate's Arithmetick natural.* So that decimal Fractions may be expreſſed without the Denominator, by fixing before the Decimal or broken Number propounded, as 12 $\frac{35}{100}$ is thus, 12.35; and 2$\frac{98}{100}$ thus, 2.98, *&c.* or 2 $\frac{5}{10}$ or 2 $\frac{1}{2}$ may be thus writ, and is in Decimals writ 2.5, that is 2 and a half: for in this Example the Integer is 10, and then 5 being half 10, ſo 'tis 2 and a half.

I have been large on this Rule, becauſe I would write to thoſe that do not know any thing of theſe Rules, as well as to to thoſe that be well verſed in them; my deſire is to learn the one, and to ſhew the other that which I could never ſee yet in any Book, *viz.* new Examples.

CHAP. XLIX.

Subſtraction on the Line of Numbers.

THE Rule is, firſt find the point which the great Numbers make, then count the leaſt Number from that point, towards the left hand; the remainder is the other Number.

Example.

Of 2 Numbers, as 12 from 144, firſt I find 144, there I ſet one point of my Compaſs, and count to the left hand 12: then reading the point that remains, I find it to be 132.

Example.

Of 3 Numbers; ſuppoſe you were to ſubſtract 8 and 19 from 800, add 8 and 19 together, which is 27, then find the point 800, then count 2 tenths and

7 of

7 of ten from the point 800 to the left Hand, this ſheweth the point 773, which is the Queſtion. This Rule is ſeldom uſed on the Line, therefore I ſhall ſay no more of it, but come to the moſt uſeful Rules on the Line, *viz.* Multiplication, Diviſion, the Rule of Three, *&c.*

CHAP. L.

Multiplication on the Line of Numbers.

THIS Rule is thus; extend the Compaſſes from 1 to one of the Numbers to be multiplied, the ſame Extent will reach from the other Number to the Content.

Example 1.

If you be to multiply 6 by 8, extend the Compaſſes from one to 6. keep the Compaſſes fixed, and that ſame Extent will reach from 8 to 48, the Content; or if you ſet one Point of your Compaſſes on 1, and extend the other to 8, at that Extent, if you ſet one point of your Compaſſes on 6, the other point will reach to 48, the Content; as was before deſcribed.

Note, that your Rule muſt be divided into 10 equal Parts, and theſe ten parts each of them into 10 other equal Parts: thus will your Foot be divided into 100 equal parts, and thus muſt your Yard, Pole, *&c.* be divided; then will theſe parts anſwer the Line of Numbers, which is a decimal Line.

Example 2.

If a Stone or Board be 14 inches broad, and 30 inches long, how many inches are there in that Stone, Board, *&c?* Extend the Compaſſes from 1 to 12, the ſame extent will reach from 30 the Length to 420 the Content in ſuperficial Inches.

But

But if you would know how much of this breadth will make a Foot ſquare of Board, Glaſs, or Stone, the Rule is this; as the Breadth in Inches is to 144 the ſuperficial Inches in one Foot, that extent will reach from 1 to the Length of one Foot in Inch-meaſure.

Example 3.

Set one point of your Compaſſes on 14 (the Breadth) extend the other to 144: that extent will reach from 1 to 10, and near $\frac{3}{10}$, and ſo much makes a foot long, at 14 inches broad ſuperficial Meaſure. To prove this, if you multiply 14 by 10 $\frac{3}{10}$, the Product will be 144 $\frac{2}{10}$; ſo it is but 2 of 10, or one fifth part more.

But the moſt cuſtomary way to meaſure Board, Glaſs, Stone, or any thing that is meaſured by ſuperficial Foot-meaſure, is, by Inch-meaſure and Foot-meaſure together. And the Rule is this: As 12 (the ſide of a Foot ſquare) is to the breadth in Inches, ſo is the length in Feet or Parts, to the Content in Feet or Parts.

Example 4.

Shall be, in the aforeſaid Example to make the Rule more plain: Set one point of your Compaſs always on 12, extend the other to the breadth in Inches, which is 14, that Extent will reach from two feet and a half (which is 30 Inches) to near 3 Feet, *viz.* to two Feet $\frac{9}{10}$ and better, as before.

But note, if the Breadth in Inches be more than 12, as in the laſt Example, then muſt you turn your Compaſſes from the Length in feet and parts to the right Hand; but if the Breadth be leſs than 12 Inches, then muſt you turn your Compaſſes from the Length in feet to the left Hand: And becauſe this Rule is the moſt uſed, ſee another Example, for this way moſt Men do meaſure by.

Example 5.

A Board ten Inches broad, and 6 Feet long, how many Feet are there in that Board? Extend your Compaſſes from 12 (the ſtanding Number) to 10 (the

(the Breadth in inches,) that Extent will reach from 6 the Length in feet (to the left Hand) to 5 the Content in feet; for as 12 is to 10, ſo is 6 to 5.

Thus having ſhewed ſome Examples in ſuperficial Meaſure in Multiplication, here I ſhall ſhew a few Examples in ſolid Meaſures. And firſt know, that you muſt take the ſuperficial Content of the Baſe or End of the piece of Timber or Stone, *&c.* whether it be round, Square or Triangle, which you may do by Multiplication, as is before ſhewed; then multiply the Content of the Baſe by the Length of the piece, and the Product giveth the ſolid Content of the piece.

Example 6.

A piece of Timber 14 Inches broad, and 10 inches deep, and 30 Inches long, how many ſquare Inches in that piece of Timber?

Set one point of your Compaſſes on 1, extend the other to 10 (the Depth;) that Extent will reach from 14 (the Breadth) to 140, the Content of the Baſe.

Then ſet one Point of your Compaſſes on 1, and extend the other to 30 (the Length;) that ſame Extent will reach from 140 (the Content of the Baſe) to 4200, the ſolid Content of the piece in Inches.

But if you would find the Content of this piece of Timber, or any other, in feet and parts, you may do it thus: Find the Content of the Baſe, as before; then as the ſquare Inches in a Foot (*viz.* 1728) is to the Content of the Baſe, ſo is the Length in Inches, to the Content in feet and parts.

Example 7,

How many feet and parts are there in the piece of the laſt Example, which was 14 Inches broad, and 10 Inches deep, and 30 Inches long? Having found the Baſe as before, to be 140, then extend the Compaſſes from 140 to 728, the ſame Extent will reach from 30 (the Length in Inches) to two Feet and near a half, *viz.* to two Feet, 744 Inches. You muſt

turn your Compaſſes from 30, towards the left Hand.

But if you deſire to know how much in Length makes a Foot, then the Rule is thus: As the Content of the Baſe is to 1728 (the Inches in a Foot ſquare) that ſame Extent will reach from 1 to the number of inches or parts, which will make a Foot at ſuch a Length.

Example 8.

Of the ſame piece of Timber mentioned in the laſt Example; the Baſe you may find (as before) to be 140, then extend the Compaſſes from 140 (the Baſe) to 1728 (the Inches in a Foot ſquare) that ſame Extent will reach from 1 to 12, and a little more than $\frac{35}{100}$; for if you multiply 12 $\frac{35}{100}$ by 144, the product will be 1729, which is but one more than the Inches in a Foot. And here you may note the Error than many Men commit in adding the Breadth and Depth together, and take the half of that Sum for the true Square; and the more the Sides differ, the more they be miſtaken.

The ſame Error is daily committed by thoſe who meaſure Timber; for they take the Circumference in the middle of the piece of round Timber, and one fourth part of that they take for the true Square of the piece, which is altogether falſe (as I ſaid before) tho Cuſtom doth ſtrongly uphold that Error againſt Reaſon. But if it be a true ſquared piece of Timber, then you may meaſure it this way, very readily: as,

Example 9.

A piece of Timber 10 Inches ſquare, and 16 Feet long.

The Rule is this: always ſet one point of your Compaſſes on 12, extend the other to the ſide of the ſquare in inches or parts; that Extent will reach from the Length in feet or parts, to a fourth Number, and from that Number to the Content in feet and parts; that is, it will reach from the Length of the piece of Timber in feet and parts, to the Content

As thus, in this Example: extend your Compaſſes from 12 to 10 (the ſide of the ſquare in inches) that diſtance will reach from 16 (the length in feet) at two turns of your Compaſſes, to 11 feet and a little above $\frac{1}{10}$, *viz.* 11 feet and $\frac{192}{1728}$. Be ſure always to remember, that if your piece of Timber be leſs than 12 inches ſquare, then you muſt turn twice from the length of the piece to the Left-hand; but if more than 12 inches, then to the Right-hand twice.

Now this being the way in uſe, I will ſhew one Example more; of a Tree 30 feet long, having the Circumference 60 Inches: now the fourth part of 60 is 15, which I take for the ſide of a ſquare equal to that Circle, as is uſually done, tho not with truth always.

Example 10.

Then I extend my Compaſſes from 12 to 15 (the ſide of the ſquare in inches) and that Extent will reach from 30 (the length in feet) to near 47 feet, the Content; this is the cuſtomary way, but if you look into the Table *pag.* 234. you may there ſee, that 60 inches circumference, one foot length gives 1,988, which multiply'd by 30, gives 59 feet and 640: here alſo you ſee the Error of the cuſtomary way. But of this I have ſaid enough already, and therefore ſhall give no more Examples now; but note this, that what is here ſaid of Feet-meaſure, may alſo be apply'd to Pole, Yard, or the like.

Having the Root given, by two turns of your Compaſſes, you may ſave two Multiplications, and find the Square of that Root, and the Cube, *&c.* and ſo may you find as many numbers as you pleaſe in a continual Proportion.

Example 11.

The Root being given, extend your Compaſſes from 1 to 12, that Extent will reach from 12 to 144, the ſame Extent will reach from 144 to 1728; ſo then, if 12 be the Root, 144 is the Square of that Root, and 1728 the Cube of that Root, *&c.*

but

but note, that when you extend your Compaſſes from 1 to 12, the next turn will go off the Line; therefore you muſt ſeek 12 at the beginning of the Line, to the left Hand, and then turn from that 12: note this in all Caſes wherein your Compaſſes go off the Line.

Thus having ſhewed you (the Root being given) readily to find the Cube, I will now ſhew you (the Cube being given) how to find the Root: and tho this, and ſome other Examples before, be not done by Multiplication; yet becauſe they depend one upon another, I do here ſhew them.

To extract the Cube-Root, the Rule is; divide the Space between the Cube given and 1, into 3 equal parts, and the diſtance of one of theſe 3 parts from 1, is the Root.

Example 11.

The Cube 64 being given, what is the Root? Divide the Diſtance from 64 to 1 into three equal parts, one third part of that diſtance will reach from 1 to 4, the Root; for the firſt third Part will reach from 64 to 16 the Square, the 2d third Part from 16 to 4 the Root, the third part from 4 to 1: for four times 4 is 16, and 4 times 16 is 64. The ſame Rule obſerve for any other Number.

Thus may you find the Square of any Circle, or the end of a Tree, the Square equal to that Circumference: and ſo meaſure it, as is before ſhewed.

Example 12.

Having the Circumferecce of a Tree, you would know the ſide of a Square equal to that Circumference, as in the 10th Example the Circumference was 60 Inches; now to find the Content in ſuperficial Inches of ſuch a Circle, the Rule is as is before ſhew'd; as 22 is to 7, ſo is the Circumference to the Diameter. Now if you extend your Compaſſes fron 22 to 7, that Extent will reach from 60 to 19, and $\frac{1}{2}\frac{1}{2}$, the Diameter; this Fraction may be turned into a decimal Fraction, andſo wrought; but being ſo ſmall, it

is not worth minding in ſuch Operations as this: then if you take half the Diameter and half the Circumference, and multiply one by the other, or if you extend your Compaſſes from 1 to 9 and a half, that Extent will reach from 30 to 285 the ſuperficial Content in Inches. Then to find the Square by the Line of Numbers, that is to find a Number, which if multiply'd in it ſelf, makes this Sum; the Rule is, Extend your Compaſſes from 285 to 1, and the middle between theſe 2 Numbers is $16\frac{882}{1000}$ very near, as here you may ſee: but firſt note, that if your Rule have but the Lines on it that moſt of your ordinary Rules have, that is but 2 Lines on it, as 1. 2. 3. 4. 5. 6. 7. 8. 9; and 1. 2. 3. 4. 5. 6. 7. 8. 9. 10; then this Queſtion may be ſome Trouble to work on ſuch a Rule. But if your Rule has 4 parts or 6 parts, as a 6 foot Rule may have, then this Queſtion may be performed very readily, as you may hereafter better perceive; for if you take 285 in the ſecond Part of the Rule, then is the middle Figure 1, 100; and the Figure 1 at the end is 10: and the Rule is, that you muſt take the middle between 1 and 285, which here you cannot; for if you count the firſt one 1, the middle 1 is then 10, and the end one is 100, ſo then 285 is off from the Line; whereas if your Rule had another Part added to it, then might you work and read it very readily.

But to work it by this Rule, you muſt take the Diſtance from 100 to 285, that is, from the middle 1 to 285; then take half of this Diſtance, and add it to half the Length of the Line, and the Compaſſes will reach from 10 in the middle to near 17 (the ſide of a Square equal to 285) as you may ſee it here proved by the Pen.

Here

Here you may ſee that 16 $\frac{882}{1000}$ multiply'd by 16 $\frac{882}{1000}$, gives 285, and $\frac{001924}{1000000}$; which Fraction being ſo ſmall, is not conſiderable.

Many other ways there are to meaſure a Cylinder; but this, after you have found the ſide of a Square equal to the Circumference, multiply'd by the Length is ſufficient, *&c.*

16.882
16.882
33764
135056
135056
101292
16882
285.001924

CHAP. LI.

Diviſion on the Line.

THE Rule is, as 1 is to the Diviſor, ſo is the Dividend to the Quotient; or as the Diviſor is to the Dividend, ſo is 1 to the Quotient.

Example.

280 being to be divided by 5, ſet one foot of the Compaſſes on 5, and extend the other to 1, that Extent will reach from 280 to 56, the Quotient.

Or thus, Extend the Compaſſes from 5 to 280, that diſtance will reach from 1 to 56, the Quotient.

Example 2.

260 divided by 5 $\frac{1}{10}$; Extend the Compaſſes from 5 $\frac{1}{10}$ to 160, that Extent will reach from 1 to 50, the Quotient.

By theſe Rules may you work any other Queſtion in Diviſion, for Diviſion is eaſier than Multiplication; for in this (having the Sums given) you look for leſs, and in Multiplication the Sums being given, you may ſeek for greater.

CHAP. LII.

The Rule of Three on the Line.

THIS Rule, which by most is called the Golden Rule for its excellent Uses, is performed with much ease; only by 2 turns of your Compasses, and in working differs little from Division.

The Rules are, if 4 Numbers are proportional, their order may be so transposed that each of those Terms may be the last in proportion, in this manner.

1. As the first is to the second, so is the third to the fourth.

2. As the third is to the fourth, so is the first to the second.

3. As the second is to the first, so is the fourth to the third.

4. As the fourth is to the third, so is the second to the first. See Mr. *Oughtred*'s Circles of Proportion, *pag.* 77.

So that four proportional numbers being desired to be known, if any three be given, you may find the fourth.

As if 2, 8, 6, and 24 be the numbers given, these numbers may be so vary'd (as is aforesaid) that if any three be given, you may find the fourth. *Note*,

First, If 2 costs, gives, or requires 8, then 6 costs, gives, *&c.* 24.

Secondly, If 6 gives 24, then 2 will give 8.

Thirdly, If 8 requires 2, then 24 will require 6.

Fourthly, As 24 is to 6, so is 8 to 2.

Fifthly, Or thus it may be, As 2 to 6, so is 8 to 24.

Here are five ways that will teach you, if you have three numbers given, to find out the fourth

propor-

proportionable to them; but the firſt and laſt are moſt uſeful, and are many times good Proofs one of the other.

Example 1.

If 2 of any thing coſt 8 *s.* then 6 will coſt 24 *s.* for if you extend your Compaſſes from 2 to 8, that ſame diſtance will reach from 6 to 24, the Queſtion; or if you extend your Compaſſes from the firſt number to the third number, that ſame Extent will reach from the ſecond number to the fourth, which was the thing ſought.

Extend your Compaſſes from 2 to 6, that ſame Extent will reach from 8 to 24, the Queſtion as before, *&c.*

Example 2.

If you ſell your Timber by the Load, that is, 50 feet to the Load, at any price, to know what it is a foot; as if you ſell for 25 *s.* the Load, what is that a foot? Firſt, know how many Pence is in 25 *s.* becauſe your feet will coſt Pence and not a Shilling: 25 *s.* is 300 *d.* then the Rule orders it ſelf thus, as 50 to 300, ſo is 1 to 6; therefore extend your Compaſſes from 50 to 300, that diſtance will reach from 1 to 6. So then 1 foot coſts 6 *d.* the Queſtion.

If you would know the Price of two Feet, then ſet one Point of your Compaſſes on 2, the other will reach to 12, and ſo many Pence two feet will coſt; and ſo of any other Sum.

Example 3.

If a Load of Timber, or 50 feet of Timber, *&c.* be ſold for 37 *s.* 6*d.* that is 450 pence, what is that for one foot? Set one Point of your Compaſſes on 50, extend the other to 450, that ſame Extent will reach from 1 to 9, and ſo many pence will 1 foot coſt, at 37 *s.* 6 *d.* the Load. And if you would know what 6 feet will coſt, the ſame diſtance of your Compaſſes will reach from 6 to 54, and ſo many pence 6 feet will coſt, at the aforeſaid price.

But now having the price of 1 Foot given you, and you would know what that is a Load; as if a Foot coſt 9 *d.* the Rule is thus: Extend your Compaſſes from 1 to 9, that Extent will reach from 50 (which is a Load) to 450, the Pence that a Load coſts; and if you would know what this is in Shillings, extend your Compaſſes from 12 to 1, becauſe 12 *d.* makes 1 Shilling, that Extent will reach from 450 to 37 and a half, that is, 37 Shillings and 6 pence; for ½ a Shilling is 6 *d.*

Example 4.

By this Line and Compaſſes you may ſoon find the Decimal Fraction of any Sum, the Integer being but given. If it be required to know the Decimal Fraction of 15 *s.* the Pound or 20 Shillings may be 10000, or 1000, or more; for the larger you make this Sum, the better will the Fraction appear. But becauſe great Sums cannot be ſo well wrought on the Line, I will take the Integer or 20 Shillings to be put into 100 parts; and then if you extend your Compaſſes from 20 to 100, that Extent will reach from 15 to 75, the Decimal of 15.

Thus if you would know the Decimal Fraction of 13 Shillings, if you keep the Extent of your Compaſſes fixed, which you took from 20 to 100, that Extent will reach from 13 to 65; ſo then 65 is the Decimal of 13 Shillings. If you would know the Decimal of 5 Shillings, the ſame Extent will reach from 5 to 25, the Decimal of 5 Shillings. The Decimal of 2 Shillings is 10, the Decimal of 1 Shilling is 05, that is 5 of 100; for if that Cypher were not prefixed before it, then were it but 5 of 10. Thus by theſe Rules may you know any other Decimal Fraction.

Example 5.

If 100 *l.* gain 120 Shillings in one Year, or 6 *l.* what will 30 *l.* gain in the ſame time?

Extend the Compaſſes from 100 to 120, that ſame will reach from 30 to 36; ſo that 30 *l.* will gain 36 Shillings in one Year, 12 Months or 365 Days.

Exam-

Example 6.

If one Year, or 365 Days yield for the Intereſt of 20 Pounds, 24 *s.* or 288 Pence, what will 60 Days yield for 20 *l?*

Extend your Compaſſes from 365, the Days in one Year, to 288, the Pence in 24 Shillings, that ſame Extent will reach from 60 to 47, and near $\frac{1}{2}$, ſo that 20 will yield in 60 Days 47 Pence $\frac{1}{4}$, and better.

Theſe few Rules of many will ſhew you the Manner how to work the *Golden Rule Direct* on the Line of Numbers. There is alſo the *Golden Rule Reverſe*, or *Backward Rule of Three*; and tho it is not ſo uſeful as the direct Rule, yet it is worthy to be known, for its excellent Uſes. By the *Rule of Three Direct*, you ſee the Number that is ſought, ought to proceed from the ſecond Term, as the third did from the firſt in the ſame Proportion: Therefore if you multiply the ſecond Number by the third Number, or the third by the ſecond, their Product divided by the firſt giveth the fourth.

CHAP. LIII.

The Golden Rule Reverſe by the Line of Numbers.

THE Rule of *Three Inverſe* is when the Number ſought proceeds from the ſecond Term, in the ſame Proportion as the firſt proceeds from the third.

And if the third Number be greater than the firſt, then will the fourth Number be leſs than the ſecond; but if the third be leſs than the firſt, then the fourth will be greater than the ſecond.

In this Rule, if you multiply the firſt Term by the ſecond, and divide the Product by the third, the Quotient ſheweth the fourth.

The firſt Number and the third muſt be of one kind, and the ſecond Number or middle Number of the three given, muſt be of the ſame kind with the fourth.

Example 1.

If 24 Men do any piece of Work in 16 Days, how many Men are required to do ſuch another piece of Work in four Days? According to the Rules before named, tho 24 be here propounded firſt, yet it muſt be in the ſecond place, and then the Queſtion will order it ſelf thus:

As 4 is to 24, ſo is 16 to 96.

Or thus, As 4 is to 16, ſo is 24 to 96.

Therefore, extend your Compaſſes from 4 to 24, that ſame Extent will reach from 16 to 96.

Or the Extent of 4 to 16 will reach from 24 to 96.

So that if 24 do a piece of Work in 16 Days, 96 will do as much in four Days.

Example 2.

If 9 Buſhels of Provender ſerve 8 Horſes 12 Days, how many Days will that ſerve 16 Horſes?

The Queſtion will order it ſelf thus: As 16 is to 8, ſo is 12 to 6.

Or as 16 is to 12, ſo is 8 to 6.

Extend your Compaſſes from 16 to 12, that Extent will reach from 8 to 6: ſo that if 9 ſerve 8 Horſes 12 Days, it will ſerve 16 but 6 Days.

If this Queſtion had been in the *Rule of Three Direct*, then it would have ordered it ſelf thus: If 8 had coſt 12, then 16 would have coſt 24.

But in this Inverſe Rule, you muſt begin with 16, which is the third Number, and ſo work backward, as is ſhew'd before at large.

Example 3.

If ſuch a Quantity of Biſket will ſerve 100 Men eight Weeks, how many Men will it ſerve ten Weeks?

In

In this Example, as in the other, you muſt begin with the third Sum firſt, and ſo work back, as before; for here the third Sum is 10, which you muſt begin withal, and the Queſtion will order it ſelf thus:

As 10 is to 8, ſo is 100 to 80; therefore to work it by the Line, extend your Compaſſes from 10 to 8, that ſame Extent will reach from 100 to 80. So it will ſerve 80 Men ten Weeks.

There are many other Rules which may be wrought on the Line of Numbers; but if you would be further ſatisfy'd, ſee the Works of Mr. *Gunter*, Mr. *Wingate*, *&c.* And I ſhall conclude with holy *David*, Pſal. 115. ver. *ult.* as I hope you will with me: *But we will praiſe the Lord from henceforth and for ever; Praiſe ye the Lord.*

CHAP. LIV.

Of Levelling any Ground, and to make Slopes or Batteries, &c.

TO level any piece of Ground that you can ſee from ſide to ſide, or from the middle to any ſide, go into the middle, and there ſet up your Inſtrument, be it Water-level, or Ground-level with ſights: and when you have placed it ſo high as you may ſee over the higheſt part of the Ground, as half a Foot, or a Foot, then ſet a ſtake in the middle, the top exactly level with the Sights; and one on the higheſt ſide, the top level with the middle ſtake: then turn the Level or Lood back ſight, and ſet one Level with theſe two on the loweſt Ground; ſo have you three ſtakes in a Line level. Keep your Level true to your Middle-ſtake, and turn your Level till

till it makes Right-Angles with theſe three ſtakes, and ſet up two ſtakes at each ſide one Level with thoſe three: So have you five ſtakes ſet true Level in two Lines; and if your Ground be large, you may ſet up two Rows more by the Level, but in ſmall Grounds 5 ſtakes are enough. Then may you lay by your Level, and looking over the head of one to the head of another, cauſe your Aſſiſtant to put down ſtakes between two and two, till you have ſet as many ſtakes level in your Ground as you think convenient: Or you may have a Rule, and look over the edge of that, it being level with the head of the ſtake, to the head of the other; and put ſtakes down between you and the other ſtake, what Number you pleaſe.

Thus having ſtaked out your Ground with all the ſtakes heads level, and half a foot higher than the higheſt part of your Ground; in ſome Ground the middle-ſtake, and the ſtakes in the Croſs-line will be the Level-line the Ground muſt be brought to; that is, abating the Hill, and filling up the low-ſide to the Level of the Mid-line: but if your Ground be very uneven, then you muſt meaſure over all the ſtakes, and take them middle-high, for their mean Level, and by the Rule of Three proportion your Ground to that.

Suppoſe a Valley be 10 Poles long, and 2 Feet deep from the ſtrait Line, and there is a Hill 5 Poles long, how many Feet deep muſt I go in thoſe 5 Poles of the Hill, to fill up this Valley? This may be anſwered by the Rule of Three Inverſe, or back Rule of Three: The Rule orders it ſelf thus. As 5 is to 2, ſo is 10 to 4: ſo if you work it by the Line of Numbers, extend your Compaſſes from 5 to 2, that ſame Extent will reach from 10 to 4; ſo then you muſt go 4 Feet deep in ſuch a Hill, to make good ſuch a Valley as is before ſaid.

Suppoſe you are to abutt the top of a Hill 4 Feet deep, and 1. 2 Pole from the top of that Hill thoſe 4 Feet ate to come out: this is eaſily performed, (tho

a Leveller to the beſt Man in the Land did not underſtand it) ſet up a ſtake on the top of the Hill 2 Feet or 3 Feet long above ground, and another at the ſame height where your depth comes out; three Rods from that ſet a ſtake down, till the head comes to be in a Line with theſe 2, and at that ſtake you muſt be 1 Foot deep: At 6 Poles another as before, there you muſt be 2 Feet deep; another at 9 Poles, there you muſt ſink 3 Feet. You may ſet more ſtakes at equal diſtances, which will direct you that you cannot go amiſs.

To make any Slope, firſt line out your top and foot true, then if your Slope be not very long, you may have a Frame of Wood made according to your Slope, which will be as a Mould to try your Work by. Two Feet Riſe, in 6 Feet Level, is a good Proportion for a Slope.

CHAP. LV.

For making Cyder, obſerve theſe Rules.

WHatſoever Apples you make your Cyder of, let them hang on the Trees until they be thorow ripe, which you may know by theſe infallible Rules: Firſt, if you find the Kernels brown, or the Seed rattle in the Apple, as in ſome they will; or if you ſee them begin to fall much in ſtill weather; or if you find them to handle like a dry piece of Wood, ſounding in your Hand if you toſs them up; then you may go to gathering as faſt as you pleaſe, ſo your Fruit be dry: obſerve that the greener your Fruit is, the ſourer will your Cyder be; therefore be not too forward in gathering.

For gathering your Apples, obſerve theſe Directions: Take care they be not too much bruiſed; for your

your bruiſed Fruit, if they be a little kept, will rot, and give your Cyder an ill Taſte, and a high brown Colour, and not yield ſo well; for your bruiſed place of the Apple, if it doth not immediately rot, the Juice of that place will vapour forth, and be a dry Red, yielding little Taſte or Liquor, but ſometimes a bad Taſte.

But to the making of one Hogſhead of Cyder, there are required a great many Apples: as if they be good yielding Fruit, and not too long kept, ſome 18 or 20 Buſhels will make a Hogſhead; if not, as aforeſaid, then 24 Buſhels, or more to one Hogſhead. Therefore, tho I would not have your Apple too much bruiſed, yet I would not adviſe you to pick them by Hand: But you may lay a Truſs or two of Barly-Straw under your Tree when you go to gather them, and on that lay ſome Blankets (or the like) according to the bigneſs of your Trees; thereon with Diſcretion ſhake your Fruit, letting not too many lie on at one time, but carry them to the Place where you intend they ſhall lie till you grind or beat them. Thus you may remove your Straw and Blankets from Tree to Tree as your Pleaſure is.

Now for keeping them after you have gathered them, let it be in ſome Houſe if you can with Convenience, and on ſome dry Boards or boarded Floors; but if it be an Earth-floor you muſt lay them on, firſt cover it with good dry Straw, and ſo lay them on that, for if you lay them on the Earth they will decay faſter, and turn muſty before they have done ſweating: for 'tis obſerved, that what is beſt to preſerve Plants is the quite contrary to keep and preſerve Fruit; for the Holy Scripture telleth plain, that which a Man ſoweth muſt firſt die, before it take root to live and produce its kind.

Thus it may be with Fruit lying on the Ground, where the ſecret Vapours of the Earth tend much to the Death or Diſſolution of the fleſhy part of the Fruit, that the Seed might the ſooner be at liberty to pro-

duce

duce its like in its ſeveral kinds. For Nature, or the ſecret providing Power of the Almighty, is at all times, and in all places, actuating and aſſiſting every Species to produce its kind: for any who hath but obſerved the Walnut or Cheſnut, tho one hath got his Fur Gown, and the other his Noli-me-tangere Cloke, as to two of the Senſes, yet notwithſtanding, when they be able to ſhift for themſelves, (as I may ſay) then how willingly the Gown and Cloke is thrown aſide, to venture boldly to the Earth, to do as at firſt their Parents did for them? But of this ſee further in the Chapters before. And ſince we are now ſpeaking of one particular Fruit, *viz.* Apples, of the time of their keeping before you make them into Cyder; a ſet time I cannot deliver, for your Summer-Fruit will be ready to beat before your Winter-Fruit: but as ſoon as you have ſeen them ſweat, which will be in ten Days or a Fortnight, then to beating or grinding of them as faſt as may be, keeping your Fruit ſeparate, if you have enough to fill a Veſſel of one kind; if not, put ſuch kinds together as be near ripe together, the Cyder will ferment more naturally.

But let your Winter-Fruit lie three Weeks or a Month before you beat or grind them; the greener your Fruit is when gathered, let them lie the longer before you beat them. Thus when you have beaten or grinded your Apples, let them lie a Night or 24 Hours if you pleaſe, before you preſs them; it will make your Cyder have more of the Sack-Colour, and hinder it from fermenting too much. And if your Fruit be ripe to eat, or mellow, then put to every twenty Buſhels of Stampings ſix Gallons of clear Water, put that on the top of the Stampings as ſoon as you have beaten them; if your Fruit be ſoft and mellow, you may put more; if not, the leſs: this alſo will keep your Cyder from fermenting too much, and tho your Cyder be weaker, it will be much pleaſanter. Therefore if your Apples be mellow before you beat them,

them, there will go ſo much of the fleſhy Subſtance of the Apple through the Strainer or Bag with the Liquor, that it will be hard to get this Lee ſeparated from the Cyder before it begins to ferment; for the Liquor will endeavour to free it ſelf of theſe little Particles, which when once ſeparated from the united Body, turneth to an earthy Subſtance; and then the Liquor working hard to free it ſelf of theſe then uſeleſs and decaying parts, and having no place to turn them out at, but at the Bung, and it being contrary for theſe earthy Parts to aſcend upwards, cauſeth by its much fermenting, not only the ſtrong, but alſo the pleaſant Spirits to take their flight, and go into the great World, to be ready to aſſiſt at another new Generation, and ſo leave the Liquor both dead and of a ſour Taſte: which when theſe higher Spirits are fled, then Sourneſs doth maſter the Taſte in the Cyder, which it receives from the groſs Lees in the Veſſel. Therefore if your Cyder be made of mellow Fruit, let it ſettle 24 Hours in ſome Fatt or large Veſſel, that the groſs Lees may ſettle to the bottom before you put it into your Veſſel: and then draw it off, leaving as much of this thick groſs Lee behind as you can (which groſs Lee you may put among your preſſings for Water-Cyder) and if you think the Cyder is yet ſo thick that it will work much, then draw it into another Tub by a Tap two or three Inches from the bottom; and in this laſt Tub let it ſettle ſo long, as you think it is near ready to work in your Tub: for if it work in your Tubs, then will you get but little of the groſs Lees from it. You muſt keep it covered all the time it is in your Tubs: for note, the finer you put it up into your Veſſel, the leſs it will work or ferment; and the leſs it fermenteth, the better will your Cyder be. But if you have chill'd the Cyder, as ſometimes it may happen in cold Weather, that it doth not work at all, when you have put it into your Barrel, or Hogſhead, and it is thick; in ſuch a caſe put to a Hogſhead a Pint of the Juice of

Alehoof,

Alehoof, with half the quantity of Iſinglaſs, and it will make it clear and fine: but if it do it not preſently, do not deſpair, for it will ferment poſſibly in the Spring, or when the Fruit bloſſoms that it was made on, the Spring after it was made.

Having obſerved theſe few Rules, then put it into your Barrel or Hogſhead, and as ſoon as it hath done working, bung it up, there keep it till it is fit to bottle, which let it be when it is fine; for if you bottle it while it is thick, or not well ſettled, it will endanger your Bottles, and not be ſo wholeſom. But ſome do love to have their Cyder cutting, counting it then the better; this may be performed if your Cyder be fine, by putting a little bit of Loaf-Sugar in every Bottle, when you bottle it, and that's more wholeſom.

I am of the ſame Opinion with Sir *Paul Neal*, that the oftner Cyder by any accidental Cauſe doth ferment, the worſe it is: if twice, it will be harder or ſourer than if it had fermented but once; and if it ferment thrice, it is ſtill worſe: therefore keep it if you can from fermenting or working too much, and alſo too often.

As for the ſorts of Fruit, the Redſtreaks and Gennet-Moyle are counted the beſt; yet there be many ſorts of Fruit, which if the Cyder be well ordered will be little inferior, if not better. The Golden Pippin makes excellent Cyder; the Kerton Pippin, the Ruſſet Harvy, Kentiſh Codlin, *&c.* makes good; or indeed any Apple that is not a Crab; for there be many ſorts of Wildings that have a fine winy Liquor, and the Fleſh of a hard, and not of a ſoft Subſtance: for that Fruit (let it be Pear or Apple) that hath the Fleſh ſoft, and is ſoon mellow, is not good for Perry or Cyder; for ſuch very ſoft Fruit doth break into ſo many ſmall Particles, that they ſpoil your Cyder before they can be ſeparated. But that Fruit that hath its Fleſh hard, that when you beat and preſs it, will flat down like a Sponge, ſooner than it will ſeparate

into

into little Particles; and if it be kept beyond its natural time of being ripe, will grow tough but not mellow; is the only Fruit for Cyder and Perry: for by Sir *Paul*'s leave, it is not always the beſt eating Apple or Pear that makes the beſt Cyder or Perry, but ſuch as aforeſaid, no more than the beſt eating Pear is the beſt baked; and of this daily Experience ſheweth the contrary.

Much more I could ſay concerning Cyder; but if there were a whole Volume writ of it, yet the ſeveral Seaſons of the Year, the ſeveral ſorts of Fruit and other Accidents that happen, no Man can adviſe you of before; therefore let your Reaſon teach you, with what hath been ſaid before: but if you would ſee ſeveral Mens Opinions of the ordering of Cyder, read Eſq; *Evelyn*'s Book, joined to his Diſcourſe of Foreſt-Trees.

To make your Water-Cyder, take the Stampings when you preſs them from your firſt Cyder, and put them into Tubs; and when you have a Tub full, put to theſe Stampings half as much Water as you had Cyder. If your Fruit be good and very ripe, you may put more; if the contrary, leſs: let the Tubs be covered, and ſtand thus with the Water and Stampings together four or five Days and Nights. If it be cold Weather, let them ſtand a Week; then you may preſs the Stampings, and as ſoon as you have got as much as you think will fill a Veſſel, put it on the Fire and ſcum it well; and when you find the Scum begins not to riſe very faſt, then take it off from the fire, and put it into Tubs or Coolers, to cool: and when it is cold, then tun it up; and when it hath done working, then bung it up, and in a Month's time it will be fit to drink. You may if you pleaſe boil a little Ginger in it, or a little Cloves, Juniper-Berries, or other things which you fancy, to pleaſe the Palate, or againſt ſome Diſtempers you fear; for ſmall things taken in time may prevent Dangers very great: Syrup of Rasberries gives a very pleaſing Taſte in Cyder.

Perry

Perry may be made and ordered after the ſame manner, only take care your Pears be not too ripe, for if they be, you will be troubled to get your Liquor fine: thoſe Pears be beſt for Perry that have a hard Fleſh, and ſtony at the Core; the Juice eaſily ſeparating from the Fleſh, the Fruit yields a good plenty of Juice, the Pears commonly of a harſh Taſte.

But thoſe Pears that have a ſoft Fleſh, as many of our beſt eating Pears have, are not good for Perry; as the Burry, Borgatmotes, Green-fields, Green-cheſels, and ſeveral others of like Nature.

We have a Pear at *Caſhioberry*, and it is at other places near *Watford*; it is a little harſh juicy Pear, but makes excellent Liquor, as my Honourable Lord can teſtify, and ſeveral others: its only Inconvenience is, it is but a ſmall Fruit, but the quantity it yields is good. I take it to be a kind of wild Pear never grafted: but for its excellency aforeſaid, the Kind deſerves to be preſerved by the Curious: I know no Name it hath as yet.

Captain *Wingate* near *Welling* hath an excellent Pear for Perry; I have taſted of the Liquor, and ſeen the Fruit, but whether it is a good Bearer, I know not, which ſhould be a property in Perry Pear-trees.

There is a Pear called by my ingenious Friend Mr. *Pritchet*, Gardiner to my Lord of *Salisbury*, Rufins Pear, which makes excellent Perry, and is a good Bearer, as I have oft been informed by him; by the Taſte of the Fruit it is very good for Perry: Indeed moſt ſorts of baking Pears make good Perry, or any that is qualified as is beforeſaid, and that bears well, and yields great ſtore of Liquor.

Mind your Veſſels be ſweet you put your Cyder or Perry in; for a little Tang in the Veſſel will ſpoil all. A Sack-Veſſel is very good (tho diſcommended by ſome) ſo is your White-wine or Claret-wine Casks, or a Veſſel where Cyder hath been before, *&c.*

THE CONTENTS OF THE CHAPTERS.

Chap. 1. *OF the several ways of raising Trees: The best for Forest-Trees is by their Seeds, Keys, Nuts, &c.* pag. 1

2. *How to observe and know the Nature of Seeds, so as the better to raise them,* 5

3. *The Shape of Seeds and their Weight do inform you how to set them,* 7

4. *Observations of all sorts of Keys and Seeds,* 8

5. *Of the several Ways to raise Forest-trees, or others; and how to perform the same by Laying,* 14

6. *Of those sorts of Trees that will grow of Cuttings, and how to perform the same,* 17

7. *Of such sorts of Trees as may be raised by the Roots of another Tree: and how to raise them,* 19

8. *What Soil, or Dung is best for Trees, or their Seeds, &c.* 21

9. *Of Water for Trees, and Seeds, and watering them,* 42

10. *Of raising and improving Oaks,* 47

11. *Of raising and ordering the Elm,* 69

Chap.

The CONTENTS.

Chap. 12. *Of raiſing and ordering the Aſh,* page 73
13. *Of raiſing and ordering the Beech,* 78
14. *Of raiſing and ordering the Walnut,* 79
15. *Of raiſing and ordering the Cheſnut,* 87
16. *Of raiſing and ordering the Sarvice-tree,* 88
17. *Of raiſing and ordering the Cherry-tree,* 89
18. *Of raiſing and ordering the Lime-tree,* 92
19. *Of raiſing and ordering the Maple,* 98
20. *Of raiſing and ordering the Sycamore,* 99
21. *Of raiſing and ordering the Hornbeam,* 100
22. *Of raiſing the Quickbeam,* 102
23. *Of raiſing the Birch,* 103
24. *Of raiſing the Hazel,* 105
25. *Of raiſing the ſeveral ſorts of Poplars,* 106
26. *Of raiſing the Alder,* 111
27. *Of raiſing the Withy, Willows, Sallow, Oſiers,* 112
28. *Of the Pine, Fir, Pinaſter,* &c. 114
29. *Of raiſing the Yew, Holly, Box, Juniper, Bays, Laurel,* &c. 118
30. *General Rules for planting Foreſt-trees in Avenues, Walks, or Orchards, as in a natural Ground,* 120
31. *Of planting Foreſt-trees to make Woods, or fill up naked places in Woods, where they want,* 122
32. *Of planting young Hedges, and how to improve and keep old Hedges,* 130
33. *Of planting ſeveral ſorts of Foreſt-trees, in order to make the beſt advantage of Ground, as Orchards, or the like,* 142
34. *Of pruning Trees, ſome general Obſervations,* 152
35. *Of the Diſeaſes of Trees,* 160
36. *Of felling and ordering Woods and Coppices,* 163
37. *How to take the height of Trees ſeveral ways, the better to judge the worth of them,* &c. 172
38. *Of making Walks, Avenues, or Lawns,* 183
39. *Of ſeveral ſuperficial Figures, and how they are to be meaſured,* 200
40. *To divide a Right Line given, according to any Proportion required; and how to divide Land or Woods: with ſome uſes of the four-pole Chain,* 205

Chap. 41. *Of measuring Holes and Borders, that are under a Pole broad, by which you may the better let or take them to do by the Pole-square,* &c. *with several Tables of Measure,* 216

42. *Of measuring Timber and other solid Bodies, with several Tables useful thereunto,* &c. 230

43. *Of the Oval, how to make it, and how to measure it; with other Observations thereon,* 237

44. *Suppose you have a Plat to draw on one or many Sheets of Paper, and you would draw it as large as the Paper will bear; to know what Scale you shall draw it by,* 240

45. *To find what Scale a Plat or Draft is drawn by, the Content of the Ground being given,* 242

46. *The Description of the Line of Numbers,* or Gunter's *Line,* 245

47. *Numeration on the Line, or to read a Sum on the Line of Numbers,* 247

48. *Addition on the Line of Numbers,* 249

49. *Substraction on the Line of Numbers,* 251

50. *Multiplication on the Line of Numbers,* 252

51. *Division on the Line,* 259

52. *The Rule of Three on the Line,* 260

53 *The Golden Rule Reverse by the Line of Numbers,* 263

54. *Of Levelling any Ground, and to make Slopes or Batteries,* &c. 265

55. *Rules for making of Cyder.* 267

FINIS.

Place the Figures here.

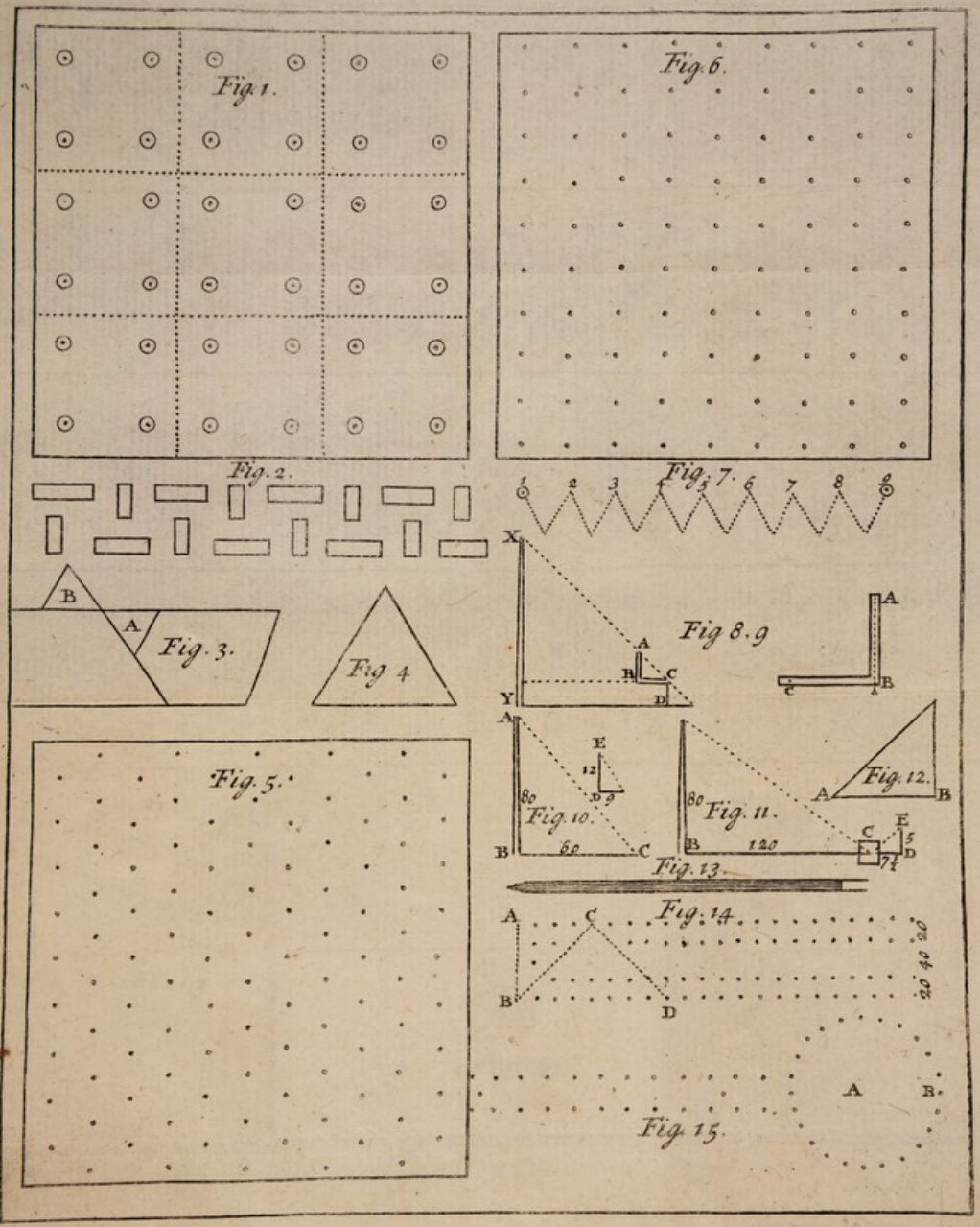
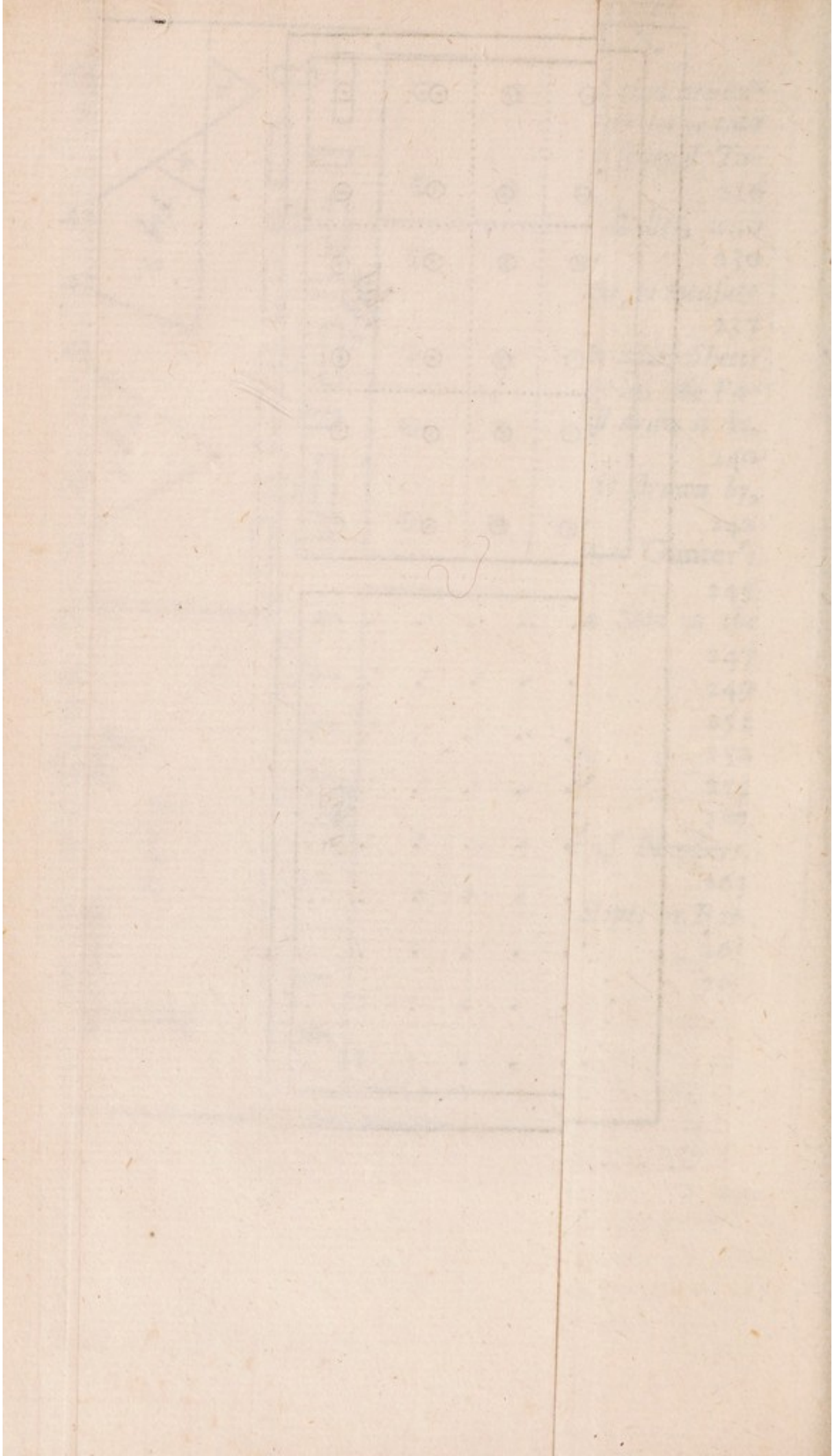


Fig. 1.
Fig. 2.
Fig. 3.
Fig 4
Fig. 5.
Fig. 6.
Fig. 7.
Fig 8. 9
Fig. 10.
Fig. 11.
Fig. 12.
Fig. 13.
Fig. 14.
Fig. 15.



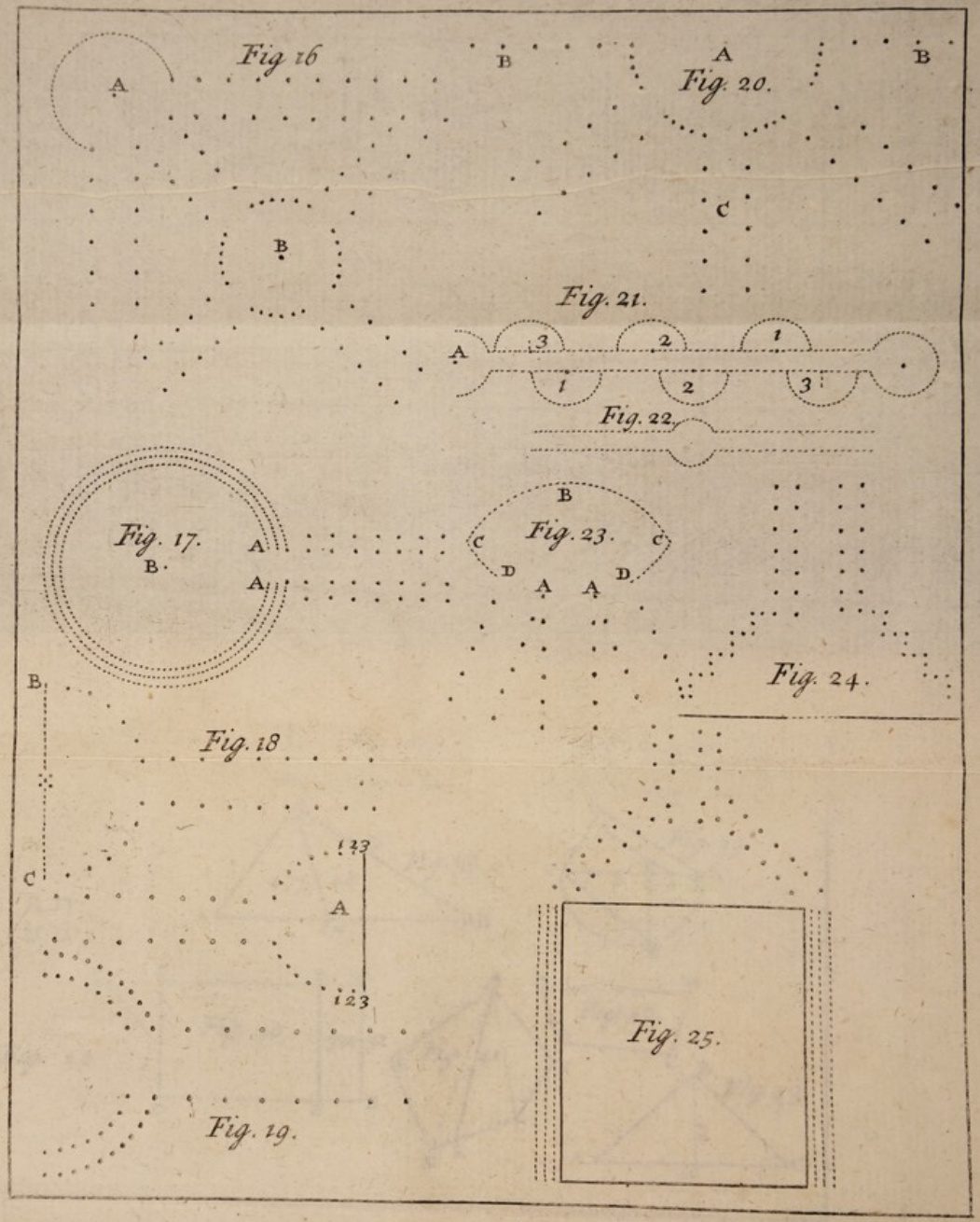


Fig. 16
A
B
Fig. 20.
A
B
C
Fig. 21.
A
3
2
1
1
2
3
Fig. 22
Fig. 17.
A
B
A
Fig. 23.
B
C
C
D
D
A
A
Fig. 24.
B
Fig. 18
C
1 2 3
A
1 2 3
Fig. 19.
Fig. 25.

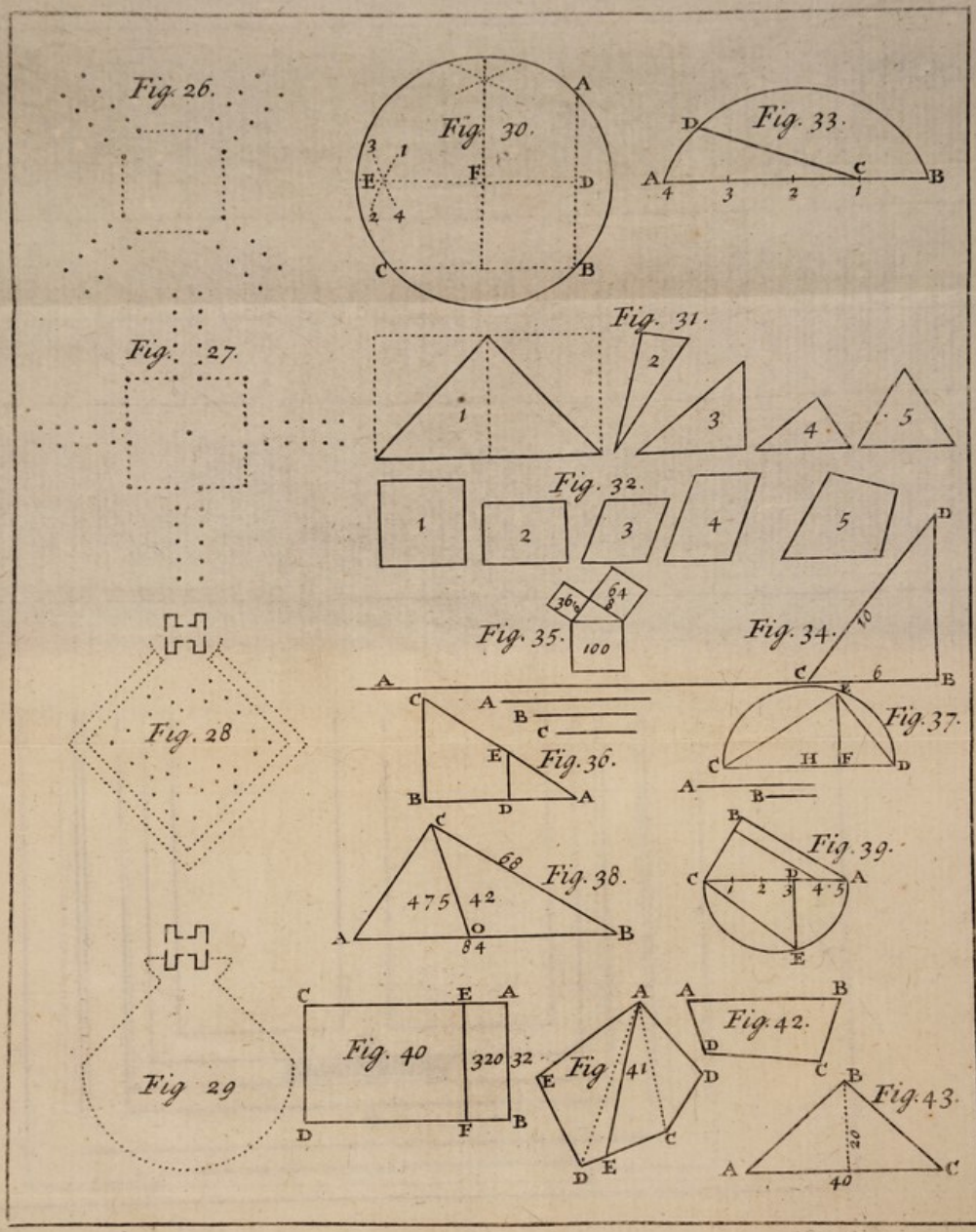
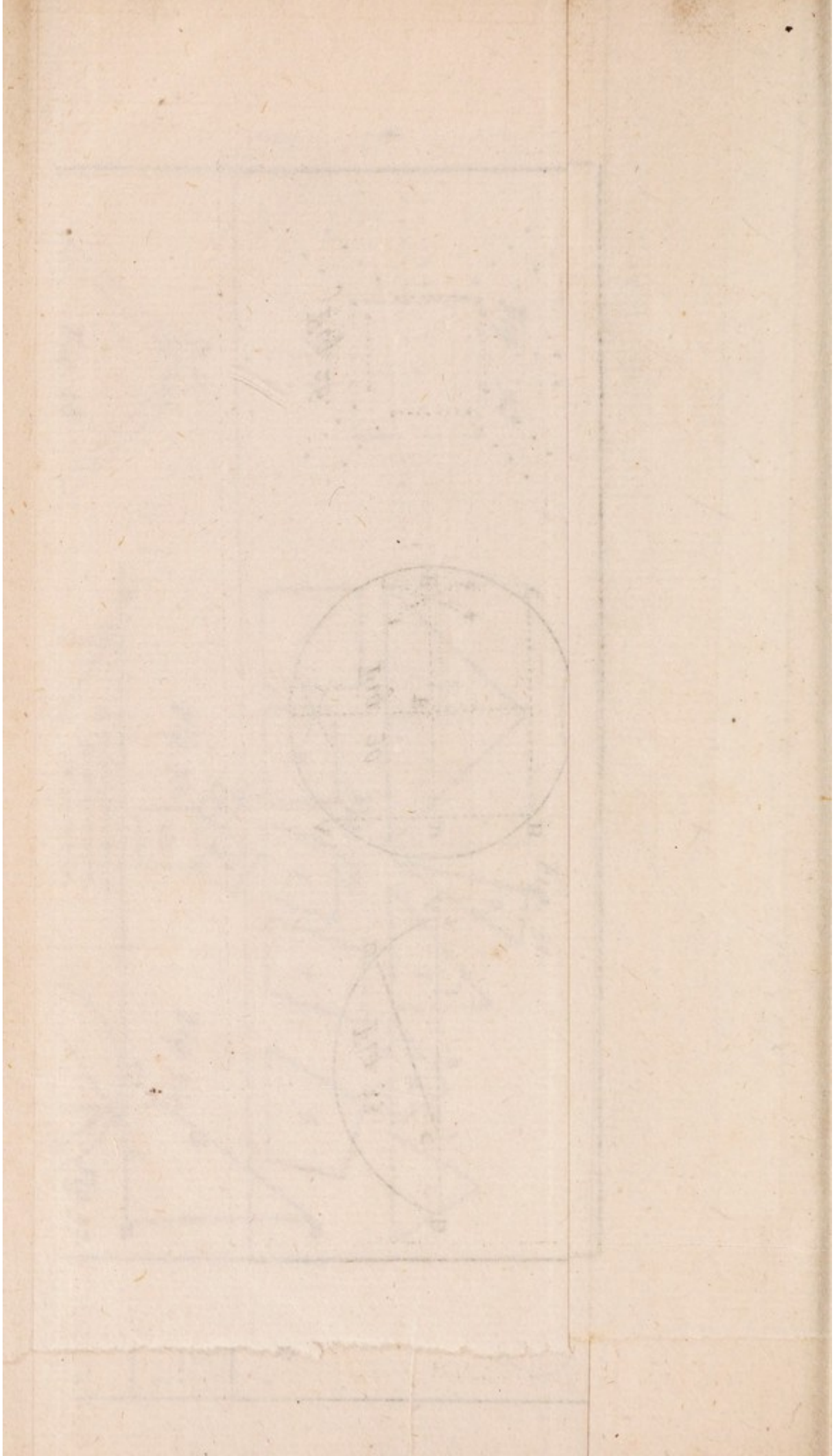


Fig. 26.
Fig. 27.
Fig. 28
Fig 29
Fig. 30.
Fig. 31.
Fig. 32.
Fig. 33.
Fig. 34.
Fig. 35.
Fig. 36.
Fig. 37.
Fig. 38.
Fig. 39.
Fig. 40
Fig 41
Fig. 42.
Fig. 43.



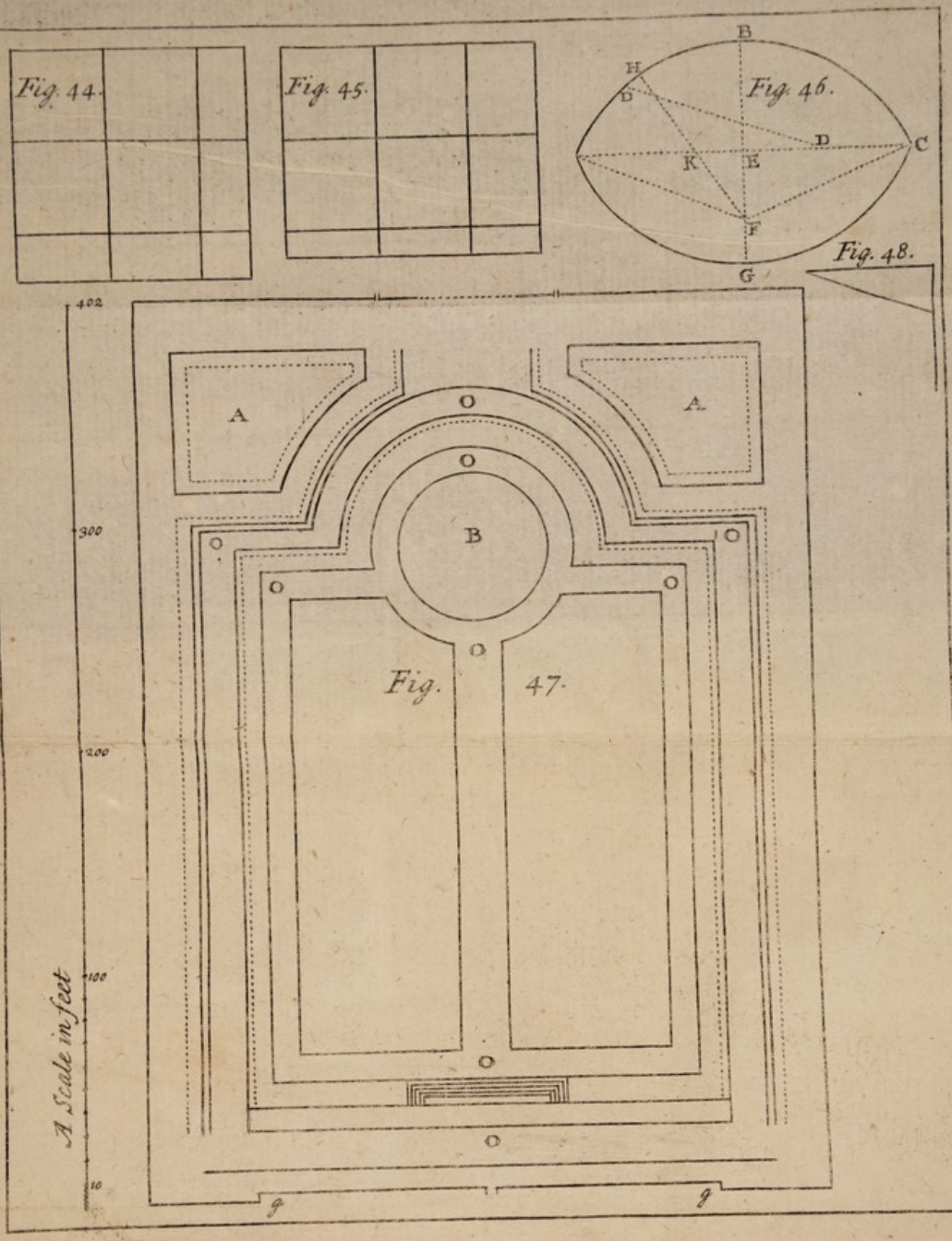
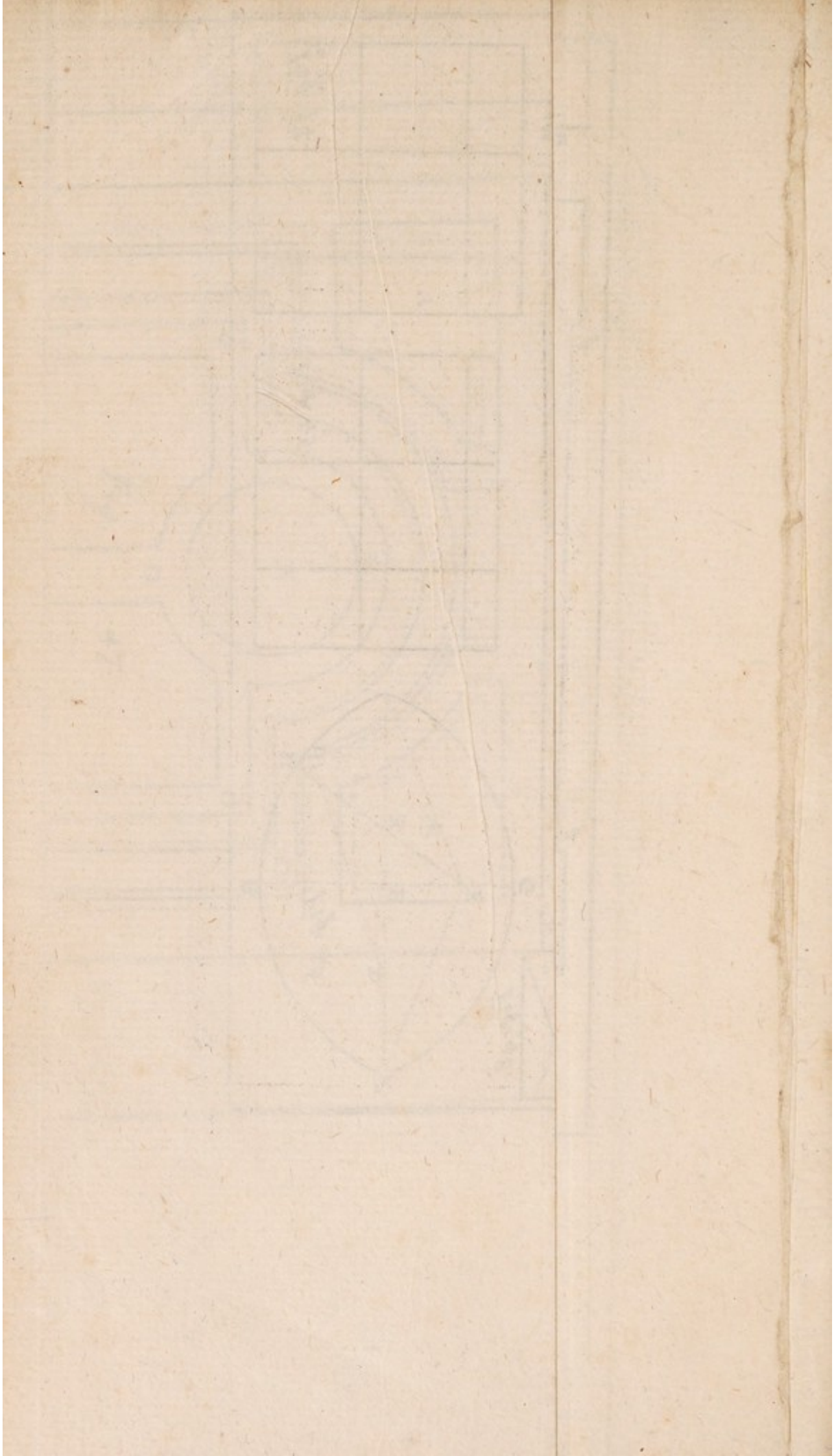


Fig. 44.
Fig. 45.
B
H
D
Fig. 46.
D
C
K
E
F
G
Fig. 48.
402
300
200
100
10
A
A
B
Fig. 47.
A Scale in feet
g
g