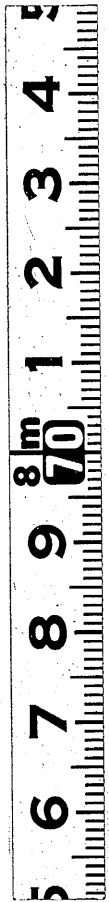


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THE
Gentleman's Steward
AND
TENANTS of MANORS
INSTRUCTED.

CONTAINING
Rational, Easy, and Familiar RULES and
TABLES for finding the Value of Estates of
Freehold, Copyhold, or Leasehold, as well on
Lives as for Years absolute, &c.

WITH
An ENQUIRY into the Nature of the Annual
Disbursements, Precarioufness of the Tenure, and Casual-
ties, that Estates in Fields or Houses, or both, are charged
with, or liable to; and how they are to be accounted for
in the Valuation.

Wherein the ERRORS and ABSURDITIES of
all the common Methods of Valuation, and the Disad-
vantages thence accruing, sometimes to the Landlord and
sometimes to the Tenant, are justly expos'd.

The TABLES for valuing Estates on Lives being founded
on Dr. HALLEY's Hypothesis, and calculated by the
Method laid down by Mr. ABR. DE MOIVRE, to 4, 5, 6,
7, and 8 per Cent.

To which is added,

An APPENDIX:

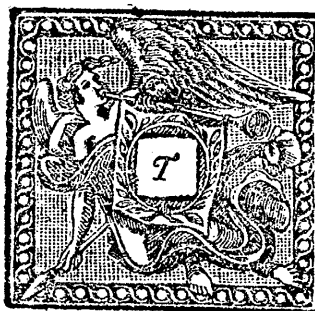
Containing the DESCRIPTION and USE of an
Instrument for discovering the Number of Feet contained
in any Timber-Trees before they are cut down, by In-
spection only.

By JOHN RICHARDS of Exon.

LONDON: Printed for JOHN SENEX, at the *Globe* against
St. Dunstan's Church in *Fleetstreet*; and WILLIAM INNYS,
at the West End of St. Pauls. MDCCLXXX.



PREFACE.



THE Inducements that led me to this Undertaking are sufficiently suggested in the Introduction; and hence all that is necessary by way of Preface, is to shew the Method in which I have treated the Subject, and in what manner the following Tables were computed; that thereby the Reader may be able to guess what Degree of Accuracy may be expected in them.

I have then first of all defined the Term Annuity, and shewn in what Sense I
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make use of the Word; and proceed to shew how far, and to what degree of Certainty the Value thereof in Cash may be found; and have, I think, fairly represented the Difficulties and Intricacies with which such a Computation is involv'd.

In the next place, I have treated of the divers Kinds of Tenures of Lands; and these are reduced to four Heads, viz. 1st, Fee-Simple; 2dly, Leaseholds for Years absolute; 3dly, Copyholds; and, 4thly, Leases for Life or Lives. And here I have likewise shewn, how each of these may be consider'd and valued as an Annuity; and altho' there may be, and doubtless are, divers Manors wherein the Holdings do not properly come under either of these Heads; yet I believe a Person thoroughly acquainted with these, and the manner of their Valuation, will find no great Difficulty in reducing any other to some of the aforesaid Forms.

I next

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I next consider the Errors that the commonly practis'd Methods of Valuation are liable to; and these are so many, and in some Cases so enormous, that tho' this Chapter is drawn out into a pretty great Length, yet is it necessary to say something more here, in order to clear up, and in some measure to account for, the preposterous Practice of renewing Leases of Church and College Lands.

In Chap. 3. is demonstrated, that the accepting of one Year's Value for renewing of seven that are lapsed in a Lease for one and twenty Years, is compounding for two Fifths of the real Value thereof at the rate of legal Interest. By real Value, I mean the Value of the Tenure absolutely consider'd: for I have there likewise shewn, that the renewing such a Lapse, on the probability that a Person of 50 Years old will live to enjoy it so long, is not worth more than one Year's Value; which are the Terms generally agreed on. And hence the Conduct of the Lessor, as far as re-
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lates to his private Advantage, is accounted for.

But then if the Lessees be at any time charg'd with the Guilt of the Oppression; or if upon their Application to the Proprietors for a Renewal, they meet with a Landlord that is not so willing to give away the Right of his Successor; in such Case their only Argument is, That they, their Father or Grandfather, &c. did, for the first Purchase, give a valuable Consideration for this Privilege of renewing.

And indeed if this be the Case, the greatest Share of the Guilt will devolve on those, who by this Practice evade and frustrate the Design of those Laws, which restrain the Possessor from alienating, or granting long Leases of those Lands; and would themselves tell another Person, that the Crime was no less than that of Sacrilege, thus to alienate God's Inheritance: For by this Privilege of renewing (if the Successor cannot break through it) a Part of the Church's Patrimony is granted away in Perpetuo. In

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In the Chapter of Copyholds, Example 1. I have shewn how much ought to be given for the first Purchase of an Estate, when this Privilege of renewing at certain Periods for a stated Sum is a Condition in the Lease. By which Example, and a due Computation, it will appear that the Lessor receives near one Year's Produce of the Estate more than he could expect, were the Lease to be absolutely terminated in one and twenty Years; and if it be consider'd that he enjoys that Overplus, which is the Right of his Successor, for twenty-one Years, the Amount thereof at the End of that Term will be little less than three times as much.

But this is still making the best of the Matter; for very often the Septennial Sum reserv'd, and which is called one Year's Value, is not more than half the Produce of the Estate; and this is another Aggravation.

But no more of this.

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In Chap. 4. are laid down some previous Considerations necessary to the adjusting the Value of Estates; such as are the Nature of the Tenure, and Term of its Continuance; the Casualties, Incumbrances, and Impositions that go along with it; the Quality of the Estate as to Repairs, &c. the yearly Value, and the Rate of Interest that the Purchaser may expect for the Money he lays out. Each of these Particulars are pretty largely discuss'd; and I believe the Reader will here meet with some Observations that are entirely new, and which he'll think deserve his Notice.

After having said something of Reversions, and of the Queries that will arise about them; I proceed to the Tables, which are rang'd in the following Order.

Tab. 1. Is for finding the Value of an Annuity for a certain Number of Years, in ready Money, at 4, 5, 6, 7, and 8 per Cent. Interest; but this being a Table

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ble that is very common, I had no more Trouble about it than just to transcribe it; for it was ready made to my Hands: As was likewise,

Tab. 2. Shewing (in ready Money) the Value of 1 l. payable after a certain Number of Years, at the same Rates of Interest with the former.

Tab. 3. Is to discover the Worth of an Annuity that is to continue 7, 10, 14, or 21 Years, if a Person of a given Age do live so long; and these are calculated by the Method laid down by Mr. Abr. de Moivre, in his Annuities on Lives, Prob. 2. pag. 21.

Tab. 4. Shews the Value of an Annuity that is to continue during the Life of a Person of any Age, at 4, 5, 6, 7, and 8 per Cent.

Tab. 5. Of the Value of two joint Lives of equal Ages. By joint Lives is meant, that the Annuity is to continue

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till one of those Lives is dead, and no longer.

Tab. 6. Of the Value of two joint Lives of different Ages.

Tab. 7. Exhibiting the Value of three joint Lives of different Ages.

All these five last mention'd Tables are built on the Foundation laid by the great Dr. Halley, in Philosophical Transactions, N^o. 196. and the Calculus perform'd by the Method set forth by Mr. De Moivre in his Tract before-mentioned.

Having gone thro' with these Tables, (and pretty well surfeited myself on Figures) I proceed in the following Chapters to shew the Use of them by a Variety of Examples; wherein the Reader will find, that I have thoroughly consider'd the Outgoings; such as Rates, Taxes, Tythes, High-Rents and Repairs, as well as the Nature of the Tenure, and the Interest that ought to be reckon'd for the Money laid

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laid out, with regard to the Security that the Purchaser has for it.

I have likewise shewn, how from these Tables by Addition and Subtraction only, to find the Value of Annuities that are to continue during the Life of the longest Liver of two or three Persons, and have given Examples to that purpose.

After this is done, and something said of Reversions, with two or three Examples to explain the Method of valuing an Estate in Possession; I have laid down some Rules of judging the Worth of Timber Trees and Coppice Wood; with a Way of trying how much Timber will increase, in any given Number of Years, in a particular Soil and Situation: And under this Head I have hinted at what Cautions ought to be used, that a Man do not give too much for growing Timber; and thence what Rate of Interest a Purchaser may insist on, for the Money he lays out in that Commodity.

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Two or three Examples, for valuing of Coppice Wood, bring me to a Conclusion of this Chapter, and was at first the Period to the whole Work: But these Papers having lain by me for above three Years; during which Interval, that Surfeit of making Tables was pretty well worn off; and considering that it would render the Work more useful, if Tables of the Value of an Annuity on the longest Liver of two or three Persons were subjoined to it: In pursuance of this Thought, I have with a pretty deal of trouble perfected such Tables; whereby the Value on such a Tenure (which is the most in Use of any amongst us) may be found for Lives of any Ages, howsoever combined, at one View.

The manner how these Tables were computed, is before hinted; but then the Accuracy of the Work must appear by the Tables themselves. And this I must submit to the Reader's Judgment, after I have told him, that tho' I made use of the
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most expeditious Ways of working that I could think of, I made the Operation for some particular Ages, and so equated for the interminate ones; all the Labour that I sav'd myself in that way, was, that I wrought for the Rates of Interest 4, 6, and 8, and by them equated those of 5 and 7; and that only for the Tables of valuing single Lives, and those for the joint Lives: for as to the Tables at the End of the Book, they were calculated for every particular Age, and to every Rate of Interest mention'd in them.

And tho' I cannot take upon me to say they are entirely free from Error, it being next to impossible that such a Calculation should be so; yet this I believe I may affirm, that the Mistakes are very small and inconsiderable; for it is hardly possible that any great Blunders should escape me, since the Numbers before and after such a Mistake would unavoidably discover the Error, and direct to your Correction.

Upon

Upon the whole, I hope that no Error so great as one tenth Part of a Year's Value hath escap'd me; and then I believe the candid Reader will be ready to say the Tables are as correct as can be expected; for, humanum est errare.

A word or two about the Appendix, and I have done.

The Instrument here describ'd is, for ought I know, a new Invention. The want of such an Instrument in the Practice of surveying Timber, put me upon the Thought of inventing one; and I have for several Years made use of this, and found it to answer my Expectation.

After all the great Pretensions of Surveyors, that they can guess to the Quantity of Timber in a growing Tree within a very small matter, I have found some of the best of them very deficient: and if in surveying a great Number of Trees, a Person once falls into an Error
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in his Guess, the following Trees are very likely to suffer the same Fate; and without a great deal of Care in correcting the Ideas in the Mind, the Mistake is likely enough to grow greater, and may increase considerably before it be discover'd.

Now if these happy Gueffers would but be persuaded to carry one of these Instruments into the Woods with them, it would be of use, or at least must be a Satisfaction to them, if they did but try one Tree in twenty, to see how justly they could pretend to this Accuracy in judging of the Quantity of Timber. And further, it would be useful to improve this Faculty, and give them in time a much better Title to what they at present with such an ungrounded Air of Assurance pretend to.



INTRODUCTION.

IT must be acknowledged by every body, that in all manner of Sales or Purchases, it is highly just and requisite, that both Buyer and Seller should have a right Understanding of the Value of the Commodities that they contract about; for whatever Advantage one Party makes by means of the other's Ignorance, it is so far an Act of Fraud and Injustice.

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But tho' every body will allow this to be true in other Mens Negotiations, where they themselves are unconcern'd; yet is it too notorious, that many (I fear the most) People, when they meet with an ignorant Chap, are willing and ready enough to strike a Bargain with him at the best Advantage for themselves; and (blinded with Self-interest) never consider that it is their Duty to set him right in his Judgment, as to the Worth of the Commodity.

How necessary is it therefore, that (where the thing will admit of it) the true Worth of Commodities should be by some stated Rules ascertained? by the Help whereof such Persons (who for want of Leisure or Learning cannot by a Chain of Arguments and Demonstrations easily attain so much Judgment or Skill, as is necessary for the preserving their Property, and doing Justice to themselves and Families) may easily in-
form

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form themselves, how much they ought to have or give for the thing that they are going to treat about.

It must be confess'd, that such a Determination of the Value of Things is in some Cases impossible, in others very difficult, and in all subject to divers Cautions and Restrictions, according as the Profit arising by that other Commodity or Species, (*viz.* Money or the like) by which 'tis valued or compared, rises or falls; or according to the Method or Time of Payment; and the Security for the true Performance of the Agreement on both Sides.

And altho' it be utterly impossible, in some Cases, to understand the real Value or Worth of the things we are dealing for, on account of the Precariousness of the Tenure, the Accidents they are liable too, or the Uncertainty of their always bearing the same Proportion to that by which we value them, as they
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do at the time of Purchase; yet all these Uncertainties may, as such, be valued, provided the Likelihood of their happening or not happening be exactly known. Thus for Instance: Admit that a Person be to win 100*l.* if he at first (wholly unskill'd) throws a Duce with a single Dye; here it is plain that he has five Chances to lose, and but one to win; consequently the real Value of his Chance before he throws is 100*l.* divided by 6, or 16*l.* 13*s.* 4*d.* And the like may be found of any kind of Uncertainties, where the Ratio of the Likelihood, to the Unlikelihood of their happening, is known.

But then, in some Cases, this Ratio becomes an Uncertainty; as particularly in finding the Worth of Annuities, or Leases upon Lives, in ready Money. Here 'tis plain, that such an Annuity is of equal Value to an Annuity for so many Years as those Lives shall continue in Being; which Number of Years are

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unknown; and the Ratio of their living or not living 1, 2, 3, 4, &c. Years, is likewise an Uncertainty. The whole Difficulty therefore of valuing this Annuity lies in finding the Ratio of the said Chances; to do which, is Part of the Business of the following Sheets,

The Want of a sufficient Judgment in bargaining about things of this Nature, is the Occasion of great Detriment, sometimes to the Buyer, and sometimes to the Seller: And I doubt not to make appear in the following Pages, that all the Rules commonly practised in these Cases are false and erroneous, sometimes doing Injustice to one, and sometimes to the other Party; and however a Person prejudiced in favour of the ancient Ways of Leasing, &c. may be prevail'd on to retain them, without troubling himself to enquire into the Reason of it; yet I persuade myself, that the greater Part of Landlords and Tenants will be so just to themselves, as to examine into
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a Matter that so nearly concerns them, and which so often falls under their Consideration; not taking it for granted, that the Rules are good, because always observ'd by their Fathers, Grandfathers, &c. in whose time the Profit arising by Money was (perhaps) as 6 to 5 to what it is now; and also whose Rules (even as the Case was then) contained nothing like Demonstration.

Neither is the Alteration of the Interest of Money the only Blunder they commit by following their old Rules, (supposing those Rules good then); but as their Predecessors reckon'd so many Years Value without deducting Rates, Taxes, &c. so they continue to do still, notwithstanding those Outgoings are altered from what they were; perhaps one third, or one quarter Part, which is very considerable. These and divers other Reasons, which I shall hereafter shew, are sufficient to apologize for this Performance (poor as it is) and may at least
give

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give a Hint, and put the Persons concern'd upon thinking on the many Errors that such a Method is likely to draw them into.

I don't know of any thing (like a rational Scheme) as yet published for adjusting the Values of Leases on the several Tenures in Use amongst us; one Reason of which may be perhaps the Difficulty, or rather the seeming Perplexities with which such a Computation is involv'd. For although several Persons have with good Success endeavour'd to obviate Part of the Difficulties; yet the Application of their Precepts to the Purposes before-mention'd, does still remain a Task insuperable to the Generality of People whom they concern; the Gentleman's Steward and Tenants being (for the most part of them at least) as much in the dark as ever.

And indeed as the Foundation of such a Scheme was too noble to be laid by a
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less Genius than that of the Great Dr. *Halley*, or Mr. *De Moivre*; so likewise are there some porterly Offices necessary in carrying on the Structure, (such as making the following Tables, &c.) that are too mean, too ignoble a Drudgery for the World to expect from their Labours.

I am free from the Vanity of ascribing to myself any more than having, with a great deal of Labour, gone through with the numerical Calculation, and of having apply'd the whole to the Valuation of Estates on those precarious Tenures. If what I have done herein be of any Use, 'tis what I chiefly aimed at; and if not, I have unwittingly mis-spent my Time; and may perhaps receive Blame and Censure for taking so much Pains to build on an Hypothesis, which is acknowledged by its Author to be uncertain for want of more Experience as to the Probability of Life. I shall only say, in Answer to those Oppugners, that
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this Hypothesis was publish'd above thirty Years ago; and I don't know of any body that hath yet appear'd against it: And further, that the Nature of the thing doth not admit of a certain Conclusion; for what may in this Case hold good in one Place at one time, may not in the same Place at another time, nor in other Places at any time. It is sufficient, that in general these Tables of Dr. *Halley's* from Mr. *Jussell's* Collections come somewhat near the Truth; I say somewhat near, for small Errors are not to be regarded in these Computations.

But some may be apt to object to this Performance, that Estates of the same yearly Value are very commonly leased for more Money in one County than in another, and in one Part of the same County than another, and that at Places not far distant from one another; and hence they conclude, that the Custom of Leasing in particular Places is the only Rule

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for Valuation, at least the only one that will be follow'd: and so concern'd they are left the Reasonableness of a new Method should prevail, that they tell us, the bare proposing any Alteration would rather move People to Mirth, than induce them to enquire into the Nature of the thing.

In Answer to this Objection, I think that the different Value given for Estates of Lease in different Places may, in some measure, arise from a prevailing Custom, as the Objector suggests: But this is so far from a Discouragement to the Undertaking, that it rather shews it necessary; for if those Estates have a real Value, and that real Value can be discover'd and made appear, 'tis requisite that it should be set forth in a proper Light; and if some People are so abandon'd to Sense and Reason, as to laugh at the Attempt to undeceive them; yet some others will doubtless give it a hearing, and practise it, at least as far as they

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they find it useful and advantageous to them.

But then I am of Opinion, that the Difference mentioned in the Objection very often arises (in Part) from Reason rather than common Usage: For

Where an Estate hath been occupied by the Lessee for a great many Years, and the Lease comes to be filled or renewed, the yearly Value, by which the filling up or renewing is generally adjusted, is taken from the Landlord's Rent-Roll, made perhaps a hundred Years before. Now in that Interval the Estate may have been improv'd by good Husbandry, or impoverish'd by the contrary to a very great Degree; from whence it comes to pass, that the present yearly Value by which, and which only, the Value of the subsequent Tenure is to be had, is far different from that in the Rent-Roll. And this being known

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to both Landlord and Tenant, the one exacts, and the other gives, more or less *Years Value*, as they call it, for the Lease; whereas perhaps the present yearly Value being consider'd, the Difference of the Fine would (in a great measure) as indeed it should, be *wholly* accounted for.

And that this Difference of Custom should prevail throughout whole Manors, may arise from the Means and Opportunities of Improvement that have of late Years offer'd themselves to some particular Places, by which their Lands have acquired a greater Value; and the same Means that thus advances one Part of a County, may and often doth sink the Value of another Part.

As to the different Values given in the same Neighbourhood for renewing of Leases, they sometimes arise from the Indigence or Conveniency of one of the Parties; at other times from the Eager-
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ness of two Purchasers, or the like: But these Cases do not alter the real Value; and are only a Reflection on the Party that takes the Advantage.



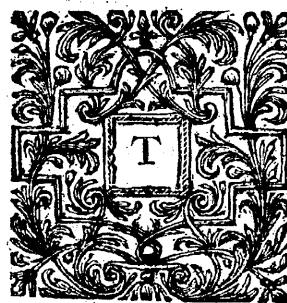
The



The Gentleman's STEWARD and TENANTS of Manors Instructed.



C H A P. I.



THE chief Design of the following Sheets being to reduce Estates of all Kinds (as near as may be) to their Value in Cash, by comparing them with Annuities to continue a certain Number of Years; it will be necessary first of all to explain

What an ANNUITY is.

And here, in general, by an Annuity, I mean a Sum of Money to be paid yearly; and if the Payment be to be continued a determined Number of Years, then I call it an Annuity for Years certain; but if it be to be

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continued as long as One, Two, or Three Persons (or either of them) shall continue in Being, then it is an Annuity for Life or Lives.

And as these yearly Payments are sometimes charged on, and payable out of Estates of a greater yearly Value, as a Security for the just Payment of them; so likewise they are, or may be incumber'd with a Part of the Assessments and yearly Outgoings of such Estates. For Instance: An Estate of an Hundred Pounds *per Ann.* may be bound for the Payment of Fifty or Sixty Pounds a Year; with this Proviso, that the Annuitant do allow out of the said yearly Sum, a proportionable Part of the Taxes, Tythes, &c. Now in such Case I would reduce these Outgoings to a Certainty as near as possible, and deduct the same out of the Fifty or Sixty Pounds, calling the Remainder, that is, the Sum that comes in yearly to the Annuitant, clear and free from all manner of Allowances, an *Annuity*.

Having shewn what an Annuity is, let us next see whether the real Value thereof in ready Money can by any certain Rules be found; that is, in other Words, Can we certainly know how much ready Money (at a given Rate of Interest) will, in the Time of the Annuity's Continuance, amount to an Equivalent for the said Annuity.

And here it's plain, that if a Person advance a Sum of Money, to receive an Equivalent

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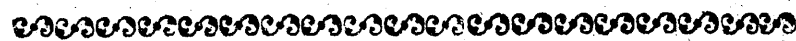
valent for the same at one Year's End, he must then receive, over and above the Sum so laid out, one Year's Interest for it: But the Sum to be receiv'd, and the Interest expected, being fix'd, the Money to be laid out may easily be found. Again: For the next Year, the Purchaser must lay out no more for this, than a Sum which continued two Years at Compound Interest would amount to the same Sum or Annuity; and so on for the Third, Fourth, Fifth, &c. Years, as long as the Annuity is to continue. Hence it appears, that where the yearly Income, the Rate of Interest, and the Number of Years are all fix'd, the Value of the Annuity in ready Specie may be easily found; the Method of doing which I shall shew hereafter.

But tho' the Method of computing the Value of an Annuity, when the Terms are thus fix'd, be very easy; yet oftentimes the certain fixing of the Terms, as the same may become applicable to the valuing of Estates, is very difficult, and not always possible: For in some Cases the yearly Income of an Estate is very hard to be found; in others, the Rate of Interest that the Purchaser ought to be allow'd for the Money he lays out, is somewhat uncertain. But lastly and especially, the Term that the Purchaser shall enjoy the Income, is in some kind of Tenures wholly unknown; one or more of these Perplexities happen in almost every Query of this Kind, according to the Nature of the Tenure by

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which the Purchaser is to hold the Estate, &c. I shall therefore in the next place give some Account,



C H A P. II.

Of the divers Kind of Tenures of Lands and Estates, and in what Manner they may be reduced to, and valued as Annuities for Years certain.

IT will be impossible for me under this Head, to give an Account of all the different Tenures that are amongst us; the Words, *Secundum consuetudinem Manerii*, inserted in the Copies of Court Rolls, refer to Customs that are different in almost every Manor: We are therefore to remark those only which are general; and may, as far as they concern my present Design, be reduced to these following;

1. All Estates in Fee, or such as the Purchaser hath the Property and Disposal of for ever. Under which Head we may likewise range those Estates that are held by Lease for a long Term, as for 200 Years, or more, under very small Rents; for tho' the Nature of the Tenure be different, yet is the real Value of them very near the same; as will plainly appear

pear by comparing the present Value of an Annuity to continue 200 Years, with the Value of the same in Fee at 4, 5, 6, &c. per Cent. Interest.

As to these Estates, the Difficulty of valuing them lies, First, In ascertaining the yearly Income that they are likely to produce, and the yearly Outgoings in Rates, Taxes, Repairs, &c. (Assessment on Lands only excepted, for that is likewise chargeable on Money at Interest.) And Secondly, The Rate of Interest that the Purchaser may expect for the Money he lays out, according as the Security for the Estate and Income are better or worse than the common Security for Money at Interest.

2. Of another Kind are such Estates as are held for a Term of Years absolute, under divers Conditions and Reservations of Rents, and the like. These are likewise reduced to Annuities as the former; only the Reserved Rent must be valued as an Annuity to be deducted, and at a lower Rate of Interest than that of the Rack Rent, in regard of the Security for its true Payment being better than that of the other.

3. A third Sort are Copyhold Lands; under which Head I include all Church, College, Dean and Chapter Lands: Some of which are held for Terms of Years, renewable at a certain Period of Years, and for a stated Sum

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Sum of Money; others for Life, or Lives absolute, renewable in like (or sometimes in different) manner with the former.

Again: It is the Custom of some Manors, that the Widow of him that was Tenant for Life, hath a Right of Dower during her Widowhood; sometimes of the Whole, and sometimes of only a Moiety of the Estate, the other Moiety and Remainder to the Son. These and divers other Customs there are, which must be well consider'd, in order to find out the real Value of these Tenures; and the yearly Income, Rate of Interest, and (in some Cases) Time of Continuance being dubious, must be fix'd with Judgment and Caution, if we would with any degree of Certainty arrive at the just Value.

4. Another Sort of Tenure is for a Term of Years, determinable on the Death of One, Two, or Three Persons, with Reservation of Rents, &c. Under this Head may be likewise included those that hold by Life, or Lives absolute; for tho' this last be in the Nature of a Freehold in Law, yet as to the real Value of such Estates, there's little or no Difference betwixt that which is held for 99 Years, if One, Two, or Three Lives, or either of them live so long, and that which is held for the same Lives absolute: And the Cautions before-mentioned in Copyhold Estates for fixing the Terms; are likewise to be observ'd in these.

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Under these four general Heads may be comprized all, or the most part of Holdings, that are at this time in Use amongst us; and as all these may, by a due Caution, be reduc'd to Annuities of a known equal Value; so likewise may the Reversion of a Term of Years, or a Life or Lives, after an Estate in esse, be by the same Method computed.

It is very justly observ'd by Mr. *De Moivre*, "That the Method of calculating the Value of Annuities upon Lives, was never perfectly understood before Dr. *Halley's* Rules came abroad." The Truth of which Observation will appear by the following



C H A P. III.

Containing an Account of the common Methods made use of in valuing those several Tenures; with the Errors that they are subject to.

AND First, as to Estates in Fee-Simple, &c. I know but of one vulgar Method made use of in finding their Value in ready Money, which is thus: Divide 100 *l.* by the Rate of Interest *per Annum*, and take the Quotient for the Number of Years Value of the Purchase in ready Money; hence, after the yearly Income is known, (which with them

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them is the Rack-Rent, exclusive of Tythes, without any Allowance for Out-goings,) there is no more to be done, but to multiply this yearly Income by the Quotient before-mentioned, and the Product is esteemed to be the Value in Cash.

The Falacy of this way of Computation will appear, if we duly consider the Consequences that flow from it: Thus, for Instance: Admit I were to purchase an Estate of 100*l.* *per Ann.*, Interest of Money being at 5 *per Cent.* Both Parties can expect no other Terms by this Method of reckoning than these; 100 divided by 5, the Quotient is 20 Years Value for the Fee, which in Cash is 2000*l.* Now, admit that out of this Estate I must pay, or allow, 12 Pounds *per Ann.* towards the Parochial Assessments, (exclusive of the King's Tax) and Three Pounds *per Ann.* more for Repairs; then 'tis plain, that I shall receive no more than 85*l.* *per Ann.* clear, for the Income of my 2000*l.* To find what Rate of Interest I have for my Money, let the Rate

be = to r ; then $\frac{100}{r} \times 85 = 2000$; conse-

quently, $r = \frac{8500}{2000} = \frac{8,5}{2} = 4,25$; that is,

four and a quarter *per Cent.* I know that the common Argument is, that a Man would rather take four and a half *per Cent.* on landed Security, than 5 *per Cent.* on the common Security for Money: And indeed this seems to be a pretty plausible Way of arguing; but then,

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then, to shew that this is a wrong Way of computing, let me once more suppose, that the Estate I would purchase were of the same yearly Rent (*viz.* 100*l.*) as before, and that the Price that I must purchase at be likewise 2000*l.*; but then admit, that in this latter, the Out-goings be no more than four Pounds a Year, (as the Case may be, in different Parishes and Circumstances:) Upon this Supposition, I have 96*l.* *per Ann.* Income, for my 2000*l.* which is above four and three quarters *per Cent.* that is, 11 Shillings *per Cent.* more than in the former Case.

Upon the Whole, by this way of Computation, a Man may purchase an Annuity in one Place, of $\frac{1}{3}$ yearly Value more than he can in another, for the same Sum of Money. And although the Difference of these Out-goings be sometimes made a Ground for Cavil in the Treaty, yet all that is said about it amounts to nothing like a regular Argument on either Side. But,

2. As to such as hold for a certain Number of Years, the common Method, if it be deficient in nothing else, is so in this respect, that no Difference is made in the Security for the Rack-Rent, and of that for the reserv'd Rent, Rates, Taxes, &c. The best of the usual Methods for estimating the Value, being to deduct the Out-goings, and value the Remainder as an Annuity, for the Number of Years that the Estate is to continue at legal

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Interest: Whereas a Man may reasonably expect more Interest for laying out his Money on such a Tenure, because he does, by the Agreement, bind and encumber the whole Estate for the Payment of an Annuity, (for such is the Out-goings,) thereby taking all Casualties upon himself. Thus, whereas if a Man, for want of Opportunity, keeps his Money by him, he pays nothing out of what it would bring in if it were at Interest; it is quite different in this Purchase; for here the Out-goings must be paid, whether the Estate bring in any thing or no.

3. The Valuation of Copyhold Estates is still more fallacious than either of the former; for, as to those who hold for Lives, no Regard is had to the Probabilities of Life, (a Matter very considerable,) neither is there any Allowance made for the Money paid out in a regular way: I shall instance in some Particulars of this Kind: And first, In valuing 3 Lives absolute, (or 99 Years determinable on 3 Lives, which is the same to all intents, as to the Value,) the general Rule was formerly to reckon it as a Lease of 21 Years certain; which by the Tables for that purpose, at 5 per Cent. is worth, in ready Money, 12,82 Years Value, and no more, for 3 Lives; the first of which they esteem'd worth 6 Years, the second 4, and the third 2,82; so that to renew 2 Lives in Reversion of one, would cost 7 Years, or one in Reversion of 2, three Years

Years Value: And this was the constant Expectation, what Age soever the Life or Lives in *esse* were of, at the Time of renewing.

Whether this Estimation of the Value of Leases arose from the Act of the 32 H. 8. or was in Use before, I know not; but it is there enacted, that a Lease for more than 21 Years or 3 Lives is void: By which it seems as tho' 3 Lives and 21 Years were reckon'd an equal Duration, the contrary of which was very evident, even before any Experiments were made concerning the Duration of Life; and therefore this way of computing was corrected by another, which is likewise in several respects erroneous. For,

By this other Method, (which is still in practice) a Lease for one Life may be reckon'd equivalent to one of

	9, 10, 11, or 12 Years, &c.
that for two Lives, at	17, 19, 21, or 23 Years, &c.
that for three Lives, as a Lease of	24, 27, 30, or 33 Years, &c.

And tho' this latter Method is a little more plausible than the former, on account of the Steward's Liberty of chusing which of these Proportions he pleases, yet I cannot see any Analogy that this bears to the Reason of the Thing: For if the different Numbers are to be chosen according to the Age or Goodness of the Lives, or the different Value of the Out-goings, or both, I don't see how they can bear any Proportion to one another: So that at best 'tis but only groping in the dark; and no body can give such a Reason for his

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Choice, as will convince an unprejudic'd Person, that the Value thereby attained is just and reasonable. By this Method, at 6 per Cent.

One Life is worth 6,8 or 7,4 or 7,9 or 8,4 Years Value,
Two Lives are worth 10,5 --- 11,2 --- 11,8 --- 12,3 Years Value.
Three Lives are worth 12,5 --- 13,2 --- 13,8 --- 14,3 Years Value.

And this is always the Rule, without any regard to the different Ages of the Lives, or the greater or less Burden of Poor, &c. And hence it appears, that when three Lives are valued at 14 Years, they value one in Reversion of two, at 2 Years, two in Reversion of one; at 6 Years, and the one Life in Possession, at 8 Years Purchase: If ever these Numbers agree with the real Value, it is by chance; as will more evidently appear, when I come to consider the Probabilities of Life, and the Value of the Chances relating thereto.

Another Particular under this Head, is that of renewing Leases for Years, of Church or College Lands; wherein the Advantage of Lessees is very evidently made appear, by an anonymous Author, in a Letter lately published to that purpose; at the End of which Letter is a Table for renewing any Number of Years lapsed in a Lease for 21 Years.

The customary Terms of doing this, is, to deduct the Rent reserv'd out of the Rack-Rent, and then one Year's Value is the Fine for renewing seven Years: Now this Method being compared with that used by the Laity in such Cases, will stand thus:

A Lease

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A Lease for 7 Years, in Reversion of another Lease of 14 Years, in Church or College Lands, is sold for } 1 Year's Value.

A Lease for the same Term, of other Lands, at 6 per Cent. is sold for, and is really worth } 2 $\frac{1}{2}$ Years Value.

Thus it appears that the former Lessors have not above two Fifths of the Value of what they sell. The before-mention'd Author hath plainly made appear, that the Tenants in Church-Lands have (when they renew their Leases) after the Rate of 11 l. 11 s. 8 d. $\frac{1}{4}$ per Cent. Interest for the Money they lay out; which is doubtless such an exorbitant Rate, as will fix on them the Guilt of Extortion in a very high Degree.

At first View of this preposterous way of dealing, I confess I was much at a loss to find what should induce Clergymen, Fellows of Colleges, &c. to give away, what they had so just a Title to, from themselves and Families.

The reading the afore-mention'd Letter did indeed confirm the Truth of the Matter of Fact; but then it gave me no Light into the Reasons of its being so. The Author very ingeniously aggravates the Guilt and Shame of the Oppression; but how the Landlords should be induced to grant such Terms, (if it be in their Power to advance the Fine) here he is silent. It's certain, that the keep-

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ing the Estates in hand would be more advantageous than to lease them out for less than half the Value; and 'tis as certain, that the Tenants would advance at least a great Part of what is under Value, rather than refuse a Bargain that would still be better than any the Laity would grant them.

To say, that by following the Rules fix'd by their Predecessors of 180 Years ago, they think they do themselves and Successors Justice, is to brand them with a degree of Ignorance they cannot be possess'd with. For the Statute of 37 Hen. 8. was made to reduce Interest of Money to 10 *per Cent.* which plainly suggests that it was higher before that Time; and hence if this was the Custom of renewing those Leases at that time, it carried Reason with it: But why the Custom should continue after the Reason of it ceas'd, is still to be accounted for.

In order to explain this seeming Paradox, the Deans and Chapters, Fellows of Colleges, &c. must be consider'd in a double Capacity: First, as they are a Society, and as such have a Right to divers Lands, with Power to make and renew Leases of those Lands for a Term of Years: But then, Secondly, in their private Capacity they have a Right to the Money brought in by these Leases, to be dispos'd of at their own Will and Pleasure.

And now if it can be made appear, that it is for the worldly Advantage of the Members of these Societies, in regard to their private

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Capacity, to keep the Leases fill'd at this low Rate, rather than to let them run out, and thereby hazard their never having an Opportunity to make any Advantage to themselves; I say, if this can be shewn, then I doubt not but every one will suspect, that it is this God of the World that tempts them to do a thing so prejudicial to themselves as a Society.

That the Value of renewing or filling up these Leases is different with respect to these different Circumstances, will appear by the Solution of these following Queries, *viz.*

Qu. 1. *What is the Value of renewing 7 Years lapsed in a Lease for 21 Years, at 5 per Cent.?*

The Answer will be, About three Years Value.

Qu. 2. *What is the Value of renewing 7 Years lapsed in a Lease of 21, to continue, if one Life should so long happen to live, at 6 per Cent.?*

This, to a Man of about 50 Years of Age, by a rational Computation deduced from the Probabilities of Life, is worth no more than one Year's Value.

Wherefore the Man that receives one Year's Value for renewing such a Lapse, receives as much as it is worth on the Chance of his own Life, (and he can enjoy it no longer, if it falls into his Hands); but as the Lease is good for the Term absolute, the Lessor grants away

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away the Right of his Successors; those Successors doing the like by the next, and so on, and have nothing for it. And this they chuse to do only, or chiefly, because the Tenants are obstinate, and will not break thro' a Custom that is so profitable to them, altho' the Reason for establishing the Custom is ceased long ago.

Whether the complying with, and (in some Sense) imposing such unreasonable Terms, be doing Justice to themselves and other People, I leave to the Consideration of the Persons concern'd. There can be no Hopes of a Reform in this Affair, till the Persons, in whose Power it is, shall think fit to exert a publick Spirit, and suffer the Good of their Society to thrust out of their Hearts their own private Interest, when they stand in Competition with one another.

That this is a Duty on them (in whatever Circumstances they are) can never be deny'd by those who are so often pressing the same on the Laity; they certainly must acknowledge, that they *ought* not to be discouraged at any Difficulties, nor terrified at any unjust Reflections that they are like to undergo, for their vigorous Endeavour to rescue their own and their Successors proper Inheritance out of the Hands of such as would unjustly detain it. A Clause added (when our Legislators shall think fit) by way of Amendment to the Act of 12 *A.* relating to the Interest of Money, would effectually secure the Property of these

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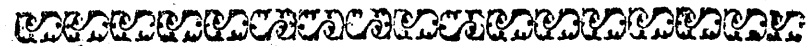
these Sufferers against Extortioners in this respect, and do that for them, which they have not Courage to do for themselves. But this is a Digression from my Subject: I shou'd now proceed to give some farther Account of the Absurdities in the common Method of valuing Copyholds; but the Customs of Manors being so various, 'twou'd be endless to run thro' them all; I shall therefore proceed to the Fourth Sort of Tenures before-mention'd.

4. And in these, Estates for 99 Years, determinable on the Death of 1, 2, or 3 Lives, the Method of valuing is generally the same with those on Lives before-mention'd, and is consequently liable to the same Mistakes. As this Kind of Tenure is very common, at least in the *Western* Counties; so the more Care ought to be taken in adjusting the Value, and, if possible, such Rules laid down as may include all the possible Circumstances, *viz.* all the Incumbrances of Rates, Taxes, Repairs, high Rents, &c. and all the Casualties; which are different, according to the Quality and Situation of the Estate. All these, I say, should be duly consider'd, and a proper Allowance made, before the Value of the Lease can be determin'd.

That the common Way of Estimation doth not provide for these Differences in any regular manner, is very evident; and therefore must of necessity be deficient on that account.

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C H A P.



C H A P. IV.

Of some Things that are to be consider'd before the real Value of an Estate or Annuity can be discover'd.

PREVIOUS to the ascertaining the Value of Leases, 'twill be necessary to have a right Understanding of the following Particulars:

- 1. The Nature of the Tenure, and Term of Continuance, (as near as may be) of the Estate to be purchased; and whether the Lord hath a full, or only a conditional Power of granting it for such a Term.
- 2. The Casualties, Incumbrances, and Impositions that go along with the Estate, and how far the Possessor of the Estate is liable to them.
- 3. The Quality of the Estate, as to the present Condition of Repair; how much it will cost to put it in good Repair, and how much *per Ann.* afterwards to keep it in that Condition during the Term to be purchased.
- 4. The Rate of Interest for Money, together with the Analogy that the common Security for Money lent, bears to the Security for the Income of the Estate to be purchas'd.
- 5. The

5. The yearly Value. And here great Care must be taken, that it be not fix'd too high, nor too low; for it is not always the Rent that an Estate is lett for, that is the Value of it. A Landlord may sett out an Estate for more or less than it is really worth, according to the Necessities or Convenience of himself or Tenant.

Besides these, there may be other accidental Circumstances that attend particular Tenures; but these being the principal, I shall take notice of them in order, as they are here set down; and leave the other less material ones, to be consider'd according to the Discretion of the Parties concern'd.

1. And *First*, As to the Nature of the Tenure, enough hath been said already: But for the Continuance of the Term, which is very often during 1, 2, or 3 Lives; this is a Matter very precarious, because no body can tell how long these Lives will continue in Being; and therefore since the certain *Knowledge* of this is entirely out of our reach, the best that we can do is to inform ourselves, as well as we may, of the most probable Consequences in those respects: And tho' in regard to these Uncertainties, the Buyer must be said to purchase a Chance; yet the real Value of these Chances (as such) may be found to a tolerable degree of Certainty: To do which, I must beg leave here to assume an *Hypothesis*, viz.

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The Probability that a Life of any given Age will continue in Being 1, 2, 3, 4, &c. Years, is justly exhibited in Dr. Halley's Tables, published in Philos. Transf. N^o. 196. or may be deduced therefrom.

No body will undertake to prove, that this is mathematically certain; for it is very evident, that the nature of the thing will not admit of mathematical Certainty. The Deficiency that the Doctor seem'd to apprehend in it, was the want of a very great Number of Years Experience; but it will, I believe, cause but a small Error in the Result, if the Numbers in the Doctor's Tables should, on future Experience, be a little varied.

But to proceed: If the Lord, or Person from whom you purchase, hath no more, or will grant no more than a conditional Right; then must the Value of the Hazard of such Conditions be computed, whether it depend on a Chance, or otherwise; and that Sum must be deducted according as Prudence and Discretion shall direct.

2. In the second place: By Casualties, I mean such unforeseen Accidents which an Estate is expos'd to; such as Fire and Inundations, whereby Houses are consumed, Wears, Banks, &c. demolish'd, and Cattle destroy'd. That some Estates are more liable than others to such Accidents, is very certain. Again: Is the Estate likely to be always tenanted?
and

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and will it not be often changing Tenants, which always brings a Charge with it? &c. And here, if on a Scrutiny the Hazards that a Person runs by the Purchase be evidently greater, or less, than the common Hazards on lending Money, a Purchaser must be allowed a proportionable greater or less Interest for the Money he thus lays out.

By the Incumbrances and Impositions that always go with an Estate, must be understood all Tythes, Rents, Rates, Taxes, Herriots, Suits, Services, &c. for the Payment of which the Estate is generally bound; and consequently these must be valued as a Rent Charge, or clear Annuity to be paid out, when (sometimes at least) the Income of the Estate, as being attended with some Uncertainties, &c. must be reckon'd at 1 or 2 *per Cent.* more than these Outgoings.

3. *Thirdly*, I am to consider of the Quality of the Estate as to Repair: And herein, as I take it, the greatest Difficulty lies; for the best that can be done is but Guess-work, as to these Disbursements. If it be out of Repair at the time you purchase, the best way will be, whether it be Fields or Houses, or both, to get Men that are skill'd in these Matters, to compute the Charge of putting it into a tenantable Condition of Repair; which Charge ought to be deducted out of the Value, and reckon'd as so much Money paid: and so far this Difficulty is surmounted.

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But then as all Estates will cost Money every Year to keep them in Repair, and some more, some less; these yearly Disbursements must be likewise computed in the best manner that may be. To do which, the Judgment and Experience of honest Men, that have been accustom'd to such Affairs in that Country or Place where the Estate lies, must be your Guide: for as Repairs of Houses, &c. are dearer in one Place than in another, so likewise are they more expos'd to Storms, &c. in one Place than another. Again: Old Houses (tho' they are at first put into Repair by the former Supposition) are more chargeable in the future Repairs, than those that are of a later building; and Houses that were at first slightly built, are more chargeable than others of a more substantial Structure. Thus sometimes it may be necessary (in Estates consisting chiefly of Houses) to allow one Fifth, and at other times not above one Tenth Part of the yearly Income towards the Repairs of those Houses. And as to the Repair of Gates, Hedges, Wears, &c. no great Difficulty will occur; for most commonly the under-Tenant is by his Agreement to do this at his own Charge; and then the Rent is the yearly Value clear of those Deductions: But if it be otherwise, it may easily be found by the Cautions that are mentioned above.

If the Right to Timber-trees, Coppice-wood, Corn, &c. or the Profits of Mines, &c. be likewise to be transferr'd to the Purchaser; then

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then (as to the former of these) they must be valu'd as to the present Worth of them, and so much Money must be added to the Fine. But as to Mines, the clear yearly Profit like to arise thereby, and the probable Time of their Continuance must be consider'd; and (the Chances being more hazardous than others) perhaps the Person that purchases may reasonably expect a greater Rate of Interest for the Money he lays out in these; and therefore they must be valu'd by themselves, and this Value must be added to that of the Estate before found.

4. I am to consider the Rate of Interest, and Security for Money lent; and compare it with that on Money laid out in Lands, &c. The legal Interest for Money is well known to every body to be at this time *5 per Cent. per Ann.* But though a Person can lawfully take no more, yet may he without the Violation of any Law lay out his Money for *less* Advantage; and many People who lend their Money by way of a Mortgage, or lay it out in purchasing of landed Security, will, and often do, accept of *4 per Cent.*

And indeed where Money is laid out on Mortgage, or to purchase a Rent Charge, or Annuity on Land, of a much greater yearly Value, or the like; in regard that the Casualties are very few, or none at all, the Rate of *4 per Cent.* may be very reasonably comply'd with: But if the Purchase be of Lands
in

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in Fee, consisting of Fields chiefly, here perhaps it may be reasonable to allow the Buyer something more, *viz.* $4\frac{1}{2}$ *per Cent.* in regard that some Hazards, such as bad or no Tenants, &c. do attend these Estates: And this lower Rate than legal Interest is the more reasonable, in consideration that the legal Interest for Money is more likely to be abated, than it is to be advanc'd.

But if a Man lays out his Money on an Estate for Life only, then I see no Reason why he should not expect the legal Interest for his Money, in regard of the Uncertainty of the Tenure, &c. And indeed so he may a great deal more, if the Estate to be purchas'd be Houses, or the like, where the Casualties are many and great; such as Fire, Damage by Storms, very bad Tenants, or perhaps none at all: Here sometimes 6, 7, or even 8 *per Cent.* may be little enough. See more of this in *Chap. 9.*

5. Because the Value of Estates of all Kinds is to be computed from the yearly Income, great Care must be taken to ascertain the said Income.

In order whereto, if the Estate hath not been lett out at an yearly Rent, then the Judgment of honest Men in the Neighbourhood will be a good Guide; who may likewise be able to determine, whether the over-good or bad Condition it is in, do render it of greater or less Value *per Ann.* than, generally speaking,

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ing, it will by a moderate Charge be kept in; as also of what Value such Advantages or Deficiencies are. And again: If the Estate has been lett at an yearly Rent, these Persons can inform whether too much, or too little hath been given for it, and upon what Account. By such Methods as these, 'twill not be difficult to arrive at a perfect Knowledge of that yearly Value of an Estate, by which it will be proper to compute the Worth of the Fee, or Lease for Years or Lives.

Besides these, there may be divers other things necessary to be known relating to particular Conditions in a Lease for Lives, or for Years, &c. as where the Lessee is bound to pay a Herriot or Farley, either absolutely of each Life, or conditionally if the Lives dye in course. In the first Case, the Probability of Life being known, *i. e.* how long 'tis likely each Life may continue in Being; the Value of the Money or Herriot then to be paid, may by the following Tables be found in ready Money; and so of each Life: And in the second Case, the Probability of the Lives dying in course, together with the Probability as to the Number of Years (as before) being found, by the Rules and Tables hereafter laid down, the Value in ready Money may thence be found; which Sums so found must be deducted out of the Purchase-Money as before.

Again: Sometimes there is a Condition in a Lease for a certain Sum to be paid for re-

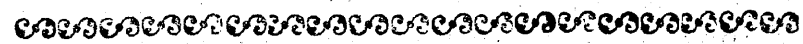
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newing a Life, in case one should die within a time prefix'd. And here the Probability of all the Lives living for that time being found, the Value of such a Privilege to the Lessor or Lessee may be found.

If there be any other Conditions of this Kind, I presume they may be fairly reduced to some or other of these, and the following Cases.

Before I proceed to the Tables, it will be necessary to say something in general,



C H A P. V.

Of Reversions.

BY Reversions, I mean that Right to an Estate, which is to take place after the Determination of a Term of Years, or Lives, during which it is held by some former Grant.

And the Questions that will arise in relation to these Estates in *Posse*, are such as these:

- 1. What is the Value of the Fee in Reversion of a certain Number of Years, or of a Life or Lives in Being?
- 2. What is the Value of a Term of Years to commence after the Expiration of another Term of *Years certain*?
- 3. What

3. What is the Value of a Term of Years, or of a Term of one, two, or three Lives, in Reversion of a Life or Lives in Being, to be nominated either now, or at the End of the Term in Being?

4. Three Persons being to enjoy an Estate by equal Portions during their joint Lives, the Remainder to the Survivors and Survivor; What is the Value of each Man's Right?

These and the like are the Queries that will arise about Reversions; and the Solution of them will appear easy enough, if we consider,

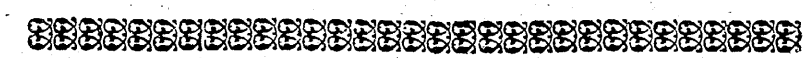
1. *First*, That the Value of the Estate in *Esse* added to the Reversion, is equal to the Value of the Fee in Possession: Whence 'tis plain, that subtracting the Value of the present Possessor's Right out of the Value of the Fee-Simple, the Remainder is the Value of the Reversion in the first Query.

2. Find the Value of the Term of Years in *Esse*, and then add the two Terms together, and find the Value of that whole Term; the Excess in Value of that whole Term above the Value of the Estate in *Esse*, is the Value sought in the second Query.

3. If, in the third Query, the Life or Lives in Reversion be to be nominated at the time of taking; first find the Value of a Lease to continue during the Term of all the Lives, and from that Value subtract that of the Lives in *Esse*; the Remainder is the Answer

to the first Part of the Question. But if the Lives are to be nominated at the Expiration of the Right in *Esse*, find the probable Duration of the present Estate in Years, and also the Value of one, two, or three Lives in Cash; then (from the Tables for that purpose) find how much this last Sum, payable at the End of the Years before found, is worth in ready Money, rebate at 5 per Cent. for this is the Value required.

4. For a Solution to the fourth Question; *Note*, That each Person hath a Right to one third of the Value of their joint Lives, and to half the Value of the Expectation after the Death of either of the other two; and also to the whole Value of the Expectation after the Death of both the others; which three Sums added together, gives the Value for each. The Value of two or three joint Lives is found by the Tables for that purpose, which follow.



C H A P. VI.

THE following Tables, for the more easy computing the Value of Annuities upon Lives, are (as I have before observ'd) the Result of those Observations published by Dr. Halley, and were calculated by the Method laid down by Mr. Abraham de Moivre in a late Treatise, entitul'd, *Annuities upon Lives.* But

But before I proceed to these, it may be proper to transcribe a Table for finding the Value of an Annuity for Years certain at 4, 5, 6, 7, and 8 per Cent.

Tho' the following Tables are calculated, some for every 5th, and some but for every 10th Year of Age; yet I presume, that the commonly known Method of Equating will accommodate them, as well to any other Year of Age, as to any intermediate Rate of Interest.



T A B.

Shewing the Value of an Annuity in Years, and decimal Parts for any Number of Years not exceeding 100, at the Rate of 4, 5, 6, 7, or 8 per Cent.

Years of Contin.	4perCen. Value in Years.	5perCen. Value in Years.	6perCen. Value in Years.	7perCen. Value in Years.	8perCen. Value in Years.
1	0.98	0.95	0.94	0.93	0.92
2	1.88	1.86	1.83	1.81	1.78
3	2.79	2.72	2.67	2.62	2.58
4	3.61	3.55	3.46	3.39	3.31
5	4.44	4.33	4.21	4.10	3.99
6	5.23	5.07	4.92	4.77	4.62
7	5.99	5.79	5.58	5.39	5.21
8	6.57	6.46	6.21	5.97	5.75
9	7.42	7.11	6.80	6.51	6.25
10	8.09	7.72	7.36	7.02	6.71
11	8.75	8.31	7.89	7.50	7.14
12	9.37	8.86	8.38	7.94	7.54
13	9.97	9.39	8.85	8.36	7.90
14	10.55	9.90	9.29	8.74	8.24
15	11.10	10.38	9.71	9.11	8.56
16	11.60	10.84	10.15	9.45	8.85
17	12.15	11.27	10.47	9.76	9.12
18	12.64	11.69	10.83	10.06	9.37
19	13.12	12.08	11.16	10.33	9.60
20	13.57	12.46	11.47	10.59	9.82
21	14.01	12.82	11.76	10.83	10.02
22	14.43	13.16	12.04	11.06	10.20
23	14.84	13.49	12.30	11.27	10.37
24	15.25	13.80	12.55	11.47	10.53
25	15.60	14.09	12.78	11.65	10.67

Years of Contin.	4perCen. Value in Years.	5perCen. Value in Years.	6perCen. Value in Years.	7perCen. Value in Years.	8perCen. Value in Years.
26	15.96	14.37	13.00	11.83	10.81
27	16.31	14.64	13.21	11.99	10.93
28	16.64	14.90	13.40	12.14	11.05
29	16.97	15.14	13.59	12.28	11.16
30	17.27	15.37	13.76	12.41	11.26
31	17.57	15.59	13.93	12.55	11.35
40	19.78	17.08	15.03	13.39	11.91
50	21.47	18.25	15.67	13.83	12.17
60	22.61	18.93	16.17	14.00	12.34
70	23.39	19.34	16.34	14.11	12.42
80	23.90	19.58	16.50	14.15	12.46
90	24.26	19.75	16.59	14.18	12.47
100	24.50	19.85	16.64	14.20	12.48
The Fee-Sim.	25.	20.	16.66	14.29	12.50

In this and the following Tables, the Numbers at the Left Hand of the Points are Years, and the remaining Figures are Decimals of a Year. I suppose there will be no Difficulty to understand the Value of these decimal Parts; but if there should, it may be very useful to such as are wholly unacquainted with Decimals, only to take the half of the Decimal, and reckon it for so many Weeks. Thus; Against 40 Years of Continuance you'll find under 4 per Cent. 19.78. the 19 shews so many Years, and the half of 78 being 39 shews so many Weeks; therefore an Annuity for 40 Years is worth 19 Years 39 Weeks; or rather 19 Years 10 Months Purchase nearly.

T A B. II.

Shewing the present Value of 1 l. payable at any Number of Years hence under 100, at 5, 6, 7, or 8 per Cent.

Years.	Value at 5 per Cent. in Parts.	Value at 6 per Cent. in Parts.	Value at 7 per Cent. in Parts.	Value at 8 per Cent. in Parts.
1	.95	.94	.93	.92
2	.91	.89	.87	.86
3	.86	.84	.82	.79
4	.82	.79	.76	.74
5	.78	.75	.71	.68
6	.75	.71	.67	.63
7	.71	.67	.62	.58
8	.68	.63	.58	.54
9	.64	.59	.54	.50
10	.61	.56	.51	.46
11	.58	.53	.47	.43
12	.56	.50	.44	.40
13	.53	.47	.41	.37
14	.51	.44	.39	.34
15	.48	.42	.36	.32
16	.46	.39	.34	.29
17	.44	.37	.32	.27
18	.42	.35	.30	.25
19	.40	.33	.28	.23
20	.38	.31	.26	.21
21	.36	.29	.24	.20
22	.34	.28	.22	.18
23	.32	.26	.21	.17
24	.31	.25	.20	.16
25	.29	.23	.18	.15

Years.	Value at 5 per Cent. in Parts.	Value at 6 per Cent. in Parts.	Value at 7 per Cent. in Parts.	Value at 8 per Cent. in Parts.
26	.28	.22	.17	.13
27	.27	.21	.16	.12
28	.25	.19	.15	.11
29	.24	.18	.14	.11
30	.23	.17	.13	.10
35	.18	.13	.09	.07
40	.14	.10	.07	.05
50	.09	.05	.03	.02
60	.05	.03	.02	.01
70	.03	.017	.008	.004
80	.02	.009	.004	.002
90	.012	.005	.002	.001
100	.008	.003	.001	.0004

I suppose that an Example or two will render the finding the Value of these Parts in Money very easy.

Thus: Against 15 Years, and under 5 per Cent. is — .48
 Multiply these Parts by ————— 20

In the Parts given are two Figures at the right Hand of the Point; therefore cut off 2 Figures in the Product, and the remaining Figure to the left Hand is } 9.60
 Shillings —————

Again: Multiply these Parts by ————— 12

And cut off as before, then the Figures at the left Hand are Pence ————— } 7.20

Hence the Parts .48 is the same with 9s. 7d. $\frac{2}{5}$.

Again: Opposite to 70 Years, under 7 per Cent. is — .008
 20

00.160

12

1.920

Hence the Value in Money is 0s. 1d. $\frac{2}{5}$. &c.

F

T A B.

T A B. III.

Shewing the Value (in Years and decimal Parts) of Annuities to continue 7, 10, 14, or 21 Years, if a Person of a given Age live so long; calculated to every 10th Year of Age, at 5, 6, 7, and 8 per Cent.

Annuity for 7 Years on a Life.				
Age	5perC.	6perC.	7perC.	8perC.
	Y.Par.	Y.Par.	Y.Par.	Y.Par.
2	5.11	4.94	4.77	4.62
7	5.43	5.24	5.06	4.88
12	5.59	5.40	5.21	5.04
22	5.55	5.36	5.18	5.00
32	5.42	5.24	5.06	4.88
42	5.27	5.10	4.92	4.74
52	5.07	4.91	4.76	4.59
62	4.80	4.64	4.38	4.13
72	3.92	3.80	3.69	3.58
79	2.64	2.58	2.52	2.46

Annu. for 10 Years on a Life.				
Age	5perC.	6perC.	7perC.	8perC.
	Y.Par.	Y.Par.	Y.Par.	Y.Par.
2	6.75	6.45	6.18	5.91
7	7.15	6.83	6.53	6.24
12	7.36	7.02	6.70	6.40
22	7.24	6.91	6.50	6.31
32	7.05	6.73	6.43	6.15
42	6.77	6.47	6.19	5.92
52	6.48	6.20	5.93	5.68
62	5.91	5.66	5.42	5.20
72	4.70	4.55	4.36	4.21
82	1.38	1.36	1.34	1.32

Annuity for 14 Years on a Life.				
Age	5perCem	6perCem	7perC.	8perC.
	Y.Parts.	Y.Parts.	Y.Par.	Y.Par.
2	8.58	8.12	7.72	7.21
7	9.21	8.68	8.23	7.69
12	9.27	8.73	8.28	7.75
22	9.04	8.51	8.10	7.50
32	8.70	8.21	7.81	7.30
42	8.24	7.80	7.43	6.94
52	7.76	7.36	7.02	6.56
62	6.78	6.28	6.17	5.76
72	5.08	4.94	4.74	4.56

Annuity for 21 Years on a Life.				
Age	5perCem	6perCem	7perC.	8perC.
	Y.Parts.	Y.Parts.	Y.Par.	Y.Par.
2	11.00	10.16	9.41	8.75
7	11.63	10.70	9.90	9.18
12	11.60	10.67	9.87	9.16
22	11.18	10.30	9.55	8.86
32	10.60	9.80	9.10	8.46
42	9.98	9.24	8.61	8.03
52	8.99	8.42	7.88	7.39
62	7.77	7.26	6.86	6.47
65	7.18	6.77	6.40	6.06

T A B. IV.

Of the Value of an Annuity for one Life, calculated to every 5th Year of Age, at 4, 5, 6, 7, and 8 per Cent.

Age.	Value at 4 per C. Y. Parts.	Value at 5 per C. Y. Parts.	Value at 6 per C. Y. Parts.	Value at 7 per C. Y. Parts.	Value at 8 per C. Y. Parts.
2	15.28	13.56	11.92	10.59	9.64
7	17.32	15.30	13.42	11.79	10.69
12	17.20	15.23	13.36	11.72	10.67
17	16.68	14.73	12.99	11.47	10.46
22	16.05	14.14	12.54	11.14	10.17
27	15.18	13.46	11.97	10.73	9.78
32	14.30	12.79	11.47	10.38	9.46
37	13.40	12.10	10.90	9.90	9.07
42	12.50	11.27	10.24	9.37	8.62
47	11.58	10.49	9.58	8.82	8.16
52	10.50	9.65	8.91	8.25	7.68
57	9.31	8.70	8.11	7.58	7.10
62	8.04	7.53	7.08	6.66	6.29
67	6.53	6.21	5.90	5.60	5.32
72	5.21	4.98	4.78	4.56	4.38
77	3.52	3.40	3.29	3.19	3.09
82	1.41	1.38	1.36	1.34	1.32

T A B. V.

Of the Value of an Annuity for two joint Lives, (to continue till one of them dies) of equal Ages, calculated to every fifth Year of Age, at 4, 5, 6, 7, and 8 per Cent.

Age.	Value at 4 per Cen. Y. Parts.	Value at 5 per Cen. Y. Parts.	Value at 6 per Cen. Y. Parts.	Value at 7 per Cen. Y. Parts.	Val. at 8 per C. Y. Par.
2	10.89	10.04	9.24	8.50	7.84
7	13.04	12.08	11.16	10.26	9.37
12	13.01	12.05	11.13	10.22	9.32
17	12.36	11.42	10.60	9.76	8.95
22	11.64	10.80	10.00	9.24	8.53
27	10.80	10.12	9.43	8.73	8.04
32	9.94	9.41	8.83	8.19	7.49
37	9.07	8.61	8.12	7.58	7.01
42	8.21	7.78	7.36	6.94	6.52
47	7.37	7.02	6.69	6.36	6.02
52	6.52	6.26	6.00	5.75	5.49
57	5.58	5.44	5.25	5.04	4.84
62	4.63	4.53	4.42	4.27	4.10
67	3.70	3.63	3.56	3.48	3.40
72	2.73	2.68	2.60	2.58	2.53
77	1.68	1.66	1.64	1.62	1.60
82	0.55	0.54	0.54	0.53	0.53

T A B. VI.

Shewing the Value of Annuities for two joint Lives of any Ages, (that is, to continue till one of them dies) calculated to every 10th Year of either of their Ages, at 4, 5, 6, 7, and 8 per Cent.

One Life 2 Years old.					
Age.	4perCen.	5perCen.	6perCen.	7perCen.	8perC.
2	10.89	10.04	9.24	8.50	7.84
12	11.88	10.99	10.11	9.28	8.48
22	11.28	10.40	9.60	8.87	8.21
32	10.37	9.68	9.01	8.35	7.67
42	9.36	8.77	8.19	7.62	7.07
52	8.17	7.74	7.31	6.88	6.45
62	6.59	6.29	5.99	5.70	5.41
72	4.52	4.37	4.22	4.07	3.93
82	1.33	1.31	1.29	1.27	1.25
One Life 12 Years old.					
12	13.01	12.05	11.13	10.22	9.32
22	12.37	11.41	10.50	9.67	8.88
32	11.27	10.96	9.84	9.11	8.39
42	10.52	9.47	8.84	8.22	7.64
52	8.73	8.39	7.84	7.38	6.91
62	6.94	6.68	6.39	6.08	5.75
72	4.71	4.57	4.42	4.26	4.10
82	1.35	1.34	1.32	1.30	1.28

One Life 22 Years old.					
Age.	4perCen.	5perCen.	6perCen.	7perC.	8perC.
22	11.64	10.80	10.00	9.24	8.53
32	10.82	10.09	9.11	8.73	8.05
42	9.65	9.22	8.45	7.92	7.45
52	8.42	8.00	7.55	7.12	6.67
62	6.71	6.43	6.15	5.88	5.61
72	4.58	4.45	4.32	4.20	4.09
82	1.44	1.33	1.31	1.29	1.27
One Life 32 Years old.					
32	9.94	9.41	8.83	8.19	7.49
42	8.97	8.54	8.03	7.53	7.04
52	7.89	7.54	7.19	6.78	6.38
62	6.39	6.14	5.89	5.62	5.35
72	4.43	4.31	4.18	4.03	3.88
82	1.31	1.30	1.28	1.26	1.25
One Life 42 Years old.					
42	8.21	7.78	7.36	6.94	6.52
52	7.26	6.92	6.58	6.25	5.96
62	5.93	5.71	5.49	5.29	5.09
72	4.27	4.12	3.96	3.81	3.71
82	1.28	1.27	1.25	1.24	1.23
One Life 52 Years old.					
52	6.52	6.26	6.00	5.75	5.49
62	5.42	5.24	5.06	4.88	4.70
72	3.92	3.83	3.73	3.63	3.50
82	1.25	1.23	1.22	1.20	1.19

Age.	One Life 62 Years old.				
	4perC.	5perC.	6perC.	7perC.	8perC.
62	4.63	4.53	4.42	4.27	4.10
72	3.46	3.38	3.30	3.21	3.13
82	1.18	1.17	1.16	1.14	1.12
One Life 72 Years old.					
72	2.73	2.68	2.63	2.58	2.52
82	1.04	1.03	1.03	1.01	1.00
One Life 82 Years old.					
82	0.55	0.54	0.54	0.53	0.53

The Use of the foregoing Table is very easy ; for the Age of one of the Lives being found at the top, and that of the other in the left Hand Column (as is usual in such like Tables) right against it (under the proper Rate of Interest) you'll find the Value of the Annuity in Years and decimal Parts : Which decimal Parts may be reduced to Months or Weeks, by the foregoing Rules laid down under *Tab. 1.*

T A B. VII.

Wherein is shewn the Value of an Annuity for three joint Lives, in Years and decimal Parts, calculated to every 10th Year of either of the Ages, at 4, 5, 6, 7, and 8 per Cent.

	2 Life 3 Life	One Life 2 Years old.				
		4perC.	5perC.	6perC.	7perC.	8perC.
Two Years old.	2	8.44	7.97	7.49	7.01	6.53
	12	9.03	8.60	8.11	7.60	7.66
	22	8.69	8.21	7.73	7.26	6.80
	32	8.17	7.87	7.50	7.09	6.44
	42	7.49	7.25	6.90	6.52	6.04
	52	6.69	6.44	6.13	5.85	5.54
Twelve Years old.	62	5.55	5.31	5.06	4.92	4.75
	72	3.98	3.89	3.78	3.67	3.53
	82	1.25	1.23	1.21	1.20	1.18
	12	9.70	9.23	8.75	8.21	7.58
	22	9.31	8.85	8.37	7.85	7.30
	32	8.66	8.28	7.89	7.43	6.92
Twenty Years old.	42	7.94	7.60	7.24	6.86	6.46
	52	7.04	6.79	6.50	6.28	5.88
	62	5.82	5.65	5.46	5.24	4.98
	72	4.12	4.04	3.93	3.82	3.68
	82	1.28	1.27	1.27	1.26	1.25

		One Life 2 Years old.				
2 ^d Life.	3 ^d Life.	4 ^{per} C.	5 ^{per} C.	6 ^{per} C.	7 ^{per} C.	8 ^{per} C.
		22	32	8.94	8.50	8.04
32	42	8.35	8.00	7.61	7.19	6.72
42	52	7.67	7.33	6.98	6.63	6.26
52	62	6.84	6.60	6.31	6.04	5.71
62	72	5.66	5.50	5.31	5.12	4.89
72	82	4.04	3.96	3.86	3.75	3.61
82		1.27	1.25	1.23	1.22	1.21
22 Years old.		32	42	52	62	72
		7.82	7.56	7.25	6.85	6.37
		7.24	6.95	6.63	6.31	5.95
		6.48	6.28	6.08	5.80	5.48
		5.39	5.26	5.11	4.94	4.70
		3.91	3.83	3.74	3.64	3.51
		1.24	1.23	1.22	1.21	1.19
32 Years old.		42	52	62	72	82
		6.71	6.44	6.16	5.88	5.60
		6.06	5.86	5.63	5.42	5.17
		5.09	4.95	4.81	4.59	4.43
		3.72	3.65	3.57	3.48	3.36
		1.22	1.20	1.19	1.18	1.16
42 Years old.		52	62	72	82	
		5.50	5.37	5.21	5.03	4.79
		4.68	4.59	4.47	4.33	4.16
		3.49	3.43	3.36	3.28	3.19
		1.18	1.17	1.15	1.14	1.13
52 Years old.		62	72	82		
		4.07	3.99	3.90	3.80	3.68
		3.12	3.07	3.02	2.97	2.91
		1.12	1.11	1.10	1.09	1.08
62.		72	82			
		2.50	2.47	2.43	2.39	2.33
		0.99	0.98	0.96	0.95	0.94
72.		82				
		0.53	0.52	0.52	0.51	0.50

		One Life 12 Years old.				
2 ^d Life.	3 ^d Life.	4 ^{per} Cen.	5 ^{per} Cen.	6 ^{per} C.	7 ^{per} C.	8 ^{per} C.
		12	22	10.44	10.00	9.50
22	32	10.01	9.58	9.09	8.58	7.95
32	42	9.28	8.94	8.55	8.07	7.48
42	52	8.45	8.15	7.78	7.37	6.89
52	62	7.46	7.22	6.90	6.64	6.26
62	72	6.07	5.93	5.75	5.55	5.30
72	82	4.27	4.20	4.11	3.99	3.85
82		1.29	1.28	1.27	1.26	1.24
Twelve Years old.		22	32	42	52	62
		9.60	9.18	8.71	8.27	7.61
		8.93	8.60	8.21	7.76	7.26
		8.15	7.83	7.47	7.12	6.69
		7.24	6.99	6.71	6.42	6.08
		5.91	5.77	5.60	5.42	5.19
		4.18	4.10	4.01	3.90	3.77
		1.29	1.28	1.26	1.25	1.23
22 Years old.		32	42	52	62	72
		8.32	8.06	7.74	7.33	6.88
		7.64	7.40	7.11	6.77	6.38
		6.82	6.64	6.41	6.13	5.80
		5.55	5.48	5.37	5.19	4.96
		4.03	3.98	3.92	3.82	3.66
		1.27	1.26	1.24	1.22	1.21
32 Years old.		42	52	62	72	82
		7.09	6.83	6.56	6.28	5.95
		6.36	6.18	5.96	5.73	5.48
		5.33	5.20	5.04	4.88	4.69
		3.85	3.79	3.71	3.62	3.50
		1.24	1.23	1.22	1.21	1.20
42 Years old.		72	82			
		2.50	2.47	2.43	2.39	2.33
		0.99	0.98	0.96	0.95	0.94

		One Life 12 Years old.						
		2 ^d Life.	3 ^d Life.	4 ^{per} C.	5 ^{per} C.	6 ^{per} C.	7 ^{per} C.	8 ^{per} C.
Aged 52.	52	5.76	5.63	5.47	5.29	5.15		
	62	4.88	4.78	4.66	4.53	4.38		
	72	3.61	3.55	3.49	3.41	3.31		
	82	1.20	1.19	1.18	1.17	1.16		
Aged 62.	62	4.22	4.15	4.07	3.97	3.85		
	72	3.20	3.16	3.11	3.06	3.00		
	82	1.14	1.13	1.12	1.11	1.09		
Ag. 72.	72	2.56	2.53	2.49	2.46	2.41		
	82	1.01	1.00	0.99	0.98	0.97		
82.	82	0.54	0.53	0.53	0.52	0.51		
		One Life 22 Years old.						
22 Years old.	22	9.20	8.80	8.33	7.88	7.35		
	32	8.58	8.25	7.85	7.42	6.95		
	42	7.88	7.57	7.21	6.86	6.46		
	52	7.11	6.88	6.50	6.23	5.92		
	62	5.77	5.62	5.43	5.26	5.03		
	72	4.10	4.01	3.91	3.87	3.70		
82	1.27	1.26	1.25	1.24	1.22			

One

		One Life 22 Years old.						
		2 ^d Life.	3 ^d Life.	4 ^{per} C.	5 ^{per} C.	6 ^{per} C.	7 ^{per} C.	8 ^{per} C.
32 Years old.	32	8.03	7.78	7.48	7.08	6.59		
	42	7.41	7.14	6.84	6.53	6.17		
	52	6.63	6.44	6.21	5.96	6.66		
	62	5.44	5.35	5.22	5.06	4.84		
32 Years old.	72	3.95	3.89	3.81	3.71	3.59		
	82	1.25	1.24	1.23	1.22	1.21		
	42 Years old.	42	6.99	6.66	6.34	6.05	5.77	
42 Years old.	52	6.17	5.98	5.75	5.56	5.33		
	62	5.19	5.06	4.91	4.76	4.58		
	72	3.78	3.71	3.63	3.54	3.43		
	82	1.23	1.22	1.21	1.19	1.18		
52 Years old.	52	5.61	5.46	5.30	5.13	4.93		
	62	4.77	4.67	4.56	4.44	4.28		
	72	3.53	3.48	3.42	3.36	3.28		
	82	1.19	1.18	1.17	1.16	1.15		
62.	62	4.14	4.06	3.97	3.88	3.77		
	72	3.16	3.11	3.06	3.00	2.93		
	82	1.12	1.11	1.11	1.10	1.09		
72.	72	2.53	2.49	2.45	2.42	2.38		
	82	1.00	0.98	0.97	0.97	0.96		
82.	82	0.53	0.52	0.52	0.51	0.51		

One

		One Life 32 Years old.				
		4perC.	5perC.	6perC.	7perC.	8perC.
32 Years old.	2 ^d Life.					
	3 ^d Life.					
	32	7.55	7.35	7.09	6.77	6.25
	42	6.96	6.76	6.52	6.25	5.87
	52	6.27	6.12	5.93	5.71	5.42
42 Years old.	62	5.26	5.16	5.03	4.88	4.60
	72	3.83	3.77	3.70	3.61	3.48
	82	1.23	1.22	1.21	1.20	1.19
	42	6.49	6.27	6.03	5.79	5.53
	52	5.87	5.70	5.51	5.33	5.11
52 Years old.	62	4.96	4.85	4.72	4.58	4.42
	72	3.65	3.60	3.53	3.42	3.29
	82	1.20	1.19	1.18	1.17	1.16
	52	5.34	5.24	5.12	4.95	4.74
	62	4.58	4.50	4.40	4.28	4.14
62.	72	3.42	3.38	3.33	3.26	3.16
	82	1.17	1.16	1.15	1.14	1.13
	62	3.98	3.92	3.85	3.77	3.66
	72	3.06	3.03	2.99	2.94	2.86
	82	1.11	1.10	1.09	1.08	1.07
72.	72	2.46	2.44	2.41	2.38	2.33
	82	0.98	0.97	0.96	0.95	0.94
82.	82	0.55	0.54	0.54	0.53	0.52

One

		One Life 42 Years old.				
		4perC.	5perC.	6perC.	7perC.	8perC.
42 Years old.	2 ^d Life.					
	3 ^d Life.					
	42	6.07	5.88	5.66	5.45	5.22
	52	5.43	5.33	5.20	5.03	4.83
	62	4.70	4.59	4.46	4.35	4.21
52 Years old.	72	3.49	3.44	3.37	3.30	3.21
	82	1.18	1.17	1.16	1.15	1.13
	52	5.05	4.88	4.71	4.58	4.44
	62	4.33	4.29	4.25	4.20	4.14
	72	3.28	3.23	3.18	3.13	3.04
62.	82	1.15	1.14	1.13	1.12	1.11
	62	3.81	3.74	3.67	3.60	3.50
	72	2.95	2.91	2.87	2.82	2.76
	82	1.08	1.07	1.06	1.05	1.04
	72.	72	2.39	2.36	2.33	2.30
82.	82	0.96	0.96	0.95	0.94	0.93
	82	0.52	0.51	0.51	0.50	0.49

One

		One Life 52 Years old.				
		4perC.	5perC.	6perC.	7perC.	8perC.
52 Years old.	2 ^d Life					
	3 ^d Life					
	52	4.65	4.57	4.46	4.35	4.20
	62	4.04	3.98	3.90	3.82	3.71
62.	72	3.10	3.06	3.02	2.96	2.89
	82	1.12	1.11	1.10	1.09	1.08
	62	3.57	3.52	3.45	3.39	3.31
72.	72	2.79	2.76	2.73	2.69	2.63
	82	1.05	1.04	1.04	1.03	1.02
72.	72	2.28	2.26	2.23	2.20	2.16
	82	0.94	0.93	0.92	0.91	0.90
82.	82	0.51	0.50	0.50	0.49	0.48
		One Life 62 Years old.				
Aged 62.	62	3.18	3.14	3.10	3.06	2.99
	72	2.54	2.52	2.49	2.46	2.41
	82	0.99	0.98	0.98	0.97	0.97
72.	72	2.09	2.08	2.06	2.04	2.01
	82	0.89	0.89	0.88	0.88	0.87
82.	82	0.49	0.49	0.48	0.47	0.46
		One Life 72 Years old.				
72.	72	1.76	1.75	1.73	1.71	1.68
	82	0.80	0.80	0.79	0.79	0.78
82.	82	0.45	0.45	0.45	0.44	0.44
		One Life 82 Years old.				
82.	82	0.28	0.28	0.27	0.27	0.27

The

The way of finding the Values of Lives of any Ages, howsoever combined in the foregoing Tables, cannot be difficult; for if the Age of any one of the Lives be found at the top, then may the Age of the other two be met with in the two left-hand Columns; and the Value of those three joint Lives is given in Years and decimal Parts, in the Column under the given Rate of Interest. How to reduce those decimal Parts to Weeks or Months hath been already shewn; I shall therefore proceed to



C H A P. VII.

Of Annuities for Years absolute, &c.

THE Application of the preceding Tables, to the finding the Value of Annuities for Years absolute, &c. is next to be consider'd; and in order to render them useful to those Persons and Purposes for which they are chiefly design'd, 'twill be necessary to explain them in as familiar Terms as possible.

To this purpose, I know of no better way than by giving some Examples in most, or all, of the particular Cases before-mention'd: In doing of which, I shall be as particular as to the Nature of the Disbursements; and as

H careful

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careful to start all the Objections that may arise on account of the Precariousness of the Tenure, &c. as I possibly can.

EXAMPLE I.

There is an Annuity of 40*l.* payable to the Annuitant, free and clear of all Outgoings, and to continue for 30 Years absolute; for the true Payment of which, he hath Security on Lands of a much greater Value, (which is equal to Parliamentary Security) what is this worth in ready Money, legal Interest being at 5 *per Cent.*?

For a Solution to this, it must be consider'd, that in regard the Security for the true Payment is better than the common Security on Money lent, and also that the Assessment of 2, 3, or 4 Shillings in the Pound on Interest of Money is hereby saved, (the 40*l. per Ann.* being by the Supposition to be paid in clear of all Outgoings;) the Purchaser ought to be contented with less than legal Interest; and perhaps, all things duly consider'd, 4 *per Cent.* may be sufficient Interest.

This being premis'd; in order to solve the Question, look in *Tab. 1.* for the Number of Years in the first Column, and right against it, under the Rate of Interest, *viz. 4 per Cent.* you'll find 17.27, which shews that the Annuity is worth so many Years Value; wherefore 17.27 being multiplied by 40, the Product is 690.8, which is the Value sought.

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To find the Value of the decimal Part ,8 in Shillings and Pence by the foregoing Rule:

Multiply—,8
by—20

Product—16.0

Hence the Annuity is worth 690*l.* 16*s.* in ready Money, allowing the Purchaser 4 *per Cent.* Interest for the Money he lays out.

Again: Suppose the Annuitant be to allow his Proportion towards the Rates and Assessments, and that those Deductions (exclusive of the Land Tax) amount to 2*l.* 10*s.* a Year; in this Case, I think if the Annuitant be to pay his Share to the Land Tax, he ought to be allow'd 4*l.* 10*s. per Cent.* and then the rest of the Outgoings being deducted out of the Annuity 40*l.*; the Remainder, *viz. 37l.* 10*s.* must be called the Annuity.

Against 30 Years in *Tab. 1.* and under 4 *per Cent.* is 17.27; and in the same Table against 30, and under 5 *per Cent.* is 15.37. The Mean between these two Numbers, *viz. 16.32*, is the Number of Years answering to 4½, or 4*l.* 10*s. per Cent.* and this Number multiplied by 37.5 (or 37*l.* 10*s.*) the Product 612*l.* is the Value of the Annuity required in the Question.

H 2

EXAMPLE

E X A M P L E II.

Admit the *Barton* or Farm of—were to be leased out for a Term of 21 Years; at the End of which Term, the Tenant to yield it up in as good Condition as he finds it.

Suppose the yearly Value thereof, at a Rack-Rent, to be (the Landlord paying Tythes, and all Outgoings except the King's Tax) 76 *l. per Annum*, according to the best Judgment that can be made thereof; and suppose that those Tythes, chief Rents, Rates and Repairs amount to 11 *l.* yearly; and further, suppose the Lessor will reserve 10 *l.* a Year Rent: Now, granting that the Casualties, &c. to which it is expos'd, make it reasonable that the Purchaser should be allowed 6 *per Cent.* for the Money he lays out, what Fine ought he to pay for the 21 Years?

In this Case, I take it, that tho' the Purchaser may expect 6 *per Cent.* for his Money that he lays out on an Estate encumber'd with such Outgoings, and subject to such Casualties; yet as to the Rates, Tythes, Chief Rent and Repairs, it being a Tenure of the best Kind, and subject to no Deductions at all, it must be reckon'd at 4 *per Cent.*; and then the reserved Rent being liable to the King's Tax only, may be consider'd as an Annuity at 4 1/2 *per Cent.* This being premised, the whole Matter will stand thus:

The

The Rack-Rent is an Annuity of 76 *l. per Annum*, subject to divers Incumbrances, Casualties, &c. and therefore, 6 *per Cent.* Interest being allow'd, 21 Years Continuance is worth *per Tab. I.* 11.76 Years Value, which amounts to ——— £. 894.

Out of this, the Parson, the Parish, the Chief Lord, &c. have an Annuity paid free, without any Deductions whatsoever, which (on the best Computation that can be made of it,) amounts to 11 *l.* yearly: This, at 4 *per Cent.* is worth, *per Tab. I.* 14.01 Years Value, which in Cash amounts to ——— 154.

Again; The Reserv'd Rent is an Annuity of 10 *l.* yearly, subject only to the King's Tax, and therefore to be valued at 4 1/2 *per Cent.*; which, *per Tab. I.* (due Equation being made,) is worth 13.41 Years Value, which in Cash amounts to ——— 134.

Lastly, If these two last-mention'd Sums of 154 *l.* and 134 *l.* be deducted out of the whole Value, the Remainder, or 506 *l.* is the Sum that ought to be paid by the Purchaser, for the Grant of 21 Years in the Barton. I hope my being so very particular in this Example, will in some measure excuse me from expatiating so largely again.

E X A M P L E

EXAMPLE III.

An Estate in Houses containing divers Tenements, to be let out for a Term of 21 Years; the whole yearly Rent amounts to 50*l.* the Charge of putting the Houses in Repair is 40*l.* or thereabout, and of keeping them so during the Term, 7*l.* per Ann.; the Out-going in Rates, &c. 4*l.* a Year; Rent reserv'd 3*l.* a Year. Now, in regard of the Situation, Casualties, Hazards of bad Tenants, or of none at all, &c. the Purchaser ought to be allow'd 7 per Cent. Query. What Fine ought he to pay?

An Annuity of 50 <i>l.</i> for 21 Years, at 7 per Cent. —	} 541. 10
Out of which deduct	
An Annuity of 11 <i>l.</i> for the same Time, at 4 per Cent.	} 154.
An Annuity of 3 <i>l.</i> for 21 Years, at 4½ per Cent.	} 40.
And the Charges of putting it into Repair —	} 40.
The Remainder, after these Deductions, is the Answer to the Query.	
	} 307. 10

If it be consider'd that Houses are liable to Accidents by Fire, and that where the Estate (as in this Instance) consists of divers Tenements, the Change of Tenants always brings

brings a Charge of Repairs with it, and very often a Loss of Rent, by the Time between one Tenant and another; I say, if this be duly consider'd, I believe that 7 per Cent. will be thought little enough to be allow'd the Purchaser.

EXAMPLE IV.

Out of a Lease for 30 Years in an Estate which at 6 per Cent. cost 700*l.* there is lapsed 17 Years: What must be given (at the same Rate of Interest,) to renew the said 17 Years?

In Tab. 1, against 30, and under 6 per Cent. I find 13.76, by which dividing 700, the Quotient is 50.85: And this is the yearly Income or Annuity, which was at first purchased for 700*l.*

The Value of an Annuity of 50 <i>l.</i> 17 <i>s.</i> to continue 30 Years at 6 per Cent. is —	} £. 700
The Value for 13 Years, at the same Rate, by the same Table, is —	} 450
The Remainder, after Substraction, is the Sum to be paid for renewing the 17 Years lapsed, —	} 250

EXAMPLE V.

An Estate in Fields, only worth 70*l.* per Annum, out of which is issuing a chief Rent of

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of 1 Pound *per Annum*, and the Rates and Tythes therof amount (exclusive of the King's Tax,) to 12 *l.* a Year: What is the Fee in Reversion of a Lease of 40 Years worth in ready Money, the Accidents and Casualties very few, or none at all?

Here the Neat Produce of the Estate is 57 *l.* a Year:

And 57 *l. per Annum*, to continue for ever, is equal to the Fee-Simple, if it were in Possession; which at $4\frac{1}{2}$ *per Cent.* is — } £. 1267

The Value of the Lease for 40 Years, by the Tables and Multiplication, is, at $4\frac{1}{2}$ *per Cent.* — } 1050

This last Value substracted from the former, leaves the Value of the Reversion — } 217

In this last Example, the Security that the Purchaser hath for the Rack-Rent, is near as good as that for the Payment of the Outgoings; on which account, I first of all deduct the Out-goings from the yearly Value, and reckon the Remainder as an Annuity: But generally speaking, it ought to be done otherwise, *viz.* by reckoning the whole Rent as an Annuity, to be received at a proper Rate of Interest, and then to compute the Out-goings so near as possible, and to value that Sum as an Annuity to be paid out, for which, generally, the Rate of Interest ought to

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to be 10 *s.* and sometimes 1 *l. per Cent.* less than the legal Interest on Money.

Having given these Cautions, I shall, in all that follows, call this last mention'd Annuity, *the Sum paid out*; which shall include all Rates, Tythes, Repairs, or the like Disbursements, which necessarily go along with the Tenure; and which must be very carefully and judiciously computed, before the just Value of the Purchase can be obtain'd.

I have, in the foregoing Examples, made a Difference in the Reserv'd Rent, and other Outgoings; and that on this Reason, *viz.* that when the Reserv'd Rent amounts to 20 *s.* or upwards, the Landlord is to allow the Tenant a Proportion towards the King's Tax, and therefore half *per Cent.* more should be reckon'd for it, than for clear Annuities; such as Rates, Tythes, Repairs, &c.



C H A P. VIII.

Of C O P Y H O L D S.

MY Method leads me next to shew, how by the foregoing Tables the Value of Estates held from Deans and Chapters, Colleges, &c. for Term of Years, or for Life or Lives, renewable at certain Periods on fixed Conditions, or otherwise, may be found; and

to this purpose I proceed to give some Examples.

EXAMPLE I.

A Tenement of Church Lands of 30*l.* per Ann. Rent, to be leased on the following Conditions, viz. that the Tenant pay at the End of every seven Years 30*l.* which is one Year's Value, for ever; What ought to be paid for the first Purchase, the Sum paid out yearly being 4*l.* and the Rate of Interest to the Purchaser 6 per Cent.?

N. B. Though perhaps no Bishops, Deans, or Fellows of Colleges, do or can grant their Leases on such absolute Conditions of renewing; yet, in effect, 'tis all one to the Tenant; for they always think themselves sure of these Terms, and the common Practice hath confirm'd it: By this Example therefore I design to shew, how much they ought to pay for the first Purchase.

The Value of the Fee at 6 per Cent. is,	} £.
by the foregoing Tables, 16 $\frac{2}{3}$ Years Purchase	

Deduct the Value of the Sum paid out	} 100
at 4 per Cent. 25 Years	

Remainder is the Value of the Estate in Fee-400	

For the Value of the Septennial Payment of 30*l.* per Tab. 1, an Annuity of 1*l.* to conti-

continue 7 Years at 4 per Cent. is worth 5.99; and per Tab. 2. the present Value of 1*l.* to be paid at the End of 7 Years, is (at 4 per Cent.) .760. Wherefore dividing .760 by 5.99, the Quotient .1269 being multiplied by 30, produces 3.84, or 3*l.* 16*s.* 1*d.* $\frac{1}{2}$. And this is the Sum that may be paid yearly as an Equivalent for the 30*l.* that is to be paid at the End of every seven Years. And consequently an Annuity of that Value to continue for ever, must be deducted out of the Value of the Fee before found.

Thus the Value of that Annuity at 4	} £.
per Cent. is worth 25 Years Value, or	

Hence the Remainder, after Subtraction,	} 305
is the Sum that should be paid	

for the first Purchase, viz. -----	

That this is the real Value of such a Tenure, if the Landlords have a Power to oblige their Successors, is very plain: I shall not here enquire, how far the common Practice agrees with this, or after what manner they adjust the yearly Value, or Sum expected, every seventh Year; of that enough already. The Method I make use of here to compute the Value of the Septennial Payment may perhaps be a little too difficult for some People: But as this Proposition is not very useful, I think 'twou'd be more inexcusable to fill up Paper with a Table for the more expeditious Performance of it, in order to swell the Bulk of these Pages, as has been the Practice

ñice of a late Author; half of whose Per-
formance confits of Tables computed to as
little purpose as this would be.

E X A M P L E II.

What is the Sum to be paid for renewing
of 7 or 14 Years lapsed in a Lease of 21, in
an Estate of 40 *l. per Ann.* at 6 *per Cent.* the
Sum paid out being 6 *l. per Ann.*?

The Value of the yearly Rent for	$\frac{\text{£.}}{21 \text{ Years, at } 6 \text{ per Cent. is}} \text{---}$	} 470
Deduct the Value of the Sum paid	$\text{out, at } 4 \text{ per Cent. ---}$	} 84
<hr/>		
The Rem. is the Value of the 21 Years		386
<hr/>		
The Value of 14 Years at 6 <i>per Cent.</i>	371:12	
The Value of the Sum paid out for	that time ---	} 63: 6
<hr/>		
Remains the Value of the Estate of	$\text{14 Years in } \textit{Esse} \text{---}$	} 308:06
<hr/>		
Hence the Sum to be paid for the re-	$\text{newing of the 7 Years shou'd be ---}$	} 77:14
<hr/>		
Again:		
The Value of the 21 Years, as above, is,	386	
The Value of 7 Years, the time in	$\textit{Esse}, \text{ at } 6 \text{ per Cent. ---}$	} 223
The Value of the Sum to be paid	$\text{out for that time ---}$	} 36
<hr/>		
Remains the Value of the 7 Years in <i>Esse</i>	187	
<hr/>		
	Hence	

Hence the Sum to be paid for the re- } $\frac{\text{£.}}{\text{newing of 14 Years lapsed should be}} \text{ } 199$
And by the like Process may the Value of
renewing any Number of Years be found,
without any Difficulty, by the Table before
mention'd.

E X A M P L E III.

To find the Value of a Lease of 7, 10,
14, or 21 Years, if a Person of a given Age
should so long happen to live.

Let the yearly Rent be 50 *l.* the Rate of
Interest 6 *per Cent.* the Sum to be paid out
7 *l. per Annum*, and the Person's Age 42
Years, What is the Value?

By <i>Tab. 3.</i> I find the Value of the Annu-		
ity for 7 Years on the given Age, at 6 <i>per</i>		
<i>Cent.</i> to be 5.10 Years, or	---	$\frac{\text{£.}}{255}$
Deduct the Value of the Out-goings ta-		
ken from the same Table, at 4 <i>per</i>	---	} 39
<i>Cent.</i> 5.6 Years Value,		
<hr/>		
Remainder is the Sum to be paid for 7		} 216
Years, on a Life of 42 Years old,	---	
<hr/>		
By the like Method of proceeding, the		
Value of 10 Years on the same Life	---	} 274
is	---	
<hr/>		
That for 14 Years is worth	---	329
That for 21 Years is worth	---	386

EXAMPLE IV.

Admit there be 7 Years lapsed in the former Lease of 21 Years, What is the Value of renewing the said Lapse?

First, The Value of a Lease of 21 Years to a Person of 49, (for that will be now the Age,) is } £. 364

Secondly, The Value of the Lease for 14 Years, on the same Life of 49, to be deducted, } 316

Remainder is the Value for renewing 7 Years, } 48

Let there be 10 Years lapsed in the same Lease, and then by the like Process, The Value of a Lease of 21 Years, to a Life of 52, at 6 per Cent. is } 353 The Lease of 11 Years in Esse is worth— 282 The Remainder after Subtraction is the } 71 Sum to be paid for renewing, }

By these Examples it appears plain, that the Value of renewing 7 Years lapsed in a Lease of 21, is, to the Person that purchases it, absolutely worth almost twice as much, as it is to him that can enjoy it only conditionally; viz. if a Person of 42 Years of Age live so long. One Example more, and I have done with this Head.

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EXAMPLE V.

What is a Lease for 7 Years absolute, in Reversion of a Life of 52 Years old, worth in ready Money, on an Estate worth 60 l. per Annum, at 5 per Cent. Interest, the Sum paid out being 9 l. per Ann. and to be valu'd at 4 per Cent.?

The Value of a Life, of that Age, and at that Rate of Interest, as may be found by Tab. 4, is 9.65 Years Purchase, or } £. 579

This Number 9.65 being found in Tab. 1. i. under 5 per Cent., against it in the first Column (by making due Equation,) is 13.51, which shews that the Life is reckon'd to continue in Being so many Years: — To this add 7, } 757 the Term of the Reversion, the Sum is 20.51; against which, in Tab. 1. under 5 per Cent. is 12.62, for the Years Value of the Rent during both Terms, which in Money is }

The Remainder after Subtraction is the Value of the Rent in Reversion, if it were to be paid clear of Out-goings; that is, } 178

The Value of the Sum paid out at 4 per Cent. during the Life in Esse, is } 94 10.50 Years Value, }

The

The Number 10.50, found in *Tab. 1.* }
 under 4 *per Cent.* answers to 13.96 }
 Years; this added to 7, the Years of } £.
 the Reversion, makes 20.96; to which } 128
 Number of Years, in the same Ta- }
 ble, answers under 4 *per Cent.* 13.96: }
 This in Money is ————— }
 The Difference of these two Sums is the }
 Value of the Sum paid out, ————— } 34
 This last Sum subtracted from the Sum }
 before found, *viz.* the Value of the }
 Rent, leaves the Value of the Rever- } 144
 sionary Lease requir'd; ————— }



C H A P. IX.

Of Leases for One, Two, or Three Lives.

IT hath been observ'd before, that the Value of a Lease for 99 Years, determinable on the Death of one, two, or three Lives, is the same with that of a Lease on those Lives absolute; so that I shall make no difference, but call them all Leases for Life, or Lives.

E X A M P L E I.

A Man of 37 Years of Age is possessed of an Estate for his Life of 65*l.* *per Ann.* the yearly

yearly Out-goings of which are as follow; *viz.*

To the Lord's Rent —————	l. s.	3 : 00
To the Church and Poor Rates ———		3 : 00
To Tythes —————		5 : 10
To Repairs (one Year with another,) —		2 : 10

How much is the Lessee's Right worth in ready Money, at 5 *per Cent.*?

In *Tab. 4.* the Value of a Life of } l. s.
 37 Years, at 5 *per Cent.* is 12.10 } 786 : 10
 Years, or, in Cash, ————— }

The Value of the same Life at 4 }
per Cent. by the same Table, is }
 13.40 Years Value, which for } 147 : 00
 the Rates, Tythes, and Repairs, }
 amount to ————— }

The Value of the same Life, at }
 4½ *per Cent.* is 12.70 Years, which } 38 : 00
 for the high Rent is ————— }

The whole Sum to be deducted is — 185 : 00

And hence the Value required is — 601 : 10

E X A M P L E II.

What is the Value, in the same Estate, of two joint Lives, one of which is 12, the other 32 Years old; and the Estate to be extinct when one of them dies?

Out of *Tab. 6.* take the Value of the two joint Lives at 5 *per Cent.* for the Rent which
 K is

is 10.56 Years; this, multiplied by 65, produces ————— £. 686

From the same Table, the Value of the joint Lives at 4 per Cent. is 11.27 Years; which multiplied into 11 l. the yearly Out-goings in Rates, Tythes, and Repairs, produces ————— } 124

By the same Table, the Value at 4½ per Cent. is 10.92 Years Value, which, multiplied by 3 l. the yearly Rent to the Lord, produces ————— } 33

Hence the Value of the Estate for two joint Lives, (that is,) to continue till one of them dies, is ————— } 529

EXAMPLE III.

To find the Value of three joint Lives on the same Estate, one of whom is 12, another 22, and the third 42 Years old.

From Tab. 7. finding the Age of the youngest at the Top, the next at the Left-hand Column, and the other in the second Column to the Left Hand, under 5 per Cent. I take out the Value of the three joint Lives, which is 7.83 Years; this drawn into 65, the yearly Rent, produces ————— £. 509

At the same Place (and under 4 per Cent.) I find 8.15, which multiplied by 11 l. the Product is ————— } 90

Again;

Again; in the same Table, the Number answering to 4½ per Cent. is 8.00; this, for the High-Rent, 3 l. per Annum, is worth ————— } £. 24

These two last Sums being subtracted out of the former, the Remainder is the Value of a Lease to continue as long as all three of the Lives remain in Being; ————— } 395

EXAMPLE IV.

An Estate of bad Houses meanly situated, containing divers small Tenements, in all, (when full of Tenants,) of the yearly Value of 50 l. to be leased for the Term of one, two, or three Lives, and the longest Liver of them; the Purchaser to have 6 per Cent. for his Money; The Sum to be paid out in Rates, Repairs, and High-Rent, (which last is under 20 s. per Annum, and therefore to be reckon'd as a clear Annuity, as well as the other Disbursements;) amounts to 6 l. a Year: What must be paid for the Purchase?

First,

For one Life aged 67 Years.

This, for the whole Rent, by Tab. 4. is worth, at 6 per Cent. 5.90 Years Purchase; which, in Cash, at 50 l. a Year, amounts to ————— £. 295

The Value of the Sum to be paid out; at 4 per Cent. is 6.53 Years, or ————— } 39

The Value of a Lease for one Life ————— } 256

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Secondly,

Secondly,

For the Value of two Lives, one 67, the other 52 Years, Mr. *Abraham de Moivre* hath demonſtrated, in *p.* 37. of his Book of Annuities, that the Value of an Annuity upon the longeſt of two Lives, is the Remainder, after Subſtraction of the Value of thoſe Lives jointly taken, from the Sum of their Values ſingly taken.

I have by choice omitted every thing that I think would perplex the Readers, for whoſe Uſe theſe Papers are principally deſign'd; and of that kind I take thoſe Algebraical Demonſtrations to be: Not but I am well ſatisfied of the Neceſſity that the Method ſhould be demonſtrative; but after the ſame hath been ſo elegantly perform'd by the afore-mention'd ingenious Author, it would be ſtuffing in things to no purpoſe, to tranſcribe it here; ſince any Perſon that is not ſatisfied without a Mathematical Proof, may be referred to that Treatiſe, and receive ſuch Satisfaction as muſt needs convince every body that underſtands it. But to proceed:

The yearly Rent on the Life of 67 Years	£.	
was found before to be worth		} 295
That for the Life of 52 is worth		} 445
The Sum is		} 740
The Value of the ſame for the joint		} 220
Lives is 4.39 Years, or		} 520
Remainder after Subſtraction is the Value on the longeſt Liver of the two,		} 520
The		

The Value of the Sum paid out on the		
fiſt Life, at 4 per Cent. is		} 39
Years, or		} 63
The Value of the ſecond Life is		} 63
Years, or		} 102
The Sum		} 102
On the two joint Lives		} 28
The Remainder after Subſtraction is		
the Value of the Out-goings on the		} 74
longeſt,		} 446
This Sum being ſubſtracted from the		} 446
520 l. leaves the Value required; —		} 446

Thirdly,

Let a third Life, aged 22 Years, be join'd with the two before mention'd, and let the Value of the Eſtate on the longeſt Liver of theſe three be requir'd.

For the whole Rent	The Life 67 Years old		} Years Val.
	The Life 52 Years old		
	The Life 22 Years old		
Their Sum is			} 27.35
The Value for the three joint			} 3.99
Lives, at the ſame Rate, (<i>viz.</i>			} 3.99
6 per Cent.) is			} 31.34
The whole Sum			} 31.34

The

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The before-mention'd ingenious Author shews, that the Values of the joint Lives combin'd, two and two added together, and the Sum substracted from the foregoing Sum, leaves the Value of the Annuity upon the longest Liver of them.

Thus for the Purpose:

	Years.
The Value of the first and second jointly	4.39
The Value of the first and third jointly	5.26
The Value of the second and third jointly	7.56

The Sum is ——— 17.21

This last Sum being substracted from the former Sum, the Remainder is 14.13 } £.
 Years for the Value of the longest Liver, which in Cash is ——— } 707

In the next place, I am to find the Value of the Sum to be paid out at 4 per Cent. in the same manner as the former was found.

The Life of 67 Years old Value in Years	6.53
That of 52 —————	10.50
That of 22 —————	16.05
The three joint Lives —————	4.15

The Sum of which is ——— 37.23

The first and second jointly ———	4.66
The first and third jointly ———	5.67
The second and third jointly ———	8.42

The Sum of these three ——— 18.75

Remainder after Substraction ——— 18.48

This

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This drawn into 6, the yearly Out-goings, produces in Money ——— } £. 1111

This Sum being substracted from the Value before found, (viz. 707,) leaves the Value of the Lease on the longest of the three Lives, and at the Rate of Interest proposed, ——— £. 596

The Result of the whole Operation will appear to be as follows, viz.

One Life of 67 Years old is worth ———	£. 256
Two Lives, one 67, the other 52, worth	446
Three Lives, aged 67, 52, and 22, worth	596

And now, here I am aware of an Outcry that will be made on account of the Difference that there is, or seems to be, betwixt this Result, and the common way of Estimation: For, says the Gentleman's Steward, 'tis always reckon'd, that one Life in Possession is as good as two in Reversion; and a third Life in Reversion of two, is generally reckon'd but in two Years Value: Whereas, by this Way of computing, the first Life amounts but to 5½ Years Value; whereas the other two are here worth above 7. And again: The third Life in Reversion of 2, in the above Example, amounts to almost 3 Years and an half's Value: And how can this be?

In Answer to which Objection, I must observe, that tho' this be true in the Example alledged, yet it is no Deviation from Reason, tho' it be from common Practice; and that it

it rather establishes the Truth and Necessity of this Method, than brings any Argument against it, will plainly appear by another Example, wherein the Value of the Reversions (on account of different Ages of the Life or Lives in Possession,) will, when found by this Method, be thought as much too little, as those are too great.

EXAMPLE V.

Admit the Estate to be purchased on Lives be worth 40 *l. per Annum*, and of such Quality, that 6 *per Cent.* is a proper Interest for the Purchaser: Suppose that the Rates, Tythes, and Repairs, be 5 *l. per Ann.* and the Reserv'd Rent 2 *l. per Ann.*; let 5 *per Cent.* be allow'd for the Money to be paid out, and let the Ages of the Lives to be purchased be,

The First 32 }
 The Second 22 } Years old.
 The Third 12 }

What will be the Value of one, two, or three of these Lives, in the Order that they are here placed?

Num-

Lives.	Number of Years Value for the 40 <i>l. per Annum</i> Rent.	Number of Years Value for the 7 <i>l. per Ann.</i> paid out.	Value in Cash after Subtraction.
	At 6 <i>per Cent.</i>	At 5 <i>per Cent.</i>	
1st	11.47 Years.	12.79 Years.	370 <i>l.</i>
2d	12.54 Years.	14.14 Years.	402
3d	13.37 Years.	15.23 Years.	428
Lives.	The Value of the longest Liver for the Rent.	The Value of the longest Liver for the Money p'd out.	Value of the Rem. Money.
1st & 2d	14.60	16.84	466 <i>l.</i>
1st & 3d	14.99	17.46	477
2d & 3d	15.40	17.96	490
The Value of the longest Liver of the three Lives for the 40 <i>l. per Ann.</i>		The Value of the longest Liver for the 7 <i>l. per Ann.</i>	Value of the Remain. in Money.
15.83 Years.		18.71 Years.	502 <i>l.</i>

By the above Estimation, it appears that two Lives of 22, and 12 Years old in Reversion of one of 32, is worth but 132 *l.* which is little more than $\frac{1}{3}$ of the Value of the Life in Possession; and that two of 32 and 22 in Reversion of one of 12, is of much less Value, *viz.* no more than 74 *l.*

Again;

One of 12 in Reversion of two of 32, and 22 Years of Age, is worth but 36 *l.* that is less than one Year's Value; and for one Life of 32 in Reversion of two of 12 and 22 Years old, must be given no more than 12 *l.*

L

Hence

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Hence the vast Difference that arises on Account of the Age of the Lives appears (if this Method holds good) to call for a particular Regard, even when the Difference of the Age of the Lives is not very great, as in this Example; how much more then, if the Tenant should defer the renewing of his Lease, till the Life or Lives in *Esse* arrive to a declining Age; as thus:

Admit that in the before-mention'd, after the Expiration of 20 Years, one of the Lives, viz. that of 22, should be dead, and the Tenant be willing to add another instead thereof, of 12 Years old, What Fine ought he to pay?

This Query, in other Words, may be thus express'd: What is a Life of 12 Years old in Reversion of two, one of which is 32, the other 52, (for that will now be their Age) worth in ready Money on the foremention'd Estate?

	Years.	For the Rent.	For the Outgoings.
The Value of a Life of 52 old—	8.91	—	9.65
a Life of 32 ———	11.47	—	12.79
a Life of 12 ———	13.37	—	15.23
The Value of the 3 joint Lives—	6.41	—	6.64
	The Sum ———		40.16—44.31
The Value on the joint Lives} of 52 and 32 ————	} 7.16—		7.50
On the joint Lives of 52 & 12—	7.84	—	8.29
On the joint Lives of 32 & 12—	9.84	—	10.56
The Sum of these Three—	24.84	—	26.35
	Sub-		

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Subtract this last Sum from the above Sum, the Remainder is the Value of these two Annuities in Years and decimal Parts—

$$\begin{array}{r} \text{15.32—17.96} \\ \hline \text{In Money—613—126} \\ \hline \text{Hence by Subtraction the Value of the Estate on the Survivor of the three Lives } \} \text{ £. 487} \end{array}$$

The Sum of the single Values of the Lives of 52 and 32 is—

$$\text{Value of these two jointly is—} \underline{\underline{7.16—7.50}}$$

The Difference of these is the Value on the Survivor—

$$\text{These Years reduced into Money will be } \} \begin{array}{l} \text{£. } \text{£.} \\ \text{529—104} \end{array}$$

Hence the Value of the two Lives in Money will be—

$$\text{Which subtracted from the Value of the three Lives before found, leaves the Sum to be paid for renewing the Lease—} \} \text{ 62 £.}$$

But again: Suppose the Tenant does not think fit to renew till after the Death of two of the Lives; and at that time the third or surviving Life is become 62 Years old, What Fine must he pay for adding 2 Lives, aged 22 each?

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One

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	For the Rent.	For the Outgoings.									
One Life 62 Years old, Value	7.08	7.53									
One of 22	12.54	14.14									
Another of 22	12.54	14.14									
The three joint Lives	5.43	5.62									
The Sum	37.59	41.45									
The Value on the joint Lives	<table border="0"> <tr> <td>of the 1st & 2d</td> <td>6.14</td> <td>6.48</td> </tr> <tr> <td>of the 1st & 3d</td> <td>6.14</td> <td>6.48</td> </tr> <tr> <td>of the 2d & 3d</td> <td>10.00</td> <td>10.80</td> </tr> </table>		of the 1st & 2d	6.14	6.48	of the 1st & 3d	6.14	6.48	of the 2d & 3d	10.00	10.80
of the 1st & 2d	6.14	6.48									
of the 1st & 3d	6.14	6.48									
of the 2d & 3d	10.00	10.80									
The Sum of these three	22.28	23.76									
This left from the former Sum	15.31	17.68									
This in Cash is the Value of the two Annuities, viz.	612 l.	124 l.									
Hence the Value of the Lease during the three Lives is	488 l.										
The Value of the 1st Life subtract	230										
Hence the Value of the two Lives in Reversion is	258										

I have enlarg'd the more on this Example, in order to shew how necessary the Consideration of the Age of the Lives is, to get a thorough Knowledge of the Value of an Annuity that is to continue as long as they are in Being.

That the Casualties or Accidents to which Estates in Fields, but especially those in Houses, are obnoxious, are sometimes greater,

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er, and at other times less, according to the Situation of them, and their Likelihood of producing the same yearly Income constantly during the Term of the Lease; and also according as they are more or less expos'd to Storms, Fire, Inundations, or the like: And again; where Houses are of a Newer or Older, a Stronger or Weaker Structure; that this is so, I say, is very plain: but then how to bring these Properties to a Computation, is not so easy a Task; the Method that I have all along made use of, is by allowing the Purchaser a greater or less Rate of Interest for his Money laid out: And I don't know of a more regular Way of reckoning; for hereby the Surplusage above the Value of Money when laid out on Annuities certain, may be esteem'd as an Insurance for the Rent against those Accidents and Uncertainties.

I know it may be objected, that by this Way of Computation a Case may be so put, that the Value of a Lease for a shorter Continuance may be greater than that for a longer time on the same Estate; and this I acknowledge to be true, when the Sum to be paid out is very large, in respect to the yearly Rent; and at the same time also the Rate of Interest to be allow'd the Purchaser is very great, on account of the ruinous Condition of Houses, or the like. And when the Case is so, let it be consider'd, whether, for Instance, the Reversion after 40 Years in an Estate of Houses that are but in bad State now,

now, and out of which the Possessor is obliged to pay an Annuity of 15*l.* which may perhaps be as much, or more than the Rent will amount to at the End of 40 Years, be worth any thing; or rather, is not such a Reversion worse than Money?

But here it may be said, that the Lessee is generally obliged by a Covenant in his Lease to yield up the Estate at the End of his Term in good Repair; and that therefore the yearly Value cannot be so prodigiously sunk as is suggested. In Answer to this, common Experience shews us, that People have a great many Ways to evade the Force of this Covenant; for *good Repair* is a Term of great Latitude, and a Man may leave Houses in such a Condition, as to skreen himself from an Action for Dilapidations; and at the same time it may be necessary for the next Tenant, if he hath a long Term in it, to rebuild a great Part of it. And thus I have known Landlords oftentimes to give a Person a Lease for Lives in an Estate, on Consideration of his laying out Money in re-edifying it; and even to give Timber, or the like, towards it, before he could get a Person to do it. If to this be added, that the Possessor is very often poor and unable to repair the Premises, and so it falls to ruin, and no Redress to be had; I believe the Benefit by such a Covenant will be very small; and hence the seeming Paradox is, I believe, in a great measure explain'd. But if some particular Cases shou'd seem

seem to thwart the Method, a Person is at Liberty to deviate from it; or rather he may moderate the Interest, at least for the time of the Estate in *Esse*, or the like, according to Discretion.

Thus, I hope, I have clear'd up this Affair, as to Estates in *Esse*; and have given some Light, as to the Valuation of Reversions; a more particular Consideration of which shall be the Business of the next Chapter.



C H A P. X.

Of REVERSIONS.

AFTER what I have said on this Particular in *Chap. 5.* it will be unnecessary to define what is meant by an Estate in Reversion, it being a Word very well understood by Landlords and Tenants; my Business is to shew, how to find the Value of such Expectancy; to do which, I shall lay down the following general Rule.

From the Value of the Sum of the Terms in Possession and Reversion, subtract the Value of that in Possession, the Remainder is the Sum to be paid for the Reversion.

In *Chap. 7. Example 5.* I have shewn how to find the Value of the Fee in Reversion of a Term

Term of Years absolute; and from the last Chapter may be easily deduced the Value of the Fee in Reversion of Lives, or of one Life in Reversion of two; of two in Reversion of one, by a due Application of the above general Rule. But something may be proper to be said of the Value of a Life in Reversion of a Term of Years, to be nominated at the Expiration of the said Term, and of a Term of Years in Reversion of another Term of a Life or Lives, or of 2 or 3 joint Lives; as also of the Right of such two or more, as hold by joint Tenancy and Survivorship.

E X A M P L E I.

Let it be required to find how much an Estate of 30*l. per Ann.* is worth during the Continuance of a Life of 22 Years of Age; the Right to commence, and the Life to be nominated, at the Expiration of a Term of 14 Years, allowing the Purchaser 6 *per Cent.* and deducting the Value of the Sum paid out, *viz.* 4*l.* a Year at 5 *per Cent.*

The Value of such a Life in Possession	} 376
for the whole Rent is, <i>per Tab.</i> 4. —	
The Sum paid out is worth	56
<hr/>	
Remains the Value of the Life, if it	} 320
were to be entred upon immediately,	

The Question then will be, What 320*l.* payable at the End of 14 Years, is worth in ready

ready Money at the Rate of legal Interest, *viz.* 5 *per Cent.*?

By *Tab.* 2. I find the Value of 1*l.* payable at the End of 14 Years, is .505 decimal Parts of a Pound; which being multiplied by 320 gives the Value of the Reversion, that is, 162*l.*

I need not foul Paper by producing more Examples of this Kind; for by this may be seen the Method to find the Worth of 2 or 3 Lives in Reversion for a Term of Years, and also of a Term of Years in Reversion of a Term in *Esse.*

If it be required to shew the Value of a Term of Years in Reversion of a Life or Lives; first find the Number of Years Value of the Estate in *Esse*, and then, by *Tab.* 1. see how many Years it must continue to produce that Value; and the Value of the Estate in *Possé*, payable after the Expiration of this Number of Years, is the Sum to be paid in hand for the Expectancy.

If a Life be to be nominated at the Death of another, the Sum to be paid for it may be found, by seeking in the Tables the Number of Years of an Annuity that is of equal Value with each of the Lives; and then find (in the Table for that purpose) the Value of the Money that the Life in *Possé* will be worth at the Death of the other, and the present Value of such a Sum is the Sum required.

E X A M P L E II.

There is at present on an Estate of 50 *l.* *per Ann.* one Life, aged 52; the Tenant would purchase another Life to be nominated at the Death of the former, *viz.* one that shall be then 22 Years old, allowing the Purchaser 6 *per Cent.*; and for the Sum paid out, which is 9 *l.* *per Ann.* 5 *per Cent.* What is the Value of the Life to be purchased?

The Life in Possession is worth, at 6 *per Cent.* (for any Rate may be taken for this purpose) } 8.91 Years. *per Tab. 4.*

This Number found under the same Rate of Interest, in *Tab. 1.* shews in the first Column, that the Life is as valuable as an Annuity certain for the Term of } 13.14 Years.

Hence the Life that is to succeed, is to be named at the End of 13.14 Years.

A Life of 22 is worth, by *Tab. 4.* } 12.54 Years. at 6 *per Cent.* And the same at 5 *per Cent.* — 14.14

Which being the Number of Years Value that the Rent and Outgoings will be worth for the second Life at the End of 13.14 Years, the Value of each in ready Money may be found

found by taking out the Numbers in *Tab. 2.* answering to the times at 5 *per Cent.* and multiplying that by these Numbers of Years respectively, the two Products will shew the Number of Years Value for the Rent, and for the Sum paid out. Thus:

The Number in *Tab. 2.* under 5 *per Cent.* and against 13.14 (by duly equating) is .527. This multiply'd by 12.54 produces 6.61 } and multiply'd by 14.14 produces 7.45 } Years

Hence the Value of the Rent in Money—^{L.} 330 And that of the Sum paid out— 67

Consequently the Sum to be paid is — 263

By the like Process may be found the Value of a third Life in Succession of two to be named at the Death of one or both of these; or of two Lives to be named, one at the Death of the first, and another at the Death of the second, or in any other manner; and this, I doubt not, will be easy enough to the Persons concern'd, without adding any more Examples to that purpose.

E X A M P L E III.

A Man dying leaves to his three Daughters an Annuity of 20 *l.* *per Ann.* each, during their Lives, payable out of Lands of a much greater Value; and he so order'd it, that when either of them shou'd die, her Annuity shou'd fall

M 2 to

to the other two in equal Shares; and at the Death of another of them, the whole is to come to the Survivor for Life; their Ages at the Father's Death are 32, 22 and 12, What is the Right of each worth in ready Money at 5 per Cent.?

	Years.	£.
The Value of the eldest Life is	12.79	or 256
That of the next is	14.14	or 283
The youngest worth	15.25	or 305

The joint Lives of the 1st and 2d is 10.21 Years.
 Of the 1st and 3d is 10.56 Years.
 Of the 2d and 3d is 11.41 Years.
 The three joint Lives is worth — 8.59 Years.

For the Right of the eldest Daughter.

First, 20 l. per Ann. during her Life is } £. 256
worth _____

Secondly, 10 l. per Ann. in Reversion of the youngest, to continue from thence during the joint Lives of the other two; found by subtracting the Value of the three joint Lives from the Value of the first and second jointly } 16

Thirdly, 10 l. per Ann. in Reversion of the second, to continue during the joint Lives of the first and third; found by subtracting the Value of the three joint Lives from that of the first and third jointly } 20

Fourthly,

Fourthly, 40 l. per Ann. in Reversion of the two youngest Lives during her own Life; found by subtracting the Value of the longest of the second and third from that of the longest of the three Lives, is _____ } £. 30

The whole Sum of these four Values is } the eldest Daughter's Portion, viz. — } 321

By the like Process the second Daughter's Right in the Estate will appear } to be _____ } 376

And that of the third or youngest — 426

The whole Value is _____ 1123

And the Truth of the Work will appear by finding (according to the Method laid down in the former Chapter) the Value of the whole Estate on the Survivor of the three Lives; which by the Tables will be found to be 18.71 Years Purchase; and this multiply'd by 60, the whole yearly Value of the three Annuities, the Product is 1123 l. as before.

Thus I have, I think, given Examples in most of the useful Cases of this Subject; by Help whereof any of the Queries that arise about the Values of Leases in Possession or Reversion may be solv'd.

It may be proper, before I conclude, to say something of Timber-Trees and Coppice-Wood; the former being generally convey'd with the Estate in Fee, and the other is often-

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times the Property of the Tenant for Years or Lives. The Value of Timber-Trees will be very different, tho' of the same Bulk and Goodness; I shall therefore consider them as to the Quality, Quantity, and Situation.

And first as to the Quality: It is necessary to consider whether the Timber growing on the Estate you would purchase, be of old standing, and fit to be fell'd for Use forthwith; and if it be, then so much Money as it will yield, free and clear of all Charges, is the Value of the Timber, and to be added to the Value of the Estate before found. But if the Trees that are in Dispute are very young thriving Timber, such as Oaks perhaps of 50 Years standing, or the like, and will not be fit to cut down for Use till they have stood (it may be) 50 Years longer; in such Case it will be proper to make some Experiments of the Growth of Timber in that Place, by observing the lower End of a large Tree after it is sawn down; where may be seen by the annular Pores or quondam Sap Vessels, the Number of Years Growth, and also the Quantity that it hath increas'd every Year: by which, and a due Allowance for what it may grow more in height, (which I believe is not very much after 50 Years standing) a tolerable Guess may be made when it will be proper to cut it down, and how much Timber it will be increas'd to in that time; and then the Sum of Money that such a Quantity of Timber will bring in at the End of so many Years,

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Years, being valued by the Tables for that purpose, will discover the Sum that ought to be added to the Value of the Lands for the present Purchase.

But then it must be consider'd, that a great many Hazards attend growing Timber; such as Storms of Wind, which oftentimes overturn large topped Trees, and oftner twists them and spoils the Timber. Again; Diseases, which Trees of all Kinds are subject to, often hinder their Growth. And lastly, that vile Practice made use of by Tenants on Lease of lopping Trees, which in time effectually renders the Body of the Tree, like its Top, fit for nothing but Fuel: It highly concerns all Lords of Manors and their Stewards, to put some stop to this destructive Way of proceeding, and not suffer their stately and venerable Oaks, the Glory as well as Bulwark of our Nation, to be thus mangled and murder'd. But this is a Digression: On Account of these Accidents and Uncertainties, the Person that lays out Money on young Timber ought to have a greater Rate of Interest, than for Money laid out on Lands.

I have, by divers Experiments, found that Oak Timber increaseth, when healthy and in a good Soil from 50 to 100 Years standing, to near about twice as much in Diameter as it had at 50; that is, a Tree that at 50 Years standing was 12 Inches in Diameter, at the End of 100 Years was two Foot Diameter; and consequently (allowing nothing for its Increase

Increase in Height) 100 Foot of 50 Years standing will, after 50 Years more, be increased to 400 Foot; to which, if there be added one fifth on account of its Increase in Height, the whole is 480 Foot. Now (*per* the Tables of Logarithms) the Log. of 480 divided by 50, the Number of Years, the Quotient will be the Logarithm of 1.0319. Hence Timber of such Growth (granting the Premises) will increase in Quantity at the Rate of 3.19 *per Cent.* and no more. But whereas, as is before hinted, a Man may reasonably expect 6 *per Cent.* for the Money he lays out on young Timber; it follows, that he must not give so much *per Ton* for the Timber that must stand some Years before it be fit to cut down, as he would for that which may be cut immediately; for 480 *l.* payable after 50 Years, at the Rate of 6 *l. per Cent.* is worth, *per Tab. 2.* in ready Money, 259 *l.* So that Timber which at 100 Years old will be worth 12 *d. per Foot*, at 50 Years old must be sold for 6 *d. $\frac{1}{2}$* , or less.

Secondly, By the Quantity of Timber, I mean that a Man ought to consider, whether there be more Timber on an Estate (that is fit for Sale) than can be disposed of in one Year. Thus it may happen, that on an Estate to be purchased, there may be Timber of a great Value; but if sold, the Buyers may expect 10, 15, or perhaps 20 Years time to clear it off, paying so much Money every Year; or, in other Terms, the Quantity of Timber may be

be so great, that the whole cannot be vended or turn'd into Money in less than 10, 15, or 20 Years. And if this be the Case, the Purchaser must consider how much *per Ann.* and for how many Years this Income will be, and value it accordingly.

Thus for Instance: Let the Value of the Timber on an Estate be 2000 *l.* and suppose Timber to the Value of 200 *l.* were to be clear'd off every Year; then 200 *l. per Ann.* for 10 Years, at 5 *per Cent.* (*per Tab. 1.*) is worth in ready Money 1544 *l.* Which shews that the Man who purchases the Lands, must give but 1544 *l.* for the Timber, that will in the time prefix'd be 2000 *l.* at those several Payments.

Thirdly, This Value may still be lessen'd by the bad Situation of Timber, both on account of its distance from a navigable River, or from some great Town, or from the Difficulty of Access to the Place where it grows; for Timber that is large and well grown for Naval Architecture, and would bring a good Price for those Uses, may be so far within Land, as not to be brought in place but at an unreasonable Charge; or it may be so situated, as to render it wholly impossible to draw any large Stocks out of the place where it grows. And hence Timber that is fit for the most noble Uses, may, by the Declivity of the Ground where it grows, or the like bad Situation, be worth but little more than for Lath-Timber, Shingling, Vessel Timber, Plough-boot, Fuel, or the like.

These and some other Particulars must be well weigh'd and consider'd, in estimating of growing Timber; which unless the Value be fix'd with Judgment and Discretion, will draw on a great Disadvantage to the Purchaser.

As to Coppice Wood, I take it that the best Way to fix its Value, is by examining how many Years Growth it may be convenient to cut it at, and how much it will yield per Acre at such Periods after the Tythes are deducted. But in order to illustrate this a little, I shall give an Example or two.

EXAMPLE I.

There is a Coppice containing 210 Acres, the Wood hath by Experience been found very good at 15 Years Growth, and uses to be sold for 4*l.* per Acre, (the Buyer to discharge the Tythes); How much is the Fee-Simple worth, if it were to be sold just after it hath been cut?

The Value of the Wood at the End of every 15 Years is 840*l.*

Per Tab. 2. one Pound payable at the End of 15 Years is worth } .481 Parts. in ready Money _____

This multiply'd by 840, produces } the Value of the Wood at that time in ready Money } £. 404

Per

Per Tab. An Annuity to continue 15 Years is worth 10.38 Years Value at 5 per Cent. wherefore 404 being divided by 10.38, the Quotient is the Annuity that is of equal Value to the Coppice, viz. _____ } £. 39

Hence the Value of the Coppice is equal to that of an Annuity of 39*l.* to continue for ever; which at 5 per Cent. will amount to the Sum of 780*l.*

EXAMPLE II.

Admit that the before-mention'd Coppice hath been constantly cut at 14 Acres every Year, and may be so continued:

Then the yearly Income is 56*l.* which at 5 per Cent. is worth in ready Money 1120*l.*

Again;

The same Coppice being at 10 Years Growth, what is the Value of the Fee?

First, The present Value of 840*l.* payable at the End of 5 Years at 5 per Cent. is worth _____ } £. 658

Secondly, An Annuity of 39*l.* (found before) to continue for ever, worth-- } 789

The Sum _____ 1438

Thirdly, Deduct the Value of an Annuity to continue 5 Years, viz. _____ } 169

The Remainder is the Value sought _____ 1269

N 2

What

What is said in these Examples is, I believe, sufficient to give a Light into this Affair. A great deal might be said as to the valuing this for a Term of Years absolute, or for Life or Lives; but I presume all those for whom these Papers are design'd, will be capable of varying the Rules according to the Nature of the Tenure, and Quality of the Woods, by what hath been before laid down in relation to Lands, &c.

I at first design'd to have concluded here; but on revising the whole, I consider that it is likely to fall into some Hands to whom it will be useless (on account of the Operations) for finding the Value of Survivorship; to do which, the Numbers are to be taken out of several Tables, and to be added, subtracted, &c. which to some Persons will seem such an Intricacy, as will, I fear, discourage them from the Attempt. I hope it will not therefore be deem'd superfluous, to have added Tables of the Value on the longest Liver of 2 or 3 Lives; where the same may be taken out at once for those Purposes, and for any Ages howsoever combined to every tenth Year.

I have also added two short Tables, the one for finding the Value of the decimal Parts of a Year in Months; and the other shewing the Value of the decimal Parts of a Pound in Money; so that it is but to find the Parts, *i. e.* the Numbers to the Right Hand of the Point in the first Column of the Tables; and right against it, in another Column, is the Value thereof in Months in one Table, and in Money in the other.

T A B.

T A B. VIII.

Shewing the Value of an Annuity for two Lives, that is to continue till both are dead, at 4, 5, 6, 7, and 8 per Cent. and to every tenth Year of Age.

Age.	One Life 2 Years old.				
	4 per C.	5 per C.	6 per C.	7 per C.	8 per C.
2	19.67	17.08	14.60	12.68	11.44
12	20.60	17.81	15.17	13.03	11.83
22	20.05	17.30	14.86	12.86	11.60
32	19.21	16.67	14.38	12.62	11.41
42	18.42	16.06	13.97	12.34	11.19
52	17.61	15.47	13.52	11.96	10.87
62	16.73	14.80	13.01	11.55	10.52
72	15.97	14.17	12.48	11.08	10.09
82	15.36	13.63	11.99	10.66	9.71
One Life 12 Years old.					
12	21.39	18.41	15.59	13.24	12.02
22	20.88	17.96	15.40	13.19	11.96
32	20.33	17.46	14.99	12.99	11.74
42	19.58	17.03	14.76	12.87	11.65
52	18.97	16.59	14.43	12.59	11.44
62	18.30	16.08	14.05	12.30	11.21
72	17.70	15.64	13.72	12.02	10.95
82	17.26	15.27	13.40	11.76	10.71

One

One Life 22 Years old.					
Age	4perCen.	5perCen.	6perCen.	7perCen.	8perCen.
22	20.46	17.48	15.08	13.04	11.81
32	19.45	16.84	14.60	12.79	11.58
42	18.90	16.39	14.33	12.61	11.34
52	18.13	15.79	13.90	12.27	11.16
62	17.38	15.24	13.46	11.92	10.80
72	16.68	14.67	13.00	11.40	10.46
82	16.12	14.19	12.59	11.19	10.23
One Life 32 Years old.					
32	18.66	16.17	14.11	12.17	11.43
42	17.83	15.55	13.68	12.22	11.04
52	16.91	14.90	13.21	11.85	10.76
62	15.95	14.18	12.66	11.42	10.41
72	15.08	13.46	12.07	10.91	9.96
82	14.40	12.87	11.55	10.46	9.53
One Life 42 Years old.					
42	16.79	14.76	13.12	11.80	10.72
52	15.74	14.00	12.57	11.37	10.34
62	14.61	13.09	11.88	10.74	9.82
72	13.44	12.13	11.06	10.09	9.29
82	12.63	11.40	10.35	9.47	8.71

One Life 52 Years old.					
Age	4perCen.	5perCen.	6perCen.	7perCen.	8perCen.
52	14.48	13.04	11.82	10.75	9.87
62	13.12	11.94	10.93	10.03	9.29
72	11.79	10.81	9.96	9.18	8.56
82	10.66	9.80	9.05	8.39	7.81
One Life 62 Years old.					
62	11.45	10.53	9.74	9.05	8.48
72	9.79	9.13	8.56	8.01	7.54
82	8.27	7.74	7.28	6.86	6.48
One Life 72 Years old.					
72	7.69	7.28	6.93	6.54	6.24
82	5.58	5.33	5.11	4.89	4.70
One Life 82 Years old.					
82	2.27	2.22	2.18	2.15	2.11

T A B. IX.

Whereby is shewn the Value of an Annuity in Years and decimal Parts for three Lives, to continue till they are all dead, at 4, 5, 6, 7 and 8 per Cent.

		One Life two Years old.				
		4per Cen.	5per Cen.	6per Cen.	7per Cen.	8per Cen.
Two Years old.	2	21.61	18.53	15.53	13.28	11.93
	12	22.14	18.95	15.85	13.44	12.21
	22	21.85	18.63	15.67	13.34	11.99
	32	21.40	18.38	15.25	13.45	11.96
	42	20.94	18.06	15.36	13.33	11.99
	52	20.52	17.69	15.02	13.02	11.76
	62	20.08	17.34	14.76	13.85	11.66
	72	19.82	17.21	14.72	12.77	11.51
	82	19.67	17.08	14.59	12.68	11.44
Twelve Years old.	12	22.61	19.24	16.04	13.48	12.28
	22	22.31	19.00	15.98	13.42	12.21
	32	22.02	18.64	15.68	13.38	12.17
	42	21.56	18.44	15.57	13.32	12.13
	52	21.24	18.22	15.43	13.22	12.03
	62	20.93	18.02	15.33	12.15	11.90
	72	20.70	17.89	15.24	12.08	11.86
82	20.61	17.80	15.19	12.06	11.85	

One

		One Life two Years old.				
		4per Cen.	5per Cen.	6per Cen.	7per Cen.	8per Cen.
22 Years old.	22	22.12	18.74	15.84	13.47	12.08
	32	21.53	18.32	15.52	13.35	12.04
	42	21.21	18.11	15.44	13.30	11.98
	52	20.80	17.81	15.22	13.15	11.85
	62	20.45	17.61	15.11	13.06	11.76
	72	20.20	17.42	14.96	12.90	11.57
	82	20.06	17.27	14.83	12.76	11.51
	32 Years old.	32	21.02	17.83	15.28	13.31
42		20.62	17.60	15.03	13.15	11.87
52		20.13	17.22	14.86	13.01	11.74
62		19.66	17.03	14.69	12.90	11.65
72		19.38	16.80	14.50	12.72	11.49
82		19.22	16.67	14.39	12.64	11.43
42 Years old.	42	20.06	17.22	14.82	13.03	11.82
	52	19.55	16.91	14.62	12.89	11.63
	62	19.03	16.54	14.38	12.58	11.41
	72	18.56	16.20	14.14	12.46	11.29
Aged 52.	52	18.92	16.49	14.31	12.61	11.40
	62	18.32	16.06	14.02	12.27	11.21
	72	17.73	15.68	13.71	12.10	11.01
	82	17.62	15.48	13.52	11.98	10.88
62.	62	17.62	15.50	13.68	12.04	10.98
	72	17.06	15.10	13.29	11.80	10.74
	82	16.15	14.83	12.23	11.57	10.53
72.	72	16.43	14.57	12.84	12.38	10.35
	82	15.97	14.19	12.51	11.09	10.10
82.	82	15.42	13.68	12.05	10.72	9.77

O

One

		One Life 12 Years old.				
2 ^d Life.	3 ^d Life.	4per Cen.	5per Cen.	6per Cen.	7per Cen.	8per Cen.
		12	23.01	19.54	16.19	13.46
22	22.71	19.30	16.12	13.46	12.28	
12 Years old.	32	22.53	19.02	15.93	13.45	12.19
	42	22.10	18.89	15.83	13.42	12.15
	52	21.89	18.70	15.77	13.90	12.58
	62	21.69	18.51	15.64	13.27	12.11
22 Years old.	72	21.45	18.45	15.64	13.25	12.05
	82	21.39	18.39	15.58	13.22	12.02
	22	22.52	19.08	16.15	13.62	12.33
	32	22.44	18.71	15.83	13.49	12.24
32 Years old.	42	21.76	18.54	15.82	13.46	12.18
	52	21.47	18.31	15.63	13.36	12.12
	62	21.18	18.15	15.54	13.31	12.08
	72	20.98	18.02	15.45	13.19	11.92
42 Years old.	82	20.86	17.95	15.38	13.19	11.96
	32	21.64	18.34	15.53	13.40	12.17
	42	21.28	18.15	15.37	13.30	12.06
	52	20.93	17.92	15.30	13.21	11.93
52 Years old.	62	20.49	17.65	15.16	13.14	11.90
	72	20.33	17.53	15.09	13.08	11.80
	82	20.25	17.46	14.99	12.99	11.71
	42	20.84	17.88	15.36	13.36	12.06
Aged 42.	52	20.45	17.65	15.21	13.22	11.94
	62	20.08	17.37	15.00	13.04	11.79
	72	19.66	17.11	14.87	12.95	11.72
	82	19.60	17.04	14.78	12.89	11.66

One

		One Life 12 Years old.				
2 ^d Life.	3 ^d Life.	4per Cen.	5per Cen.	6per Cen.	7per Cen.	8per Cen.
		52	19.98	17.12	14.97	13.00
62	19.53	16.98	14.82	12.82	11.66	
72	19.17	16.72	14.55	12.67	11.53	
82	18.98	16.59	14.43	12.60	11.45	
Aged 52.	62	18.99	16.55	14.39	12.68	11.50
	72	18.54	16.27	14.22	12.45	11.34
	82	18.32	16.08	14.05	12.31	11.21
62.	72	18.03	15.90	14.06	12.20	11.12
	82	17.73	15.65	13.72	12.03	10.96
72.	82	17.31	15.30	13.43	11.79	10.73
One Life 22 Years old.						
22 Years old.	22	22.43	18.82	15.99	13.58	12.27
	32	21.74	18.34	15.58	13.38	12.12
	42	21.54	18.28	15.63	13.47	11.99
	52	21.31	18.01	15.39	13.28	11.93
	62	20.85	17.77	15.29	13.20	11.91
	72	20.61	17.57	15.13	13.12	11.82
	82	20.46	17.46	15.07	13.04	11.79

O 2

One

		One Life 22 Years old.				
		4 per C.	5 per C.	6 per C.	7 per C.	8 per C.
32 Years old.	2 ^d Life.					
	3 ^d Life.					
	32	21.14	17.91	15.31	13.33	12.09
	42	20.84	17.72	15.20	13.24	11.99
	52	20.27	17.39	15.00	13.10	11.87
	62	19.93	17.15	14.86	13.01	11.77
42 Years old.	72	19.70	16.95	14.69	12.83	11.62
	82	19.56	18.83	14.60	12.80	11.57
	42	20.53	17.52	15.10	13.17	11.76
	52	19.89	17.10	14.86	13.05	11.70
	62	19.49	16.84	14.68	12.82	11.51
	72	19.04	16.51	14.46	12.65	11.35
Aged 52.	82	18.92	16.38	14.34	12.59	11.33
	52	19.30	16.64	14.56	12.78	11.59
	62	18.81	16.32	14.33	12.61	11.42
	72	18.37	15.97	14.05	12.36	11.28
Aged 62.	82	18.14	15.79	13.89	12.28	11.16
	62	18.22	15.87	13.95	12.31	11.20
	72	17.71	15.50	13.69	12.07	10.94
72.	82	17.39	15.23	13.47	11.93	10.86
	72	17.11	15.01	13.28	11.70	10.62
82.	82	16.70	14.67	13.00	11.51	10.48
	82	16.17	14.22	12.62	11.22	10.25

One

		One Life 32 Years old.				
		4 per Cen.	5 per Cen.	6 per Cen.	7 per Cen.	8 per Cen.
32 Years old.	2 ^d Life.					
	3 ^d Life.					
	32	20.63	17.49	15.01	13.34	12.18
	42	20.18	17.18	14.81	13.13	11.84
	52	19.65	16.86	14.61	13.03	11.77
	62	19.28	16.58	14.44	12.87	11.68
42 Years old.	72	18.85	16.30	14.22	12.68	11.53
	82	18.68	16.17	14.12	12.60	11.44
	42	19.64	16.80	14.55	12.91	11.63
	52	19.05	16.44	14.39	12.77	11.49
	62	18.51	16.07	14.09	12.56	11.33
	72	17.99	15.70	13.87	12.33	11.12
Aged 52.	82	17.85	15.56	13.69	12.16	11.04
	52	18.34	15.99	14.07	12.52	11.31
	62	17.72	15.45	13.74	12.29	11.14
	72	17.19	15.12	13.41	12.01	10.92
62.	82	16.93	14.91	13.22	11.89	10.77
	62	16.95	14.96	13.28	11.96	10.90
	72	16.33	14.50	12.95	11.68	10.63
72.	82	15.98	14.19	12.67	11.39	10.41
	72	15.59	13.90	12.45	11.24	10.27
82.	82	15.12	13.48	12.08	10.93	9.97
	82	14.50	12.95	11.63	10.54	9.59

One

		One Life 42 Years old.				
		4perCen.	5perCen.	6perCen.	7perCen.	8perCen.
42 Years old.	2 ^d Life.					
	3 ^d Life.					
	42	18.94	16.35	14.30	12.74	11.52
	52	17.20	15.90	14.07	12.58	11.27
	62	17.67	15.46	13.68	12.23	11.04
52 Years old.	72	16.95	14.94	13.35	11.98	10.89
	82	16.82	14.78	13.14	11.80	10.71
	52	17.51	15.35	13.61	12.20	11.01
	62	16.76	14.87	13.35	12.06	10.98
	72	16.04	14.26	12.84	11.59	10.55
Aged 62.	82	15.77	14.02	12.59	11.39	10.35
	62	15.90	14.12	12.67	11.43	10.42
	72	15.04	13.48	12.22	11.07	10.12
	82	14.64	13.11	11.84	10.75	9.82
	72	14.04	12.67	11.58	10.53	9.69
82.	82	13.47	12.18	11.09	10.12	9.31
	82	12.73	11.47	10.43	9.54	8.75

		One Life 52 Years old.				
		4perCen.	5perCen.	6perCen.	7perCen.	8perCen.
52 Years old.	2 ^d Life.					
	3 ^d Life.					
	52	16.59	14.80	13.19	11.85	11.23
	62	15.72	14.07	12.68	11.47	10.47
	72	14.95	13.42	12.16	11.01	10.14
Aged 62.	82	14.51	13.07	11.84	10.78	9.89
	62	14.68	13.22	11.98	10.95	10.07
	72	13.70	12.47	11.41	10.44	9.65
	82	13.15	11.96	10.95	10.06	9.29
	72	12.63	11.53	10.61	9.73	9.08
One Life 62 Years old.	82	11.85	10.85	9.99	9.22	8.51
	82	10.78	9.92	9.15	8.48	7.89
	62	13.41	12.14	11.08	10.13	9.56
	72	12.28	11.27	10.41	9.65	9.01
	82	11.49	10.56	9.76	9.09	8.51
One Life 72 Years old.	72	10.90	10.13	9.47	8.82	8.28
	82	9.87	9.20	8.62	8.07	7.60
	82	8.44	7.90	7.42	6.98	6.59
	72	9.19	8.64	8.19	7.64	7.26
	82	7.82	7.40	7.03	6.65	6.36
One Life 82 Years old.	82	5.85	5.59	5.37	5.14	4.95
	82	2.86	2.80	2.75	2.71	2.68

One

T A B.

T A B. X.

Shewing the Value of the decimal Parts of a Year in Months and Weeks; useful for finding the Value of those Parts in the preceding Tables.

Parts.	Value in M.W.	Parts.	Value in M.W.	Parts.	Value in M.W.
.02	0 1	.35	4 2	.67	8 3
.04	0 2	.37	4 3	.69	9 0
.06	0 3	.38	5 0	.71	9 1
.08	1 0	.40	5 1	.73	9 2
.10	1 1	.42	5 2	.75	9 3
.12	1 2	.44	5 3	.77	10 0
.13	1 3	.46	6 0	.79	10 1
.15	2 0	.48	6 1	.81	10 2
.17	2 1	.50	6 2	.83	10 3
.19	2 2	.52	6 3	.85	11 0
.21	2 3	.54	7 0	.87	11 1
.23	3 0	.56	7 1	.88	11 2
.25	3 1	.58	7 2	.90	11 3
.27	3 2	.60	7 3	.92	12 0
.29	3 3	.62	8 0	.94	12 1
.31	4 0	.63	8 1	.96	12 2
.33	4 1	.65	8 2	.98	12 3

T A B. XI.

Shewing the Value of the decimal Parts of a Pound in Shillings and Pence at one View.

Parts.	s.	d.	Parts.	s.	d.	Parts.	s.	d.
.004	0	1	.062	1	03	.163	3	03
.008	0	2	.066	1	04	.173	3	06
.012	0	3	.070	1	05	.183	3	09
.017	0	4	.075	1	06	.204	4	00
.021	0	5	.079	1	07	.214	4	03
.025	0	6	.083	1	08	.224	4	06
.029	0	7	.087	1	09	.244	4	09
.033	0	8	.091	1	10	.255	5	00
.037	0	9	.096	1	11	.265	5	03
.042	0	10	.100	2	00	.275	5	06
.046	0	11	.112	2	03	.285	5	09
.050	1	00	.122	2	06	.306	6	00
.054	1	01	.142	2	09	.316	6	03
.058	1	02	.153	3	00	.326	6	06

Parts.	s.	d.	Parts.	s.	d.	Parts.	s.	d.
.34	6	:09	.57	11	:06	.81	16	:03
.35	7	:00	.58	11	:09	.82	16	:06
.36	7	:03	.60	12	:00	.84	16	:09
.37	7	:06	.61	12	:03	.85	17	:00
.38	7	:09	.62	12	:06	.86	17	:03
.40	8	:00	.64	12	:09	.87	17	:06
.41	8	:03	.65	13	:00	.88	17	:09
.42	8	:06	.66	13	:03	.90	18	:00
.44	8	:09	.67	13	:06	.91	18	:03
.45	9	:00	.68	13	:09	.92	18	:06
.46	9	:03	.70	14	:00	.94	18	:09
.47	9	:06	.71	14	:03	.95	19	:00
.48	9	:09	.72	14	:06	.96	19	:03
.50	10	:00	.74	14	:09	.97	19	:06
.51	10	:03	.75	15	:00	.98	19	:09
.52	10	:06	.76	15	:03	1.00	20	:00
.54	10	:09	.77	15	:06	1.01	20	:03
.55	11	:00	.78	15	:09	1.02	20	:06
.56	11	:03	.80	16	:00	1.04	20	:09

A NEW



A NEW and EASY

METHOD

For finding the

Number of Solid FEET

Contained in any Timber-Trees before
they are cut down,

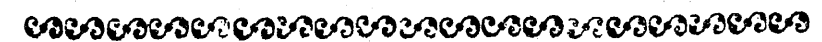
By the Help of a

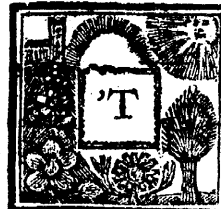
Common Quadrant and a Micrometer.

With a familiar Description of the Instruments,
and Directions for the Use of them.

Whereby Gentlemen may inform themselves how to
Sell, and the Artificer how to Buy Timber by
the Tree.

By *JOHN RICHARDS.*





IS a common Practice when a Gentleman designs to dispose of any Timber-Trees, he goes into the Woods or Groves, and sets a Mark on such Trees as he judges convenient to be cut down; and then lets it be known abroad, that Chapmen may have Opportunity of viewing the Trees before the Day of Sale.

In bargaining, the Carpenters, Shipwrights, &c. are for the most part willing to agree at so much *per* Tree, or so much for the whole Quantity, imagining perhaps that they can give a better Guess, as to the Quantity, than the Seller can, and so BITE him, as they sometimes express it. But whether they are not very often mistaken, and so bite themselves, is a Question to be solved by such Persons as they have hired to measure for them after it has been cut down, (for some of those that buy Timber can't measure it) who I believe will find it in the affirmative.

However, this way of dealing is oftentimes agreed to; the Gentleman, depending either on his own Judgment, or calling in the Assistance of some other Person, whom he hath Reason to think understands it. He farther considers, that by this way of dealing, all Cavils about the Mensuration are prevented, and that he hath nothing to trouble himself
about

about but the Price, and the Security for the Payment of the Money.

How useful would it be now to both Parties, could they but know before-hand the Quantity of the Timber? For by this the Gentleman would be as well instructed to accept of a just and reasonable Offer when it was made to him, as to guard himself against the wilful Impositions of knavish, and the as prejudicial Mistakes of ignorant Chapmen.

The greatest Pretenders to nice guessing in these Cases, have doubtless found themselves very wide from Truth, especially in large Timber; and therefore they'll be sure to keep within Compass, as they call it; that is, they will be sure, if they do agree, to make such a Bargain as they may get by; and one of the Parties hath as much Reason as the other to be thus cautious; by which Rule no Bargain can be made, unless one of the Parties at least be deceiv'd in his Judgment; for 'tis next to impossible that ever the Buyer or Seller should hit right by this random Guess.

It often happens, that thro' this Difference in Judgment no Agreement can be made; whereas if both Parties knew the Quantity of Timber, the Price would perhaps be easily accommodated betwixt them. But the commonly known Methods of measuring will by no means discover the Quantity of Timber, unless the Length and Girt of the Trees be first measured with a Rule and Line; and some People are so obstinately wedded to their own

own way of dealing, that they will by no means be prevailed upon to buy or sell by the Ton or Load, and have it measur'd when down.

To remove this Difficulty therefore, is the chief Design of this *Appendix*; and was the only Motive that put me upon contriving this Instrument, by which the Length and the Diameter of any Tree may be found by Inspection only; and tho' perhaps it may not be found so exact as it can by the Rule and Line when down, yet will the Errors be very inconsiderable to a careful Observer; as will, I believe, be allow'd by every body that can understand the Construction of the Instrument.



S E C T. I.

The Description and Use of the Quadrant for taking the Height or Length of Trees.

I SHALL not take any notice of the Errors in the customary Way of measuring Timber, by girting the Trees in the middle of the Length, and taking the quarter Part of that Girt for the Side of the Square: That this is not a true Way for finding the Content, hath been plainly enough made appear by others; but as the Custom of measuring round Timber in that manner hath so long

long prevailed, and as divers very good Reasons have been given for allowing the Buyer these Advantages; I shall suppose it an establish'd Rule, and take it for granted, that the Quantity so found is the Number of Feet that both Parties are contented to compute the Tree at.

But the Difficulty of measuring growing Timber (as before hinted) consists in finding the Length, and Girt in the middle of that Length; both which Dimensions are very difficult, troublesome, and sometimes impossible to be taken by climbing the Tree, and I presume may be found to as much Nicety as the matter requires, by the following Instruments.

And first, For finding the Height or Length of any Tree, and the Middle of that Length.

The Instrument that I would recommend for this Purpose, is no other than a common Quadrant of about 12 Inches Radius, or more, such as that described in *Fig. 1.* which may be made of Brass, Box, Pear-tree, Holly, or the like; and upon this Quadrant (if it be made for this purpose) may be inserted the two Graduations of the Quadrantal Arch within that of the Degrees, divided so as to shew at one View the Altitude of any Object in Feet or Yards, being observed at a Station 10 or 20 Feet or Yards distant from a Perpendicular suppos'd to fall from the top of the Object; or, which is all one (if the Object

Object stand upright) at a Station 10 or 20 Feet or Yards distant from the Foot of the Object, be it Tree, Tower, Steeple, or the like.

But tho' these Lines are very handy for the purpose, because they do at one View, without any farther Trouble, shew the Length required; yet are they not absolutely necessary: for any Person that is but furnished with a Quadrant that hath only the Degrees on the Arch, need only to refer himself to the following Table; where finding the Degrees that are cut by the Thread in Observation on the Limb of the Quadrant, in the first Column, right against it, in their proper Columns, is the Height of the Object in Feet or Yards when the Station is 10 or 20 distant: and also in another Column of the same Table is the Length of the Hypothenufal Line, that is, the Distance of the Apex of the Object, or the Point observ'd from the Eye of the Observer: Which last Numbers may be likewise inserted in two other Lines within the former ones on the Quadrant, if it be design'd for this Use. These Lines I have likewise described in the Figure of the Quadrant hereto annexed.

In *Fig. 2,* and *3.* are described the Form of the Vanes to be fix'd at the time of Observation on the Edge of the Quadrant; the former, which I call the Eye-vane, (because it is to be held to the Eye in observing) having a Hole to look thro' at *E,* the Jaw of this

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this

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this *A* must be fix'd on the Edge of the Quadrant at *A*; and the other, which is the Object-vane, must be fix'd in like manner on the same Edge at *B*.

The Ball or Plummet suspended by a fine Thread at the Center *C*, (as is always the way in this sort of Quadrants) compleats the Instrument, and renders it fit for finding the Angle that a Line drawn from the Eye of the Observer to the Object observ'd, makes with the Horizon.

The way and manner of observing the Height of the Moon or Stars, or of any Tree, Tower, or the like, by the Quadrant, is thus: Holding the Quadrant in your Hand (the Vanes being first fix'd as before) with the Hole of the Eye-vane to your Eye, and turning towards the Object, move the Instrument so, that when you look through the Hole in the Eye-vane, the Edge of the Object Vane *DF* may cut the top of the Object, or that Place of it whose Height you would know. At the same time the Thread and Plummet playing free and steadily, observe the Number of Degrees which it cuts on the Limb of the Quadrant; and this is the Altitude in Degrees, or the Number of Degrees contain'd in the Angle made by the Horizon, and the Line drawn from the Object observ'd to the Eye of the Observer.

Let this suffice, as to the general Use of the Instrument; I come now to apply this to
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the finding the Height or Length of any upright Object in Feet or Yards.

With a Line, Rod, or the like, measure off 10 or 20 Feet or Yards from the Foot of the Object, any way that you shall judge most convenient for your purpose, and there fix your Station for observing; and having in the manner before described, found the Height of the Object in Degrees, right against it on the Quadrant (if those Lines are graduated thereon) or in the Tables for that purpose, under the stationary Distance, is the Height of the Object in Feet or Yards, &c. according to that Measure which you measur'd off the stationary Distance with. But here must be understood, that the Altitude or Length thus found, is only of that Part of the Tree, &c. that is above the Level of the Eye of the Person that observes.

And hence to find the whole Length of the Object from the Ground it stands on, which in measuring Timber-trees is the Length that must be used: Turn the Quadrant (held at your Eye as before, till the Thread of the Plummet falls on the Line *CG*, and then mark the Place in the Object which is cut by the Edge *DF* of the Object-vane, which Place I call the horizontal Level; measure with a Rule the Height of this Mark above the Ground, and add that Measure to the Length before found, for the whole Length of the Tree, &c. above the Ground whereon it stands: but with this Caution,
Q 2 that

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that it is not true except the Point of the Object observ'd for the Height, be perpendicular to that Place of it from which you measure off the Distance of the Station.

Wherefore in taking the Length of Timber-trees, &c. which stand inclining, if that Inclination be but little, a small Allowance may be made according to Judgment. But if a Tree leans very much, as sometimes they do; then the best way will be to fix your Station so, that the Inclination may be towards the right or left Hand, and not from or towards the Station; and having first of all, in the manner before-mention'd, found the Mark on the Tree level with your Eye, that is, the horizontal Level; fasten one End of the Line that you measure the stationary Distance with, to that place in the Tree, and the other End to the Centre of the Quadrant; change places with the Vanes, fixing the Eye-vane at *B*, and the other at *H*, and holding out the Quadrant so as to keep the Line streight; move yourself to the right or left, till you bring the Line as near as you can to make a right Angle with the leaning Tree; then thro' the Hole in the Vane, and by the Edge of the Object-vane, observe by moving the Quadrant, and leaving it answerable to the Tree, the Top or Point from which you would take the Length; at the same time the Line extended from the Tree, and passing over the flat Side of the Quadrant, will cut thereon the Degrees, answering to the
Length,

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Length, in the same Nature as it was said to be cut by the String of the Plummet in the former Observation of upright Trees; and then the Length from the horizontal Level added to this, gives the whole Length of the Tree.

Tho' this may seem a little difficult at first, I doubt not but a little Practice will render it easy enough to find the Length of any Tree. What remains therefore towards the computing the Number of Feet contained in it, is to find how much the Tree will square in the Middle. But first, 'tis necessary to shew how the Middle of the Tree may be found, or the Place where it ought to be girt, in order to find the Content in Feet. Thus:

From the half Length of the Tree, found before, subtract the Length below the horizontal Level, and note the Remainder or the Degrees correspondent thereto. Then take the Quadrant, the Vanes fix'd as in the first Case; and hold it so to your Eye, that the String of the Plummet may fall on the said Degrees, and at the same time see what Place in the Tree is cut by the Edge of the Object-vane *DE*; and this is the Place that the Tree is to be girt at, *viz.* the Middle of the Length of it. But if at this Place there should happen to be Branches or Limbs growing out, then the nearest smooth Place above or below must be made choice of, allowing something, if need be, according to Discretion. The Middle being thus found, you may, by taking

king notice of some Limb or other Mark, be able to find the Place after you have laid down the Quadrant.

But because the Distance of this Place from the Eye of the Observer, (which is the Length of the visual Ray, or the Hypothenufe of a right-angled Triangle; one of whose Legs is the Tree, and the other the Line of Station) is necessary towards finding the Bigness of the Tree at the Place assigned; I have therefore (as I said before) inserted that likewise on the Quadrant, and also in the following Table; which is too plain to need any Explanation more than hath already been given of it.



A TABLE

A TABLE shewing the Altitude of any Object, and the Distance of the Top thereof from the Eye of the Observer; being seen from a Station of 10 or 20 Feet or Yards Distance, answering to the Degrees of the Quadrant from 15 to 85 Degrees.

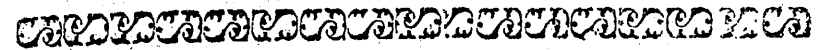
Degr. on the Quadr.	Station at 10 Distance Length.	Dift. from the Eye.	Station at 20 Distance Length.	Dift. from the Eye.
15	2. 7	10.3	5. 4	20.6
20	3. 6	10.6	7. 2	21.2
25	4. 7	11.0	9. 4	22.0
30	5. 8	11.5	11. 6	23.0
35	7. 0	12.2	14. 0	24.4
40	8. 4	13.0	16. 8	26.0
45	10. 0	14.1	20. 0	28.2
50	11. 9	15.6	23. 8	31.2
53	13. 3	16.6	26. 6	33.2
56	14. 8	17.9	29. 6	35.8
58	16. 0	18.9	32. 0	37.8
60	17. 3	20.0	34. 6	40.0
62	18. 8	21.3	37. 3	42.6
64	20. 5	22.8	41. 0	45.6
66	22. 5	24.6	45. 0	49.2
68	24. 7	26.7	49. 4	53.4
70	27. 5	29.2	55. 0	58.4
71	29. 0	30.7	58. 0	61.4
72	30. 8	32.4	61. 6	64.8

Degr.

Degr. on Quadr.	Station at 10	Distan. from the Eye.	Station at 20	Distan. from the Eye.
	Length.		Length.	
73	32.7	34.2	65.4	68.4
74	34.9	36.3	69.8	72.6
75	37.3	38.6	74.6	77.2
76	40.1	41.3	80.2	82.6
77	43.3	44.4	86.6	88.8
78	47.0	48.1	94.0	96.2
79	51.4	52.4	102.8	104.8
80	56.7	57.9	113.4	115.2
81	63.1	63.9	126.2	127.8
82	71.1	71.8	142.2	143.6
83	81.4	82.0	162.8	164.0
84	95.1	95.7	190.2	191.4
85	114.3	114.7	228.6	229.4

I might here subjoin a Table of the Degrees of the Quadrant answering to every Foot of the Length of the Object, for the more easy graduating the Lines on the Quadrant: But as this would be only useful to such as make Instruments, to whom it will not be difficult to form such a Table for their own Use, I have omitted it; and proceed to

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SECT. II.

The Description and Use of the Micrometer for finding the Bigness of a distant Object.

THIS Instrument consists of a sliding Rule, which when shut is two Foot long, and will draw out to about four Foot; the Edges running one in the other, with a Brass at each End for the Pieces to slide thro'; much of the Form of a Glasier's Dimension-Rule.

On the Edges of this Rule are Lines graduated; one to shew the Diameter of the Object, another, how much a Tree of that Diameter will square, according to the common Method of taking one quarter of the Girt for the Side of the Square. There will be room for other Lines; such as the Circumference, the Area (which I take to be very useful, for the readily computing the Quantity of Timber by Pen) the Side of the Square equal, or the like, according to any Person's Fancy. On the other Side may be put Lines of Numbers; and the Timber Line, for the ready casting up the Dimensions when taken, according to the common Form of Carpenters Sliding Rules: but all this is as People please.

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To one End of this Rule must be fitted an Eye-vane, in all respects like that for the Quadrant, save that the Jaw for putting it on may be different; and for the other End must be a Piece fitted to stand cross the Rule upon its Edge, and at right Angles with the flat Side of it. This Piece may be about one Inch square, and four Inches long; and along the middle of the upper Side thereof must be a Groove work'd Dove-tail ways, for the End of a Vane to slide in, and to stand steady when fix'd. To this Groove must be fitted two Vanes, which are to be moved at a greater or less Distance; each Vane turning crooked at the top, for the convenient straining of a Thread in; which two Threads must always stand upright, and parallel to one another. The Form of the Groove-piece, see in *Fig. 4.* and of the Vanes, *Fig. 5.* One of these Vanes may be fix'd, but the other must be moveable. The Edges of the groov'd Piece are graduated and number'd from the fix'd Vane with 10, 20, 30, &c. The Use of which Division is for fixing the moveable Vane to the Distance of the Object from the Eye at the time of Observation.

It would be losing time, to shew the manner of constructing these Lines on the sliding Rule and Groove-piece; for those who would understand such a Construction, will comprehend it without any Directions; and to those who do not understand it, it will be of no Use at all: I shall therefore only give the follow-

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following Hint, as to the Foundation of them, *viz.* All the Rectangles arising from the Distance of the Vanes from each other, into the Distance of the Object from the Eye, are equal within themselves; and also equal to the Rectangles made by the Breadth of the Object into the nearest Distance of the Eye-Vane from the Line that joins the Object-Vanes.

Tho' I have order'd one of the Object-Vanes, for the sake of Conveniency, to be fix'd fast; yet I am sensible that in Strictness it should likewise move, so that the middle of the Sliding Rule might be always in the middle betwixt the two Strings. But the Error arising on this account will be of no Consequence in Practice; for when most, it will not be above three Minutes in the Angle at the Eye.

Having thus largely described the Instrument, I shall have the less Trouble in laying down the manner of using it to the purpose in hand.

For after the Length of the Tree, and the Place where it must be girt, is found by the Quadrant as before directed, and also the Distance of the Place from the Eye; Take the Micrometer, and having fix'd on the Eye-vane and the Groov'd-piece, set the moveable Object-vane to the Distance of the Object from the Eye, as before found; and applying the Hole in the Vane to your Eye, draw the

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Sliding

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Sliding Rule out, till the Threds of the Object-vanes do just include the Body of the Tree at the Place of girding it; then will the Brass on the End of the Rule cut, in the Line for that purpose, the Side of the Square by which the Tree is to be measur'd, and also the Area (if such a Line be inserted on the Rule); which Area being drawn into the Length, or otherwise wrought by the Sliding Rule, (according to the commonly known Methods of working it) will shew the Content in Feet. And this will agree with the Content found by girding the Tree, and taking a quarter of that Girt for the Square, if the Tree to be measur'd be truly circular in that Place where it comes to be measur'd: But if the Tree should in that Place happen to be flat, or rather Elliptical, as is very often the Case; then the best way will be to try it at two Stations, and take a Mean between the Area's found at each Station, for the true Area by which the Content is to be found.

This is to be observ'd, that the Way of measuring round Trees is to girt them on the Rind, and allow four Inches out of the Girt for the Thickness of the Rind, that is, one Inch square; or else to beat off the Rind, and then girt it. But now in growing Timber the Bark is not to be taken off; wherefore the Allowance of one Inch out of the Side of the Square must be made before the solid Content is computed.

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Here is farther to be noted, that on one Edge of the Rule is graduated the Side of the Square, when the Object-vanes must be so fix'd, as to be drawn in nearer to the Eye than two Foot, as will always happen when the Diameter of the Object is greater than 14 Inches; and on the other Edge, the Line is graduated so as to shew the Side of the Square when the Diameter of the Object is less than 14 Inches.

Because some People may be desirous of having an Instrument longer than two Foot, for the greater Nicety in Observation; I have here inserted a Table for the graduating thereof, by which the Lines of any Length may be divided; for 'tis but to divide a Line of the Length of the Sliding Rule betwixt the inner Brasses into 24 Parts, and each of these into 10; and from this Line set off the Parts, as in the *Table*, from either End where the Vanes are fix'd, and the thing is done; always remembring that each of the four Brasses must be exactly half of one of those 24 Parts in Breadth, or $\frac{1}{48}$ of the whole Length between the inner Brasses.

I have likewise drawn up another *Table* for graduating the Grove-piece; the Parts in which are to be taken from the same Line of equal Parts, and to begin at the fix'd Vane; which Vane should be fix'd $\frac{1}{3}$ of the whole Length of the Graduations on the Grove-piece from the Middle of the Jaw that fixes it to the Sliding Rule towards either End thereof.

A Ta-

A TABLE for graduating the Grove-piece.

Dist. of the Object in Feet.	Parts distant from the fix'd Vane.	Dist. of the Object.	Parts from the fix'd Vane.	Dist. of the Object.	Parts from the fix'd Vane.
10	3.00	16	1.87	30	1.00
11	2.73	17	1.76	40	0.75
12	2.50	18	1.67	60	0.50
13	2.31	19	1.58	80	0.37
14	2.14	20	1.50	100	0.33
15	2.00	21	1.43	120	0.25

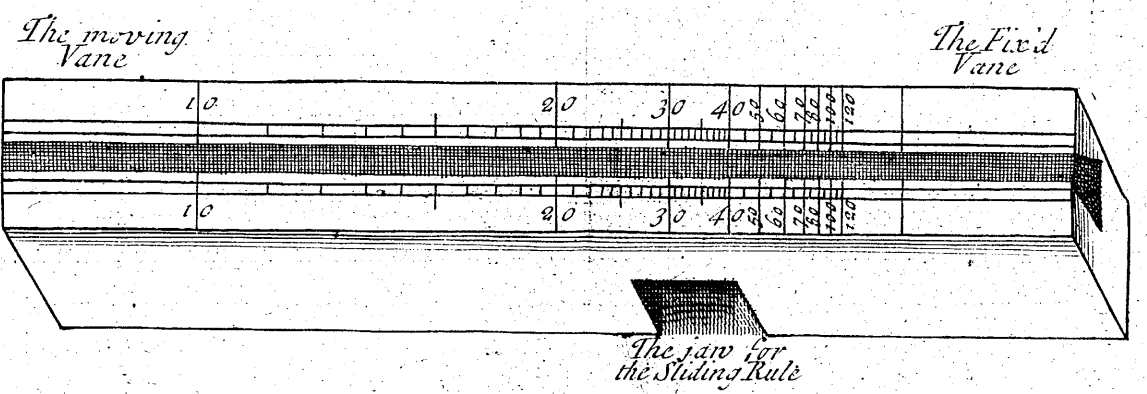
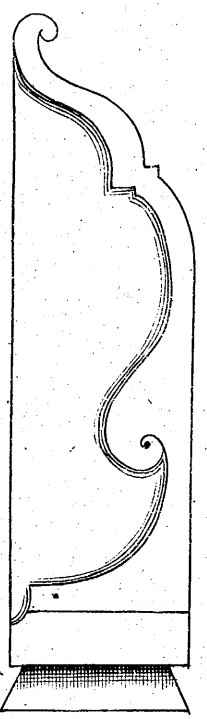
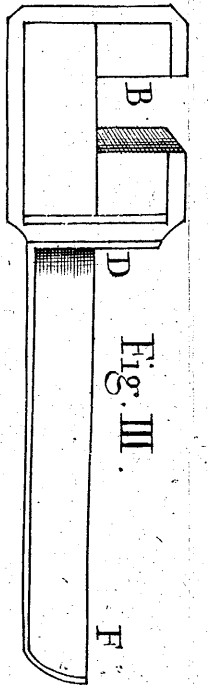
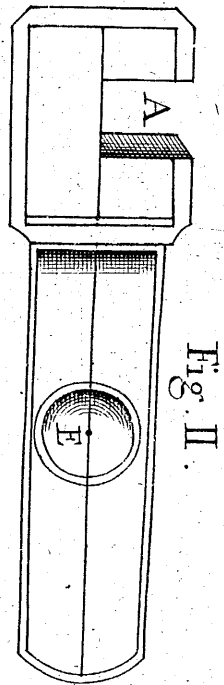
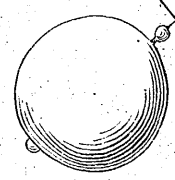
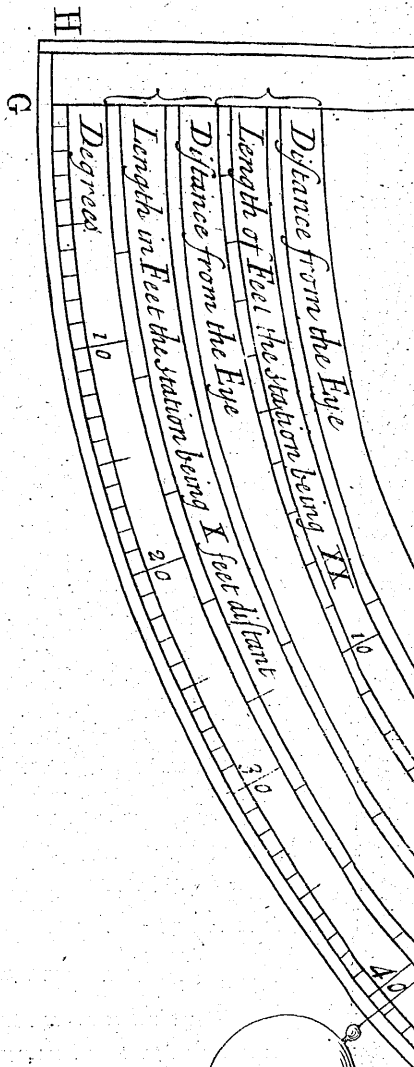


A TABLE

A TABLE for graduating the Sliding Scale of the Micrometer by a Scale of equal Parts; 24 of which Parts is the Length of the Scale (when shut) between the Brasses, shewing in Parts the Distance from the Eye-vane to every Inch of the Side of the Square from 6 to 36 Inches; and also shewing the Diameter of the Object answering to the Sides of the Square.

Side of the Square.	Diam ^r of the Object.	Parts distant from the Eye-vane to frings	Side of the Square.	Diam ^r of the Object.	Parts distant from the Eye-vane to frings
6	7.63	47.18	22	27.98	12.85
7	8.90	40.31	23	29.25	12.29
8	10.17	35.40	24	30.52	11.78
9	11.44	31.47	25	31.79	11.32
10	12.71	28.32	26	33.06	10.88
11	13.98	25.76	27	33.33	10.48
12	15.26	23.57	28	35.61	10.10
13	16.53	21.76			
14	17.80	20.20	29	36.88	10.73
15	19.07	18.86	30	38.15	9.43
16	20.35	17.68	31	38.42	9.13
17	21.62	16.64	32	37.70	9.84
18	22.89	15.71	33	40.97	8.57
19	24.16	14.88	34	42.24	8.32
20	25.43	14.14	35	43.52	8.08
21	26.70	13.47	36	44.79	7.86

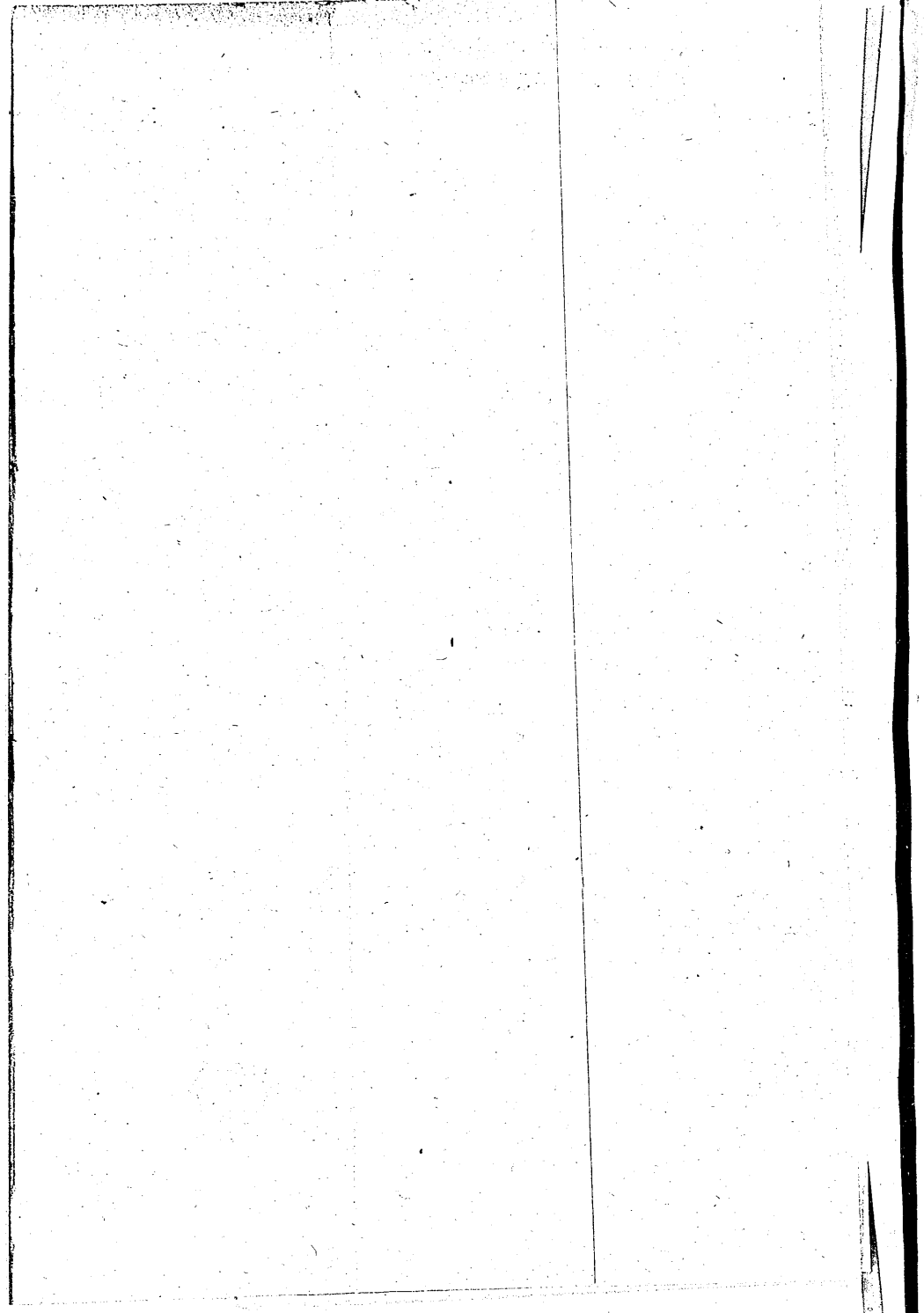
F I N I S.



The Sliding Rule partly drawn

10	11	12	13 Area	14
8	9	10	Side of sq.	11
5 or 1/2	6 or 2/3	7 or 3/4	Diameter	8 or 3/2
4 or 1/2		3 or 1/3		

5 6 7 8 9 ^{8m} 10 1 2 3 4 5



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