

A N
E S S A Y

ON THE

Proper Method

For FORMING the

Man of Business:

IN A

LETTER, &c.

By THOMAS WATTS,

Of the ACADEMY OF ACCOUNTANTS'
OFFICE for qualifying Young Gentle-
men for Business, in *Little Tower-street.*

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THE
PREFACE.

 *THE Design of
the following
LETTER is to
shew the Qualifications
to be learnt at this
Academy, and the Man-
ner of communicating
them; which are every
thing necessary for Busi-
ness,*

(ij)

ness, or Accomplishment, without the common Hindrances from Play-Days, Breakings-up, or other Vacations, or from any Delay occasioned by the Instructor's private Interest ; the general Qualifications being always taught by the Whole, not by the Quarter or Month.

The proper Age for Education here is from
about

(iiij)

about Thirteen or Fourteen upwards ; and the Young Gentlemen are not only such as are immediately designed for Trades, Merchandize, the Sea, Clerkships in Offices, or to Attorneys, or any other Employments in Business at home or abroad ; but those in general who are not designed for the Universities, or while they study there, intend

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intend to spend their Vacations in learning Accounts and Mathematicks, or in going through the Courses of Experimental Philosophy; the whole Education being so calculated, as to answer the Ends of those whose Fortunes are not abounding, as well as of the Rich, the Charge increasing only with the Number of Qualifications to be attained.



S I R,



IS but just, that he who undertakes so difficult and important a Concern, as any Part of Education is, ought to give some Satisfaction, how capable he is of the Performance ; especially if he proposes to do it in a Method out of the common Way, and in which others have not trod. In consequence of this Reflexion, I here present you with those *Sentiments* on the *Subject* of *Forming the Man of Business and Employment*, which the other day you were pleas'd to be so indulgent to, as to wish 'em committed

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mitted to Paper. There is no Inclination, I assure you, SIR, wanting in me to serve the Publick; and I must confess, the Success I have had with the hopeful Young *Gentlemen* you have done me the Honour to place under my Care, is an Encouragement to me to pursue its Advantage in what I can: But still, if it should receive any Benefit from my Service, 'twill be obliged to the Defe-
 rence due to a Judgment founded upon so large an Experience of Men and Business, and so accomplish'd as Yours, SIR; and to which, if I did not submit, I should forfeit my Own.

Importance of Education in general.

SIR, I need not observe, that *Educ*-
tion in general is of such vast Impor-
 tance, and of such singular Use in the
Scene of Life, that it visibly carries its
 own Recommendation along with it:
 For, on it in great measure depends
all that we hope to be, every Perfection
 that a generous and well-dispos'd Mind
 would gladly arrive at. 'Tis *this* that
 stamps the Distinction of Mankind, and
 renders

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renders one Man preferable to another ; is almost the very Capacity of doing well, and remarkably adorns every Point of Life. This is what no body will dispute ; and therefore 'twould be impertinent to insist on it. The Misfortune is, that, like a stately Mistress, 'tis difficult of Access ; 'twill not condescend to shew itself at the first Visit, but will be sought for as Silver, and search'd for as for hid Treasure, or 'twill not be seen, much less won. Hence it comes, that some have not Resolution enough to make Court to it ; and many that have, are discouraged, and forced to give over the Pursuit, and sit down under that unconceivable Loss that is always inseparable from the Want of it. Wherefore, an Attempt to make the Way to it more easy, may hope to be receiv'd with Indulgence, whatever the Success may prove. And since the same Difficulty, in proportion, that attends the Pursuit of *Education* in general, affects the particular Branch

I am concern'd for, if I can assist its Growth, and make it thrive and flourish with the greater Vigour, as 'twill yield me no small Pleasure, so it will justify the Undertaking to all that understand their own Interest, and desire (what's but natural for them to do) the Promotion of it.

*Education
for Busi-
ness.*

The superiour Advantage of this Part of *Education* will easily be confessed by all who shall but turn their Eyes upon this great and magnificent City, and consider that immense Wealth and extensive Commerce, which makes this Nation known to, and honour'd in the most distant Places of the habitable World. Hence, as from the Heart to the Body, flow such continual Streams, that diffuse Life and Spirit, Trade and Riches, through the Whole; here the best Returns are made of a ripen'd Capacity, and an improvable Fortune; here your Men of Years treasure up Abundance, and your young Men are best qualify'd to tread in their Industrious

trious and Successful Steps. The Man of *Commerce* is the Man of *Business*; 'tis his Element, and, to manage it well and successfully, his Care and Labour.

But to set out well, is to have his Business half done; and 'tis the Design of what I *here* offer, to prevent his Miscalrying; which, in great measure, depends on his *first* Appearance in the World, as that does upon the Qualifications he is Master of when he makes it. But I trust he'll be secure in this Point, if managed in the Method I advance. But,

SIR, I must premise, and 'twill be *Not every* own'd, that tho' He that undertakes to *Master of* teach an ART must be Master of it, yet *an Art e-* 'tis not every one that is Master of an *qually* Art, that is equally qualify'd to teach *qualify'd* it; since many times it is much more *to teach it.* difficult to communicate an Art to another, than it is to attain it ourselves: And the Reason is visible; because the *Capacities* and *Tempers* he has to do with, may be as various as the Number
of

*Different
Capacities
and Tem-
pers re-
quire dif-
ferent Ma-
nagement.*

of his Pupils ; so that his first Care must be to make a right Judgment of their several *Capacities* and *Tempers*, which he must always have in his Eye, when he sets them Rules, and deals out Instruction to them. 'Tis in vain, as 'tis unmerciful, to lash on the Horse that has no Heels ; but the Tutor's Skill, and the Pupil's Industry, in time will improve and brighten the less promising and more cloudy Parts ; and the narrow Genius will widen and enlarge under the Art of infusing Instruction into it leisurely and by degrees ; but to pour all at once, is to throw it beside the Understanding, and to leave it unwater'd, and consequently unfruitful : Besides, the slow and less forward Disposition is not so happily drove on, as 'tis led and encouraged, by having laid before it such Examples, as though they once labour'd under the same Disadvantages of Nature, yet by Desire, Diligence, and Resolution, conquer'd the Ruggedness of

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of the Way, and at length arrived at great Mastery and Perfection.

Secondly, On the other hand, tho', where Nature has been more generous of her Gifts, and the Pupil's more ready Apprehension and Felicity of Parts save the Instructor much Time and Labour ; yet *there* the Exercise of his Skill and Judgment is rarely less, but generally more indispensably required. For, as in the *former* Instance, he can't have too much Patience and Diligence, so in *this* he can hardly be enough on the Guard and Watch ; but must still have his Eye on his CHARGE, and narrowly observe his Motions ; which if he does not find very various and inconstant, 'tis more than he ought to expect ; both Reason and Experience forbid it. And therefore, tho' he be at less Trouble to point out to him the Path he is to tread in, and the End it leads him to ; yet to prevent his breaking out of it, and to confine him to it, often proves a sufficient Trial of his Skill.

Besides,

Besides, the finest Parts, like your finest cutting Instruments, soonest lose their Edge, are soonest tired, and turn'd in the Pursuit of Knowledge: If the Difficulty on the first Summons does not open and make way for them, they are too delicate upon a Repulse to renew the Attack; instead of resolutely cutting their Way thro', they retire and divert on some Object, if not sensibly prejudicial, yet at least insignificant to their Purpose.

Besides, in *this* Case, the Imagination is apt to conceive so thick and hastily, that the Ideas either stifle and destroy each other in the very Birth, or else crowd so fast on the Understanding, that how inconsistent soever they be in their own Nature, yet it often can't apprehend or see the Difference; much less has it time to digest and sort, and range them into their proper Classes; nor will they stay for the Operation of the Judgment, but rush on the World without its Passport. And what, I pray,
can

can such a huddled Production be good for? Only, like the Monsters of *Africa*, to be admired for its Imperfections and Deformities.

Wherefore, since as the luxuriant Vine, unless artfully dress'd and pruned, runs out into Wood, but yields nothing in the Time of Vintage, but an unprofitable Shew of Leaves; so your quick and flowing Parts, unless guided with singular Judgment and Dexterity, produce nothing beautiful or useful: How requisite is it, that the *Youths* blessed with such Advantages of pregnant Parts, should have their Conceptions assisted and regulated by the Care and Skill of an able Instructor, who shall, by the Rules of *Art*, direct their Progress through the Understanding and Judgment, so as they may at length be brought to Maturity, and prove of Service, and an Honour to the Owner; who himself, by that means, will be sure to become an Honour to his Country.

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But

But farther, as the different *Capacities* of Youth require a different Management for the Improvement of their Understandings; so a distinct and proper Regard must be had to their different natural Tempers and Dispositions, which commonly are the more or less gentle and tractable, as their Parts are the less or more brisk and prominent. A *mild Temper* generally attends upon the less lively Parts, and succeeds best under the Influence of Kindness and Tendernefs. *Here* a gracious Look is a mighty Encouragement; and the soft Voice has a strange Charm in it, and is answer'd in the Returns of a surprizing Proficiency and Advancement in Knowledge; whereas a lowring and angry Brow, or a sharp and severe Reproof, frightens and dashes such modest Tempers out of Countenance, and forces back their Parts into those dark Retreats, whence nothing but the mildest and sweetest Way of Persuasion could draw them forth, and produce them on
the

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the Stage of the World. And tho' the *Confidence*, that is generally observ'd to attend on the more forward and sprightly Parts, may, in order to reduce it to a modest and becoming Assurance, demand a Check; yet I must confess, I can't fall in with the Notion of the Necessity of *Severity* even in this case. A *generous* Spirit will regard Reason, and conclude it more fitting his Nature, to be led like a *Man*, than to be drove like a *Brute*. An *over severe* Usage has, I am satisfy'd, been the Ruin of Abundance of Youth, which an *engaging* Temper, and a discreet Conduct might have made eminently useful in their Generations. By saying so, I do not design to be understood to recommend a senseless Indulgence of Youth in misemploying their Time or Thoughts; *all* I mean is, that a great and active Spirit should only be regulated, and kept within just Bounds, but not broken, or subdu'd to an *Indolence* or *Stupidity*; which is the fatal Effect generally of *too rigid* a *Disci-*

pline. I have often observ'd the Success of this *Method*, in improving the *Understanding* : But in *fashioning* the *Manners*, such a *Moderation* can have no Place. For, Vice must not have the least Connivance, but, upon every Appearance, meet with such a Rebuke, as shall make it effectually retreat, and not dare to shew its Face. And as your richest Soil is the most subject to Weeds, so 'tis found, your most pregnant Genius is the most susceptible of ill *Impressions*. Here the *Senses* have not Patience to wait on the Judgment, but out-run it, and leave *Consideration* far behind 'em ; so that Vice has easy Admittance, and makes a cheap Conquest of the naked and defenceless Mind. Wherefore, the Instructor should have a very quick and careful Eye upon the *Avenue* that favours *Vice* ; and, if *Persuasion* will not do, should not forbear *Asperity*, rather than suffer his *Charge* to lie exposed to its Approaches, and in the way of Ruin.

Every Appearance of Vice to be suppressed.

What

What I have hitherto offer'd, in a manner *indifferently* affects the *Education* of the greener, as well as of the riper Years. But *those* that come more *immediately* under my *Management*, are generally of *Stature* fit for *Business*, and in an *Age* when the Love of Idleness is too often strong and predominant, and the Tide of Passion runs high, and carries all before it; and, drove on by the Vanity of *unthinking Youth*, impatiently brooks every necessary Restraint. But this is a *Crisis* of Life that often determines the whole *Course*; and therefore cannot be too narrowly observ'd, or too carefully provided for. *Business* and full Employment is the only Barrier to keep out the Enemy, and secure the Man: *Business a Preservative against Vice.* Vacant Hours move on heavily, and drag Rust and Filth along with them: A Breaking-up, or three or four Weeks *Vacation* in *this* time of Life, has often destroy'd the *Labour* of Years; and the *Youth*, by having nothing else to do, has contracted such ill Habits, which, it may be,

be, no Time or Skill could ever after root out : I need only appeal to the Experience of *those* who have mourn'd the Ruin of the once Hopeful and Promising, whether the Source of their Misfortunes has not very often proceeded from a Want of Employment.

Not that a continual Intenfeness on *Business* is necessary or convenient. For *Proper Recreations allowable and useful.* certainly, well-timed and innocent Recreations, while they divert, strengthen the *Faculties*, and add a fresh Sprightliness to the o'er-labour'd Mind : Only they should be so allotted, as rather to seem *Reliefs* from *Study*, than Set Times for *Idleness*. *Children* may play by the *Almanack* ; but he that is taking on him the Countenance of a *Man*, and intends for *Business*, should rather let the *Exchange* be his Oracle for *Vacations* ; especially, when he considers that Time insensibly glides on to the farthest Distances ; that *He* and his *Friends* are impatient till he lives for *himself*, and is settled to Satisfaction : And then what
vast

vaſt Hindrances and Interruptions muſt idle Days, Weeks and Months, needs be to him that perhaps has not above three or four Months to employ in Qualifying himſelf for *one* great *Buſineſs* of his *Life*?

'Twas theſe laſt Reflexions mov'd me to diſſent from the *Common Practice* in *this* reſpect, among many others, by breaking through the ancient *Cuſtom* of being *Idle* on all *Holy Days*, and in one regard or other loſing one Fourth of the Year in Vacations; which however pleaſing to the over-indulgent Mother, and Darling Child, muſt needs be of the moſt untoward Conſequence, as I have obſerv'd, in *our* Caſe. And I am the more confirm'd in *this*, and every other *Method* I have taken to promote the ſpeedy and perfect accompliſhing of *theſe* placed under my *Inspection*, in that, SIR, they entirely fall in with your *Sentiments*, and have likewise had the Approbation of moſt of thoſe Gentlemen I have had the Honour for ſome
Years

Years to be employ'd by. And now, SIR, give me Leave, as short as possible, particularly to touch on those *Qualifications* necessary to *Form* the *Man* of *Business*. And,

First, Whoever would be a *Man* of *Business*, must be a *Man* of *Correspondence*; and *Correspondence* can never be so commodiously, or at all to the Purpose maintain'd, as by the Use of the Pen: So that WRITING is the *First* Step, and *Essential* in furnishing out the *Man* of *Business*. And this *Qualification* is more excellent, as 'tis more useful in *Business*, and beautiful to the Eye, and may not improperly be consider'd in two respects, as it proceeds from the Eye and the Hand: From the one we have *Size* and *Proportion*, from the other *Boldness* and *Freedom*. For as the *Exactness* of the Eye fixes the *Heights* and *Distances*; so the *Motion* of the *Joints*, and *Position* of the *Hand*, determine the *Black* and *Fine* Strokes, and give the same *Inclination* and *Likeness* in the

the *Standing* and *Turn* of the LETTERS. But, in order to write *well*, there must be just Rules given, and much Practice to put 'em in Execution. Plain, Strong, and Neat *Writing*, as it best answers the Design for Use and Beauty, so it has most obtain'd among Men of *Business*; with whom all *affected* Flourishes, and quaint Devices of Birds and Bull-Beggars, are as much avoided, as Capering and Cutting in ordinary Walking. A full, free, open *Letter*, struck at once, as it discovers more of Nature, so it gives a Masterly Beauty to the Writing; to which may be added such Ornamental *Turns* of the *Pen*, as seem rather design'd to fill up Vacancies on the Paper, than studiously compos'd to adorn the Piece. In Flourishing, the *Fancy* would be so *Luxuriant*, was it not corrected by the *Judgment*, as almost to destroy the *End* of *Writing*; as *Airs* in *Musick*, when too often repeated, or too long or too variously performed, disorder the Harmony

C

mony of a just Composure. But those who are Excellent this Way, and display Art and Nature by the gentle Turns of a well-guided Pen, do certainly deserve their Commendations for their *Curiosity* and *Ingenuity*, if not for performing any thing much tending to the *Use* and *Benefit* of *Mankind*. But, as above, if Usefulness and Beauty are the Excellencies of WRITING; that which will, with the greatest Facility, contribute to these, is the *best* Method of *Teaching*. Supposing, therefore, the Make and Proportion of the Letters and Joinings to be once well fixed and understood, single-line Copies will cease to be of Service: For they are apt to create a *Stiffness* in the *Operation*, and a Formality more like painted than native Beauty; whereas, if the Learner is us'd to copy the common Forms of *Business*, Letters, Long Accounts, and Estimates, &c. his Hand will grow confirm'd in an Aptitude and Readiness, which will insensibly arrive
at

at Perfection and Dispatch ; and give in *Writing*, what we admire in *Fine Gentlemen*, an *Easiness* of *Gesture*, and *disengag'd* Air, not to be attained by *Art*, but insensibly caught from frequently conversing with the Polite and Well-bred.

Secondly, The mutual Intercourse and Dependence of Mankind upon each other, from whence arises a *Variety* of Affairs for Computation, makes ARITH-^{Arithme-}METICK the next necessary *Qualification*^{tick.} for the *Man of Business*: And *this* is more valuable, as 'tis the more exact, easy, and short. If the Rules and Principles are once well fix'd and understood, frequent *Application* will make the *Practice* easy, and wonderfully reduce the *Operations*: The Art lies in giving as few Rules as possible, and clearly explaining them. Confounding Principles together, and Diversifying them into several Rules, when they are built on the same Reason, is what has made ARITHMETICK seem so difficult ;

and the learning all by *Rote* has spoil'd many an Accountant. In Teaching ARITHMETICK, I shall have a special Regard, SIR, to your Advice, That the Learner be well exercis'd in the short Rules of Practice and Computation; and that the Questions he is us'd to, be such as generally occur in *real* Business; which will not only be what he may most commonly meet with, but as they are about such Things as are generally within his Hearing and Notice, so he will the more readily conceive the Reason of his *Operations*, and take the greater Delight in Working them: For there is Nothing sooner perfects a Man in any Study, than the *Secret* of engaging him to find something Pleasant and Delightful in it; then the Labour goes down easily, and a little Confusion or Perplexity only quickens, and gives a fresh Relish to the Satisfaction.

Merchants
Accounts. Thirdly, MERCHANTS ACCOUNTS is the third *Qualification*. The Unskill'd often confound this and *Arithmetick* together;

gether; infomuch that 'tis fometimes taken for *Arithmetick*; and fo, he that is a good *Arithmetician*, is erroneoufly judg'd a good *Book-Keeper*: But *Book-Keeping* is a diftinct Art; and is the Buſineſs of *Reason* to determine the juſt and proper *Debitors* and *Creditors*; of *Art* to methodize our Results, and of *Arithmetick* only to answer the ſeveral Questions of Computation ariſing. The *Italian Method* of Book-Keeping by *Double Entry*, as now practis'd by you *Gentlemen* of Commerce, may truly be allow'd to comprehend all Excellencies in Accounting: For, as the Judicious Author of the GENTLEMAN ACCOUNTANT obſerves, ' All other Methods, ' which particular Perſons have occa- ' ſionally inſtituted for their own pri- ' vate Concerns, are found in this; and ' all thoſe Methods, whatſoever they ' are, were, or can be invented, for the ' Uſe of any Accounts, are Parts of, ' and as it were taken out of the *Debi- tor* and *Creditor*; and ſo much as they
want

' want of that, however in private
 ' Concerns serviceable enough, just so
 ' much they want of desirable Perfe-
 ' ction. For the *Debitor* and *Creditor* is
 ' pure and perfect right Reason, and
 ' contains the whole material Truth
 ' and Justice of all the Dealing, and
 ' nothing else; and this not only be-
 ' tween the Accounter and his Traf-
 ' fickers, but also between all the seve-
 ' ral Traffickers one with another; so
 ' far as they have intermix'd in the Sub-
 ' ject Matter of the Accounts: And not
 ' only so; but also of the Incidents,
 ' Circumstances, and Consequences of
 ' the Traffick, such as Estimates, Losses,
 ' or Advantages thereby; and all this
 ' in a perpetual State, so as every
 ' Question that can be proposed, con-
 ' cerning any Dealing, is answer'd al-
 ' most as readily as demanded: And no
 ' Person can be injur'd, who takes his
 ' Account upon the Stating of the Books,
 ' so far as it runs; and in all Times,
 ' even in After-Ages, the Transactions
 ' will

' will be understood as well as if the
 ' same had been inquired at the very
 ' Instant of the Writing.' And in an-
 other Place the *same* excellent *Author*
 says, ' That 'tis a Method so Com-
 ' prehensive and Perfect, as makes it
 ' worthy to be put among the Sciences,
 ' and to be understood by all *Virtuosi*,
 ' whether they ever intend to make use
 ' of it or no, but even for pure Specu-
 ' lation, Curiosity, or rather Admira-
 ' tion; as happens, when with some
 ' Pains we have attain'd the Knowledge
 ' of some Art or Skill, tho' less Com-
 ' plex than this; which thro' the In-
 ' vention of Past Ages, Universal Pra-
 ' ctice, and in Matters of Interest (the
 ' fiercest Engagement of Humane Wit
 ' and Stratagem) is reduced, as this is,
 ' to the strictest Compendium, and (re-
 ' specting the Intention or Use of it)
 ' to a consummate Perfection, and in
 ' Rule and Method is so contracted
 ' and concise, that, without a Fault,
 ' nothing can be rescinded from, or
 ' added to it.'

From

No different
Methods a-
mong Mer-
chants.

From all which 'tis abundantly evident, how ridiculous that common Error is, which many are apt to fall into, that BOOK-KEEPING is different among Merchants and Men of Business; that hardly two make use of the same Method; and consequently, that he who keeps Books well in one *Counting-House*, is not qualify'd to do the like in another. But this false Objection can proceed only from not understanding the Art. A just and proper *Debitor* and *Creditor* is founded on Reason and Demonstration; and that which is so in itself, must be so to every one that understands it, and therefore the Method must be in Effect the same; there being only *Double Entry* and *Single Entry*, that is indeed Method and no Method. By the first we have such a Relation and mutual Dependence of Accounts, and a perpetual Balance of all, that Nothing can be afterwards placed in the Books with dishonest or unfair Design; nor any Error made in the Progress left uncorrected.

corrected by the latter, the Way lies open to Fraud and Deceit, Confusion certainly attends it ; and there's no Possibility of ascertaining Truth and Exactness ; to all which every Method is liable, except the *Debitor* and *Creditor* by *Double Entry*. So that this Dispute can be only between those that do, and those that do not understand Book-Keeping. And 'tis certainly true, that he who comes from a *Counting-House* of Confusion, or at best only recording Facts and Things *Simply* as they occur, (as in common Shop-Books, &c. where they *Shop-Books* so speciously mimick the true *Debitor* and *Creditor*, that the Ignorant really think it so ; whereas nothing of that Art, Truth and Justice is found in it) can never be qualify'd to succeed him who has digested his Affairs into a most exact Order, and concise Method, according to Reason and Art. 'Tis true indeed, as Men are of different Complexions and Constitutions, and have different Ideas of Things, so every

D

Man

Man may have some Peculiarity in his Method; but then this Difference cannot be in Essentials, nor in the general Reason and Manner of Book-Keeping, but only in Particulars indifferent, that are as soon known as seen.

But I have Reason, SIR, to ask Pardon for so long insisting on the Excellency and Usefulness of that, which you practise with so much Exactness and Delight, and so happily recommend: But 'tis, as you call it, my *Darling Science*; as such, I can't help dwelling on the Subject, and being zealous in propagating of it: To do which successfully, that is, to complete a Book-Keeper, there's much more required than is generally taught. 'Tis not *Copying* a Sett of Books, or even being able to make a proper *Debitor* and *Creditor*, is all that's necessary: For almost in every Case, besides the *Debitor* and *Creditor*, there are many Incidents, and seemingly small Circumstances, that will often puzzle a tolerable Theoretick Accountant;

tant ; and as 'tis allow'd in all Affairs, that generally the Circumstances of an Action should be as much consider'd as the Action itself, therefore the *Learner* should not only be instructed how to Enter, Post, and Close an Account ; but also in the previous and consequent Incidents, as Terms of Agreement, and general Customs observ'd among Merchants and Men of Business, with the Forms of common Use in the Variety of Affairs, as Invoyses, Bills of several sorts, Bonds, &c. as also the Customs and Duties, and shortest Ways of computing them, and the Nature of Remittances as to Bills of Exchange, or the Course, Rise, Fall, &c. of the Exchange, and all other intervening Circumstances that can be imagin'd to happen ; and this not only as to the bare Form and Manner, but the Learner should trace every of these as incident in each particular *imaginary* Case, as if he was transacting *real* Affairs. And, SIR, I have referr'd to this Place

(where the Use will appear most evident) the humble Thanks I owe for those Books of *real Business* you were pleased to send me the other day, so justly kept, and consisting of such Variety of Transactions: I know not any thing will more promote my Design for the Advancement of this Art; and therefore have made some Progress in digesting a proper *Waste-Book* of Cases for the Uses above, and shall find no small Improvement from Stating them as my Copy directs; only, as you have advis'd me, I shall continually add such Cases to them, as may be drawn from any new Manner, or Place of Trading I shall be inform'd of, or can possibly get light into. And I'm persuaded, if this Method was followed, and each *Professor* qualify'd to perform it, we should not find so many Youths on their first Entrance on Business so much Strangers to it; but the instructing *Counting-House* might produce as accomplish'd Clerks as the Merchants or Publick

lick Offices, provided the same Application was made use of.

But that which is call'd *Merchants Book-Keeping Accounts*, is not only absolutely necessary for every Merchant or Trader, but is what no Man of Business should be Ignorant of, and is the best Method for Men of all Professions and Estates to keep their own Accounts in; with this Difference, that as the Incidents alter with the Variety of Affairs, so they should be accordingly apply'd and consider'd; and the Knowledge of this Art (tho' not made use of in every one's private Concerns, yet) creates an excellent Capacity for Business in general, with Ease unriddles the most confus'd Accounts, and renders a Gentleman capable, with the greatest Readiness, to overlook his Affairs when managed by others; and I cannot better conclude my Thoughts on this Subject, than in Mr. Locke's Words: ' Merchants Accounts, tho' not likely to help a Gentleman to get an Estate, yet possibly there

Book-Keeping necessary for Gentlemen of Estates.

Thoughts on Education. Pag. 316.

' there is not any thing more of Use
 ' and Efficacy to make him preserve the
 ' Estate he has. 'Tis seldom observ'd,
 ' that he who keeps an Account of his
 ' Income and Expences, and thereby has
 ' constantly under View the Course of
 ' his Domestick Affairs, lets them run
 ' to Ruin. And I doubt not, but many
 ' a Man gets behind-hand before he is
 ' aware, or runs farther on when he is
 ' once in, for want of this Care, or the
 ' Skill to do it. I would therefore ad-
 ' vise all Gentlemen to learn perfectly
 ' Merchants Accounts, and not to think
 ' it is a Skill belongs not to them, be-
 ' cause it has received its Name, and
 ' has been chiefly practised by Men of
 ' Traffick.

*Mathe-
 maticks.*

Fourthly, The several Parts of the
 MATHEMATICKS are of that extensive
 Use and Benefit to Mankind, that
 hardly any thing is to be done without
 them; consequently the *Man of Business*
 can have no small Share in these Scien-
 ces: For he that has a thorough Know-
 ledge

ledge in them, must have the best Foundation laid, and a Mind exquisitely furnish'd for the undertaking of any Business. From *this* Fountain all *Arts* and *Sciences* flow; it enlarges the Mind, extends our Ideas, and strengthens the Judgment. By *this* we even soar into other Worlds, and as it were pry into the very Secrets of Nature. And tho' the Knowledge of this vast useful and extensive Learning is not absolutely necessary for *every* Man, yet he that attains any Part thereof, will never repent his Labour. But there are *some* Employments of Life that cannot be carry'd on without them. All concern'd in Weight or Measure should learn *Geometry* and *Mechanicks*: Every *Artificer* will *here* find the Foundation and Demonstration of his *Art*: And indeed *Geometry* is the *Ground-Work* of all the other Parts of the *Mathematicks*, by which all *Operations* are performed and demonstrated. Monsieur *Fontenelle*, in his Preface of the Usefulness of *Mathematical* Learning,

Learning, says, ' That *Geometry* and *Algebra* are the *Keys* of all the Enquiries that can be made concerning *Magnitude*. Besides, a thorough Knowledge herein greatly cultivates the Art of Reasoning, and may even supply the Want of Logick itself.

For this Cause, those that intend to Reason justly, to Talk pertinently, to take every Question in its true Light, and to Think closely, and Determine with Clearness and Perspicuity ; those, I say, that would arrive to any degree in Reason and Judgment, the shortest, easiest, and surest Way, must attain to some Perfection in *Geometry* : This is the Learning that is truly useful and valuable ; this is what so much obtains in the World, and without which 'tis now hardly possible to be a considerable Man, but more especially necessary for those that speak in Publick ; for all designed for the Law, or are any ways concern'd in the *Mechanical Arts*. And *The Law*. having just mentioned the *Law*, I beg leave

leave to make an Observation upon some Qualifications, that seem to be of the greatest Use for Attorneys Clerks; and indeed, what is in the common Method required, is, that they understand a little *Latin*, and write the Law Hands. Thus much, 'tis true, is absolutely necessary; but I have instructed young Clerks yet farther; they have learnt Book-Keeping, by which they have been render'd abundantly capable of adjusting those Accounts, which others, ignorant of that Art, must have apply'd to some Accountant to have settled for them; and Cases of this nature frequently happen among those that are employ'd by Merchants and Tradesmen in Statutes of Bankrupts, &c. whose Books are a perfect Secret to those that do not understand that incomparable Method they are generally kept in: And besides this, I have often read *Euclid's Elements* to them, that they might attain that excellent way of Reasoning, the vast Benefit of which

E

'twould

'twould be impertinent to mention.

But to return to completely forming our Man of Business; if his Education should be so liberal, while he is labouring at *Dry Geometry*, he may at times solace himself with a Piece of *Mechanicks*: For his Service therefore, I have lately publish'd, in the *English Dress*, Monsieur *Robault's* Treatise of *Mechanicks*, which I use as a kind of *Praxis* on *Euclid's* Elements; the kind Reception it has met with in the World, may be a sufficient Convincement how proper 'tis for the purpose design'd; 'tis on the Principles advanced in this Treatise, that all our modern Discoveries in Natural Philosophy and Anatomy are built; therefore, tho' a Course of Experiments is at any time diverting and improving, 'twill much more be so after first reading such an Introduction as this; then what is seen will be easily accounted for, and reduced into some solid Satisfaction and Improvement; from whence we may conclude, how necessary 'tis for
Anato-

Anatomists and Surgeons, &c. to read
some Piece of *Geometry* and *Mechanicks*.

Now, to carry my *Man of Business* a
little higher yet, let him make some
Progress in the wonderful Analytick
Art, ALGEBRA, which may be render'd *Algebra*.
the Art of Resolution or Reduction,
whereby all unknown Quantities, how-
soever intricately involv'd in any Que-
stion propos'd, are resolv'd into, and
compared with those that are known.
In short, *Algebra* is the great Mystery
of Invention, the rich Magazine of new
Discoveries, the grand *Arcanum* so re-
ligiously conceal'd by the Ancients,
whereby all their Theorems and De-
monstrations are found out, which they
always took care to disguise afterwards,
by propos'g them in a quite contrary
Method, and different Dress. As un-
derstanding the first Principles of this
Art will ease the Learner of much
Trouble and Pains, and Labour of
Thinking in his Geometrical Studies;
so it is absolutely impossible to be a

good Mathematician without a more thorough Acquaintance with it, and some competent Skill and Dexterity in this *specious* Method of Calculation, which is as much preferable to the Arithmetick of Numbers, as a *general Rule* or *Theorem* is to the Application of it in a *particular Case*.

Perspective, Architecture, Fortifications, and Gunnery, will all be found necessary Qualifications in different Parts of Life. The two last, that brave Man should be well acquainted with, who would rise in the Field of Glory, by his own Merit, scorning purchased Honours. The two first make the excellent Painter, and the noble Designer; for he only that is well instructed in these Arts, can lay down a just Plan for a fine Edifice, or adorn a stately Apartment with Scenes that may be admired as long as they are in being.

Country Gentlemen, Stewards of Estates, and all concern'd in Land, Building, or Farming, should by all means understand

understand *Surveying* and *Measuring* ; *Surveying*
 and indeed, for the Nobleman, or Gen-^{and Mea-}
 tleman's *Steward*, these Parts of the *asuring.*
Mathematicks seem to be Essential Qua-
 lifications. For tho' his *Chief* Business
 be to receive Rents, let Leases, keep
 Courts, &c. and also to keep a just and
 clear Account of all ; yet 'tis also a
 Pleasure and Satisfaction to the Owner
 of the Estate to view his Lands in his
 Closet, that is, to have them *Survey'd*,
 and every Mannour, or particular Te-
 nant's Farm neatly *Mapp'd*, the Timber
 he Sells, Builds, or Repairs with ; as
 also Walling, Paling, Tiling, Cieling,
 or Painting, to be exactly measured :
 And who so proper to do this, or so fit
 to be trusted in an *Affair* of this na-
 ture, (where often is great Deceit and
 Damage by trusting to others) as the
 chief Manager, the *Land-Steward*, or
Rent-Gatherer ? But to instance in all
 the Concerns and Employments where
 some Parts or other of the *Mathematicks*
 are useful and necessary, would be as
 tedious

tedious as that Knowledge is extensive :
Therefore, S I R, I shall only just mention the peculiar Excellency of two Parts more, as Accomplishments worthy the prime Man of Business, the Merchant ; that is, G E O G R A P H Y and N A V I G A T I O N.

Geography. G E O G R A P H Y not only teaches the *Situation* and *Distance* of Places and Countries, the *Knowledge* of the *Earth* in general and particular, but is one of the greatest Accomplishments in Conversation, and the very Inlet to *History*, which informs us of the *Laws*, *Manners*, and *Customs* of Nations, their Advantages and Disadvantages ; from whence we may be enabled to form a right Judgment to promote the Interest of our own Country, and to lay down such Rules as may be useful in our *private* Concerns.

Navigation.

N A V I G A T I O N is the A R T by which our Ships are conducted through the wide-extended O C E A N, which carries off our Superfluities, and brings us home
our

our Conveniencies, and makes the Pleasures, Riches, and good Things of the whole World common to all Mankind. To us of this Nation, 'tis our *Wealth* and *Defence*, and the Envy and Terror of our *Enemies*. And tho' this *Science* more immediately concerns the *Mariner* to be Master of it, yet the *Merchant* will scarce think it belongs not to him to have a Taste thereof: For, from it he may draw great Advantages in Trade. For Instance, a Knowledge of the Length, Distance, and Safety of *Voyages*, will furnish him with good Reasons to conjecture the Rise and Fall, and may point to him the most probable Markets to vend his Commodities.

Under this Head of *Mathematicks*, I beg leave to recommend the Art of DRAWING, as a Qualification worthy *Drawing* every Gentleman, as well as Man of Business; for tho' it is not necessary to come to a Perfection in Face and Feature; yet, to be able to take the Out-Lines of a Picture, to hatch neatly, to lay

lay down Buildings, Trees, &c. to take a Landskip, justly represent Heights and Distances, and to finish and fill up the Perspective, is what will be useful in forming to one's Self, and representing to Others, a just Notion of any Design which cannot be so clearly conceived or expressed any other way: For this purpose therefore I have provided one of the ablest Masters in this Art to attend three times a Week.

English
Style.

Fifthly, To accomplish the *Man of Business*, 'tis requisite he should be Master of the *Propriety of Expression*. He that delivers his Sense in *improper Terms*, converses to his Disadvantage; and his other Acquisitions, be they what they will, often suffer for this *Imperfection*. He that absurdly, or darkly, or dubiously, or with Difficulty, expresses his own Mind, will be thought not very ready in apprehending the Mind of others; or what is still a greater Misfortune, brings his *Ingenuity* or *Integrity* under Suspicion; whereas his
Judgment

Judgment alone is in the Fault. And yet, according to the *common* Method of fitting *Young Gentlemen* for *Business*, a *Style* in Writing is what they seldom or never hear of; and the *Masters* generally take themselves to be no farther concerned, than that their Scholars should write a *fair Hand*, without considering how monstrous and ridiculous their Conceptions may appear. But surely, to speak and write with *Propriety* and *Elegance*, has too great an *Influence* on *Business* to be neglected. I need not here in so plain a Case produce Reasons of the Importance of this *Qualification*; Common Experience is an undeniable Proof of it. Who undertakes *Business* to most Advantage, or succeeds best in it? But he who shews he understands the Nature of it, by the Manner of his Address, and who expresses himself without Ambiguity or Affectation. Subjects of different Natures will be treated of indeed in different Kinds of *Style*: One is peculiar to the Pulpit, another

to the Bar, and a third to common Conversation. 'Tis this *last* that can alone suit Commerce; which, tho' like other *Arts* and *Sciences*, it has proper *Rules* and *Terms* belonging to it, yet delights in a *Short* and *Familiar*, but withall a *Neat* and *Significant* Way of Expression. So that the *Merchant* must converse with his *distant* Correspondent with no more *Stiffness*, than if he met him on the *Exchange*. He must not detain him an *Hour* for the *Business* of a *Minute*, nor put him to Pains to understand him, nor express himself to be understood to his Damage. This would render a Correspondence less agreeable to his Friend, and consequently less beneficial to himself. *Majesty* and *Grandeur* are a Stop to *Dispatch*, whereby *Business* lives, and thrives, and flourishes. So that the Style for Commerce must be Concise, Perspicuous, and Natural; not lined with swelling impertinent Epithets, but purely *Epistolary*, and expressing the Thoughts with the same *Facility*, as
if.

if the Correspondent were Face to Face.

And now I am shewing how necessary for the carrying on *Business* happily, a proper *Style* is; let me not part with my CHARGE, till I recommend to him the Knowledge of the *Modern Languages*. He that deals or trafficks with such whose Language he's a Stranger to, will soon be sensible not only of the Conveniency, but also of the Necessity of this *Accomplishment*. There's no Man but must needs reap greater Satisfaction, and generally greater Advantage, from transacting his Affairs himself: That's the way for him to be sure of the Condition they are in, and what he has to trust to, and what Foot he is to proceed upon: Whereas to leave 'em to the Management of other Hands, which it may chance have not Skill enough to see and pursue his Interest; or if they have, may not have Integrity enough to do him Justice, is running the Hazard of being *undone*:

French,

Or, if he should have the Fortune to escape, yet it must be a continual Uneasiness to him, to think he is all the while at the Mercy of such as might, if they would, have ruin'd him. But, to shorten my *Young Gentleman's* Pains, 'twill be sufficient for him to make himself Master of the FRENCH Tongue, which will answer in a great measure for the rest. For, at present, it seems to be the *Universal* Language. 'Tis so far Universal, that the Place is scarce known where 'tis not spoken; and we hardly find the *Foreigner*, of whatsoever Country he claims his Birth, but is able to transact his Affairs, or hold a Correspondence in it. In short, he must needs be much at a Loss, and very unequal to *Business*, that has not attained to a competent Skill in this Language.

I must confess, the Methods made use of in teaching it, are too various; and almost every Teacher affects some *Nostrum*, which he is not a little fond of.

of. But this, I take it, will not be disputed; That as a just Notion of Grammar, so the Opportunity of frequent Conversation is absolutely necessary, if one would ever arrive at any Perfection in this Language; and therefore I have not only fix'd on a Master, that is capable of doing the first, but do entertain him constantly in my House, where all those *Young Gentlemen* that learn *French*, are obliged always to speak it, and have their Master daily to converse with.

And that there may be nothing wanting, if possible, to answer every one's Qualifications for *Business*, we beg leave to make the Learned Languages a part of our Care, it being a common Complaint, that what was learnt at the Grammar-School is forgot, while Youths are gaining these other Qualifications: Therefore I have prevail'd with an unexceptionable Gentleman, to read to those that desire it, the *Latin and Greek* Latin and Greek.
Classicks

Classicks in private Lectures, out of our Times of *Business*.

But, SIR, I forget that there's nothing required to form the *Man of Business*, but what may be learnt with greater Advantage from your Practice, than from any thing I can offer. And I should think it as great Indecency in me to address peremptorily to so complete a Judge of this Subject, as 'twas in *Phormio* to talk of the Rules of War before *Hannibal*. Only pardon me, SIR, whilst I observe, that tho' my *Young Gentleman* should be furnish'd with all these Qualifications I have instanced in, he's still deficient in the main Article, if he has not imbibed the Knowledge of RELIGION and GOOD MANNERS along with 'em. And therefore, it must be his chief Care constantly to attend the stated Times of GOD's Publick Worship, as well as to pay him his Devotions in Private. He must be possess'd with a Sense of the Necessity of GOD's Blessing upon his

Still incomplete,
without
Religion
and Good
Manners.

his Endeavours, if he would hope to succeed ; nor can he expect the Divine Blessing, without living in Obedience to the Divine Will. Besides, *Religion* obliges a Man to be just and conscientious in his Dealing, punctual to his Word, and open, and fair, and honourable in all his Actions. A Man of this Character will be valu'd by all Men ; and his Correspondence coveted and courted ; especially, if Humility and a thankful Heart accompany his Success and Prosperity, and discover themselves in Compassion and Charity. If Patience and Temper, if Resignation and Chearfulness of Mind, attend him in Misfortunes and Adversity, (for the wisest and greatest Men are subject to some of these) such a Man is in the likeliest way to repair his Fortunes ; which, if he should fail in, yet he will sit down with the Support of a good Conscience, which is worth all the Comforts in the World besides whilst he lives, and will be remember'd when dead with
lasting

lasting Honour. When I am thus marking for the Youths design'd for Business, the Steps they are to take, if ever they would arrive at the End propos'd, and become Men of Consideration and Importance; methinks I feel the Weight of that *Trust* that lies on *us* who have the *Care* of them. What Vigilance, what Prudence, what Management, is not necessary for the successful Discharge of our Duty! But equal Improvement must not be hop'd for in such as we are concern'd with but at *certain Hours*, and instruct *only* in *Arts* and *Sciences*, but who are at *Liberty*, because out of the Reach of our *Observance*, to spend the rest of their Time as they please; as may reasonably be expected, and is generally found, in such as are *constantly* under our more immediate *Inspection*, confined to our *Walls*, and within the *Cast* of our *Eye*. If these do not better answer the Expectations of their Friends, with regard both to their *Knowledge* and *Manners*, I do not see
how

how we shall be able to acquit ourselves from Want of Ingenuity, or due Application in our Undertaking.

Thus, SIR, I have, in as little Compass as possible, traced out what I take to be requisite to *build up the Man of Business*, and touch'd on the properest Manner of *Communicating* and *Enforcing* his *Qualifications*. The Copiousness of the *Subject* has drawn out this *Letter* to a greater Length than I at first designed; but I hope for your usual Candour and Pardon to,

SIR,

Your very Obedient,

and much Obliged

Humble Servant,

THO. WATTS.



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- | | |
|---|--|
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|---|--|

NB. That the Course will contain not only all that is usual, but likewise some considerable Experiments which are entirely new; and that the Apparatus itself is new and complete, and every thing contrived according to the latest Improvements. The whole being very diverting and useful, not only for those who have learnt the Mathematicks, but for such as are not at all acquainted with that Study, by which they may with Ease and Pleasure come to the Knowledge of those Things, which cannot be attained any other way without great Labour and Application.

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Of Matter and Vacuum.
Experiments to prove a Vacuum.

The

The Universal Law of Gravitation explained.

The Law of Cohesion, or the Attraction of the small Parts of Bodies, deduced from the Ascent of Fluids in small Tubes, and between Glass-Plates, and Variety of other Experiments.

Experiments concerning the Repulsion of the Particles of Matter.

Of Electrical Attraction and Repulsion.

Experiments relating to Electrical Attraction.

The Electrical Phosphorus.

Mercurial Phosphorus.

Liquid Phosphorus.

Solid Phosphorus.

The Light of Phosphorus augmented in *Vacuo*.

Concerning Motion in general.

Experiments to distinguish Motion from Velocity.

Experiments to explain the Nature of, and to find, the Center of Gravity in

all Bodies, and to distinguish it from the Center of Magnitude.

The Experiment of the double Cone rolling upwards.

A heavy Body, which of itself would fall from a Table, hinder'd from falling, by adding a heavier Body to it.

Experiments about the Falling, Sliding, and Rolling of heavy Bodies.

Concerning the Center of Motion.

Concerning the Distance and Line of Direction of a Weight and Power.

Experiments to shew the whole Mystery of the Feats done by *Sampsons*, or strong Men.

Of Simple Machines.

Of Balances, which are either Scales or Steel-Yards.

Of the four Kinds of Levers.

Of Pullies, single and combined.

Of the Wheel and Axle.

Of the Inclined Plane.

Absolute and Relative Gravity.

Of the Wedge.

Of

Of the Screw.

Compound Engines.

Sails of Ships, Wind-Mills, Water-Mills, &c. explain'd on these Principles.

Experiments to shew how Men or Horses of unequal Strength may be made to carry or draw a Burden in Proportion to their Strength.

Experiments to shew the Advantage of great and small Wheels in Coaches, Cars, &c.

A general Method to determine the Quantities of Friction in all Engines.

Sir Isaac Newton's first Law of Motion demonstrated.

That the Composition of Forces in several Directions not contrary to each other, produces a new Direction in a Diagonal Line.

An Experiment to shew, that the Line of the Relative Ascent and Descent of a projected Body, is the same; whether the Place from whence 'tis thrown be continually at Rest, or in continual uniform Motion.

Objections

Objections against the Motion of the Earth, solv'd from this Principle.

The Centripetal and Centrifugal Forces of solid and fluid Bodies in Motion, explain'd and demonstrated by Experiments.

Monfieur *Des Cartes's Vortices* exploded.

Introduction to the Theory of Projectiles and Motion of the Heavenly Bodies.

How a Body will move, when its Projectile Force either yields to, overcomes, or exactly balances that of Gravity.

Sir *Isaac Newton's* second Law of Motion demonstrated.

An Experiment to shew that the Velocity of Falling Bodies is as the Times, and the Spaces gone thro' as the Squares of the Times of Falling.

The Force of Resisting Mediums considered.

A curious Experiment to explain the Foundation of the Art of Gunnery.

The

The Nature of Fortification explain'd
from a large and curious Plan.

The Moon's Motion explain'd from the
Doctrine of Projectiles.

The Motion of the Planets and Comets
deduced from the same Principle.

The Solar System explain'd.

The Tides, and Phases of the Moon
demonstrated.

Experiments with the Load-stone.

Experiments concerning the Descent of
Bodies on inclined Planes, being an
Introduction to the *Theory of Pendulums*.

Experiments concerning Pendulums.

Center of Oscillation explained.

A Cycloide described.

Cycloidal Cheeks for Pendulums.

The Motion of Pendulums altered by
Heat and Cold.

That the Motion of the Waves in the
Sea answers to the Motion of a
Pendulum.

Sir *Isaac Newton's* third Law of Motion
demonstrated.

Flying and Swimming accounted for.

Of

Of the Nature and Cause of Elasticity.
How to destroy the Elasticity of some Metals.

Concerning the tremulous Motion of sounding Bodies.

Experiments concerning the Laws of the Communication of Motion in hard and elastick Bodies.

HYDROSTATICKS.

CConcerning Fluids in general.

Experiments to prove that Fluids gravitate in Fluids of the same kind.
That Fluids of different Kinds gravitate upon each other.

That Fluids press in all manner of Directions at the same time.

That the Quantity of that Pressure in all Fluids is proportional to the perpendicular Height of the Fluid in all Parts of the containing Vessel.

That any given Quantity of Water, tho' never so small, may be made to press with a Force equal to any given Weight, tho' never so large.

To

To raise any given Weight by the Force of a Man's Lungs only, provided he blows thro' a Tube proportionably small.

An Experiment of Lifting a Weight by a Chain of inflated Bladders, applied to Muscular Motion.

Several other Experiments to explain the Hydrostatical Paradox.

Experiments to shew how high, and why, Water will rise in Fountains and oblique Jetts, and the best way of making spouting Pipes.

The Expence of Water spouting from equal Holes at any given Distance from the Surface, computed, and shewn to be as the square Root of those Distances.

The Working of Syphons, sucking, forcing, and lifting Pumps explained.

Experiments to shew that Bodies heavier than Water, when weighed in Water, lose as much of their Weight as is equal to their Bulk in Water;

H

and

and Bodies lighter than Water will so swim in it, that a Quantity of Water equal in Bulk to the Part immersed, will be equal in Weight to the whole Body.

How upon these Principles Lead, or any Metal, may be made to swim in Water, and even raised up by it.

The Hydrometer.

The hydrostatical Balance to determine specifick Gravities.

Glass Bubbles accounted for.

PNEUMATICKS.

EXperiments concerning the Nature of the Air in general.

That the Density and Spring of the Air is as the Force that compresses it.

That the Pressure of the Air decreases, according to its Distance from the Surface of the Earth.

Cupping-Glasses.

The Rising and Falling of the Quick-silver in the Weather-Glass, explained and accounted for.

The

The different Sorts of Barometers.

Thermometers and Hydrometers of several Kinds.

The Effect of high Winds on the Barometer, shewn by an artificial Storm.

The Air-Pump, and Manner of its Working, explain'd.

Several Experiments, which directly prove the Weight, Pressure, and Spring of the Air, by breaking Glass-Vials, the Sense of Feeling, the Phenomena of Bladders, Glass-Bubbles, Fountains of several Sorts, and the Diving Bell.

Barometers *in Vacuo*.

The famous Experiments with the Hemispheres.

Wind-Gun.

The surprizing Motion of several sorts of Liquors *in Vacuo*.

Experiments with the Condensing Engine.

Experiments to prove that Sound can't be convey'd without Air, and that

'tis increased or diminished according as the Air is rarified or condensed.

That Fire and Flame are fed by the Air.

That Gunpowder is fired *in Vacuo* without any Explosion.

The Effects of rarified, condensed, and burnt Air upon the Life of Animals.

The Force of rarified Vapours in raising Water by Fire, &c.

With several other curious Experiments by the Air-Pump.

OPTICKS.

CONCERNING the Nature and Motion of Light.

Of Vision in general.

That when Rays of Light are reflected, the Angle of Incidence is equal to that of Reflection.

Of Plane Mirrors.

The several Reflections from two Surfaces of Looking-Glasses consider'd.

Of

Of Concave and Convex Mirrors,

A Concave Cylindric Mirror.

A Convex Cylindric Mirror.

Cylinder and Picture.

The Cause and Law of Refraction
explained by Experiments.

Multiplying Glasses.

Experiments to shew the Nature of
Convex and Concave Glasses, and
the Manner of the Rays of Light
passing through them, and uniting
in their Focus's.

How to find the Focus of a Lens, and
whether it be truly center'd.

Water made to burn, by collecting the
Sun's Rays into a Focus.

Camera Obscura,

The Magick Lanthorn.

The Dissection of the Eye.

The Faults of Vision shew'd by an In-
strument.

Experiments to shew how the short-
sighted and old Eyes may be help'd.

To shew why both Eyes see things
only single.

The

The Nature and Use of Microscopes
and Telescopes.

How to measure the Refraction of any
sort of Liquors.

An Experiment to measure the Refra-
ction of the Air.

A new and most curious Experiment to
shew the Circulation of the Blood
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Sir Isaac Newton's Theory of Light and
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