Three essays in artificial philosophy, or universal chemistry: viz. I. An essay for the farther application and advancement of chemistry in England. II. An essay for the improvement of distillation ... III. An essay for concentrating wines, and other fermented liquors / [Peter Shaw].

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THREE

ESSAYS

IN

Artificial Philosophy,

OR

UNIVERSAL CHEMISTRY:

VIZ.

I. An ESSAY for the farther Application and Advancement of CHEMISTRY in *England.*

II. An ESSAY for the Improvement of DISTILLATION, in the Hands of the *Malt-Stiller*, *Rectifier*, *Compounder*, and *Apothecary.*

III. An ESSAY for Concentrating WINES, and other FERMENTED LIQUORS; or taking the Superfluous Water out of them to advantage.

By *PETER SHAW*, M. D.

LONDON:

Printed for J. OSBORN, and T. LONGMAN, at the *Ship* in *Pater-noſter-Row.*

M.DCC.XXXI.

TO

Dr. Middleton Mayo,

FELLOW of the Royal College
OF PHYSICIANS,

And of the

ROYAL SOCIETY, London.

SIR,

AS I defire to put my Chemical Eſſays into ſuch hands as are capable of improving them; you'll pleaſe to accept thele THREE in the View they are preſented you, by

Your very Humble Servant,

PETER SHAW.

TO

Dr. *Middleton Maſſey*,

FELLOW of the *Royal College* of PHYSICIANS,

And of the

ROYAL SOCIETY, *London.*

SIR,

AS I deſire to put my *Chemical Eſſays* into ſuch hands as are capable of improving them; you'll pleaſe to accept theſe THREE in the View they are preſented you, by

Your very Humble Servant,

PETER SHAW.

ADVERTISEMENT.

Somewhat of our general Deſign, *whereof the preſent* Eſſays *make a part, was intimated in the* Philoſophical Principles of Chemiſtry *we lately publiſhed. That Work indeed was not our own; but claims for its Author no leſs a Perſon than an* Aulic *Counſellor, and Chief Phyſician to his* Pruſſian *Majeſty. We however took the liberty to adopt it, as a thing extremely uſeful to our Deſign of recommending the farther Cultivation and Improvement of* Chemiſtry. *For, as it contains the* ſolid Elements *of Chemical Knowledge in general, and opens new Views of infinite Extent; we could not do*

better

better than make it a Foundation, whereon to raiſe a Structure of practical or artificial Philoſophy, *for the ſervice of ordinary Life.*

To open this general Deſign more fully, we have here, Firſt, *employed an entire* Eſſay; *containing the whole Scheme; explaining the Nature, and proper Uſes of* Chemiſtry; *and ſketching out the methods of practiſing it in full Latitude.*

Next, *as we propoſe ourſelves to tread in the Paths we chalk out; and to ſupply, as well as explain, or illuſtrate; we give a* Specimen *of a Subject, that has not been touched upon to purpoſe, by any one that we know of; and treat in our manner the buſineſs of* common Diſtillation, *or the* Production and Refinement of INFLAMMABLE SPIRITS.

Thirdly, *we endeavour to illuſtrate and improve a Subject already treated*

by Dr. Stahl; viz. *the buſineſs of* Condenſing Wines, *or reducing them to a ſmall bulk, without prejudice : and this by way of a* Praxis *upon the fundamental* Doctrine of Fermentation, *laid down in the* Philoſophical Principles of Chemiſtry. *And here we ſtop for the preſent.*

The next Set of Eſſays intended, are, (1.) For introducing a PORTABLE LABORATORY ; by means whereof all the Chemical Operations are commodiouſly perform'd, for the purpoſes of Philoſophy, Medicine, Metallurgy, and a Family.

(2.) An ESSAY towards the natural and experimental Hiſtory of WINES; foreign and domeſtic. *And,*

(3.) An ESSAY upon the Art of finding, judging, and digging of MINES ; and ſeparating, purifying, and working of METALS, from the Ore, to the Utenſil. *We*

We farther propose to continue, in this manner, publishing, at times, two or three ESSAYS *together; one in* Philosophical, *one in* Technical *or* Commercial, *and another in* Oeconomical Chemistry; *as we can find opportunity to finish them.*

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BOOKS printed for JOHN OSBORN *and* THOMAS LONGMAN.

I. PHiloſophical Principles of Univerſal Chemiſtry: or, the Foundation of a ſcientifical Manner of inquiring into, and preparing the natural and artificial Bodies for the Uſes of Life, both in the ſmaller way of Experiment, and the larger way of Buſineſs. Deſigned as a general Introduction to the Knowledge and Practice of artificial Philoſophy, or genuine Chemiſtry in all its Branches. Drawn from the *Collegium Jenenſe* of Dr. *George Erneſt Stahl*. By *Peter Shaw*, M.D.

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ERRATA.

PAG. 22. marg. for *anning* read *Tanning*.
——58. line 25. for *hal* read *half*.
——68. —— 6. for *Sprits* read *Spirits*.
——83. Note, line 1. read *for the*.
——92. Note, read *An.* 1699, *&* *An.* 1718.
——176. line 25. dele *ſame*.

An ESSAY, *for the farther* Application *and* Advancement *of* Genuine CHEMISTRY *in* England.

AN impartial Conſideration of *Chemiſtry*, in its proper Extent and neceſſary Relations, may perhaps ſhew it of that uſe and benefit in Life, as to deſerve the particular regard of this *Kingdom*, which at preſent appears remarkably to overlook, condemn, or deſpiſe it. Chemiſtry *diſregarded in* England.

Chemiſtry may be conceived as the buſineſs of actually reſolving, ſeparating, mixing, combining, new modifying, and changing the Forms of the various Bodies, whether produced by Nature, by Art, or by Accident, in this Globe of ours; with a view to ſearch into their *internal Structure* and *ſecret Relations*, ſo as to find out ſome new Properties or Uſes thereof, and thence increaſe our knowledge of theſe Bodies, or ultimately render them, one way or other, more ſerviceable in human Life*. *General* De-finition.

If this Deſcription be juſt, it will follow, that whoever would underſtand the true import and real

* See Pag. 19.

real buſineſs of *Chemiſtry*, muſt view and conſider it in a ſtate of Action and manual Operation; or, as it practically contributes to enlarge the Underſtanding, ſupply the Neceſſities, and afford the Conveniences of Life: which is the Light wherein the Lord *Verulam*, and Mr. *Boyle* have juſtly placed and conſidered it.

To give a fair and full Repreſentation of *Chemiſtry*, in ſo extenſive a view, muſt be the Work of Ages: and before any ſtep can be taken in it to ſatisfaction, the Subject requires a Diviſion into ſeveral Branches; each whereof being gone over a-part, may give ſome general Notion of the whole.

And general Diviſion of the Art. The moſt uſeful Diviſion ſeems aptly to fall under the comprehenſive *Heads*, or *Titles*, of *Philoſophical*, *Technical*, *Commercial*, and *Œconomical Chemiſtry*.

SECT. I.

Of Philoſophical CHEMISTRY.

Philoſophical Chemiſtry explained;

1. *PHiloſophical Chemiſtry* is that particular part, which, contented with things entertaining, ſatisfactory, and inſtructive to the Mind, does not directly and ſollicitouſly endeavour after ſuch as are immediately uſeful, or advantageous.

2. In this view, *Philoſophical Chemiſtry* will conſiſt of three Parts, *viz. Invention*, *Rationale*, and *Experiment*. Whence it might be defin'd, the particular Exerciſe of the inventive and rational Faculties of the Mind upon Chemical Subjects, Operations, and Effects, leading up to Experiments and back again; ſo as to draw Concluſions, account

count for Phænomena, ſtart Problems, and attempt their Solution, in this Circle ſucceſſively *.

And divided.

3. *Philoſophical Chemiſtry*, therefore, is the Source and Soul of the whole Art; as by inventing, reaſoning, comparing, and adjuſting of things, directing Experiments, and concluding from the Reſult, it forms new Doctrines, and makes new Diſcoveries, for itſelf, and all the other Branches, to improve and apply.

Applicable in the way of Invention,

4. In the way of *Invention*, this part of *Chemiſtry* is more particularly applicable; (1.) To the *Imitation* of *natural* and *artificial Things*: (2.) To the *Production* of *new artificial Bodies*: (3.) To the *ſtarting* of *new Arts and Trades*: And, (4.) To the *ſupplying* of *Deſiderata*, or *Defects* in the *old ones*.

To the Imitation of natural and artificial Bodies.

(1.) As natural Bodies may be ſo reſolved or taken to pieces, as in many caſes to diſcover their conſtituent Parts, or Ingredients; *Philoſophical Chemiſtry* hence forms Rules for imitating various Productions of Nature; which, in ſome particulars, is done to great Exactneſs; as in the making of *Cinnabar*, *Vitriol*, &c. where the Reſolution has been found eaſy; in others leſs exactly, where, by the common Methods, the Reſolution has hitherto proved more difficult, as in the Buſineſs of *artificial Gems* and *Metals*; tho' ſome well-meant Attempts have appear'd in this way too.

The like alſo is to be underſtood of *artificial Bodies*, made in one Country, and imitated in another; whence the Imitation of *Venice-Glaſs* in *England*, the Imitation of *Porcellane*, the *Japan Varniſh*, various Refinements of foreign

* Nec manus nuda, nec intellectus ſibi permiſſus, multum valet: inſtrumentis & auxiliis res perficitur; quibus opus eſt non minus ad intellectum quam ad manum. BACON.

Drugs, Sugar, *&c.* in *Europe:* all which, where not caſual, are of pure chemical Extraction: and the proper Enquiries into things of this kind, fall under the *inventive* Part of *Philoſophical Chemiſtry.*

The Production of new artificial Bodies.

(2.) New *artificial Bodies* are chemically producible *ab Origine*, either in the way of Separation, or Combination.

In the way of *Separation*, Chemiſtry has invented and produced fermented potable Liquors, inflammable Spirits, Salts, Sugar, Pot-Aſh; thoſe vulgarly call'd *Chemical Preparations*, as Oils, Extracts, Spirits, *&c.* various Pigments, and all the pure and unmix'd Metals: And in the way of *Combination*, it has produced Soap, Glaſs, Vitriol, Gun-Powder, all the mix'd or artificial Metals, *&c.*

The ſtarting of new Arts and Trades,

(3.) Arts and Trades are the genuine Fruits or Conſequences of the preceding Diſcoveries; in which view inventive *Chemiſtry* is the Purveyor to all the other Branches; and has thus ſtruck out a very large number of Hints, which are frequently form'd into Trades. Thus the Invention of *Aqua fortis*, for example, has given riſe to the Scarlet-Dye, the Buſineſs of Etching, the Art of Refining, *&c.*

And ſupplying their Deſiderata.

(4.) And as *Inventive Chemiſtry* ſtrikes out new Arts and Trades, 'tis no leſs capable of diſcovering means to promote them, or ſupply the Defects, which may appear in their firſt Eſtabliſhment, or retard their farther Advancement. Inſtances of this kind are every where to be met with; particularly in the Arts of Sugar-baking, Soap-boiling, Fermenting, Diſtilling, *&c.* wherein many ſhorter and better Methods of working have been ſeverally diſcover'd.

5. In the way of *Rationale*, *Philoſophical Chemiſtry* is particularly applicable: (1.) To *the accounting for Natural and Artificial Phænomena, and Effects:* (2.) To *the Explanation of the general and particular Properties, or Forms and Qualities of Bodies:* (3.) To *the Diſcovery of the Chemiſtry of Nature:* (4.) To *the Conſideration of Natural and Artificial Tranſmutations:* And (5.) To *the giving a rational Theory of Medical Matters.* *Applicable in the way of Rationale.*

(1.) *Philoſophical Chemiſtry* accounts for many Natural and Artificial Phænomena and Effects, as it is often in the power of this Art to imitate the ſame; whence, reaſoning by juſt Analogy, it may be allow'd to give fair and ſatisfactory Solutions. After this manner it endeavours to account for Lightening and Thunder, with their ſtrange Effects; the *Aurora Borealis*, Earth-quakes, Vulcano's, *&c.* And much in the ſame way it ſolves the Phænomena of Gun-Powder, the *Phoſphori*, and various other ſurprizing Productions of Chemiſtry itſelf. *To the ſolving of natural and artificial Phænomena.*

(2.) As this Part of *Philoſophical Chemiſtry* is uſed to explain the general and particular Properties, or Forms and Qualities of Bodies, it conſiders, Heat, Cold, Light, Moiſture, Dryneſs, Volatility and Fixedneſs, Fluidity and Firmneſs; Continuity and Contiguity, Colours, Taſtes, Odours, Congelation and Conglaciation, Effervеſcences, Fermentations, Putrefaction, Solution, Precipitation, and the various Operations of Chemiſtry, with numerous other Phænomena; ſo as to ſhew how they are produced, affected, altered, or changed in Bodies; and thence to make out their general and particular Hiſtories. *Giving the Hiſtories of Qualities.*

(3.) *Philoſophical Chemiſtry* finds many Reaſons for allowing a *Chemical Agency* in the Production *Diſcovering the Operations of Nature.*

duction of natural Bodies, and their manner of acting upon one another; whence they bring about a kind of true Chemical Effects. And upon this Foundation the original Compoſition and Structure of natural Bodies is rationally accounted for; with the operations and effects of the Elements upon each other. Thus Water and Air may be chemically conſidered as two grand Menſtruums of Nature, which, by means of the Sun's heat, and the ſubterraneal warmth, are continually at work upon all ſublunary Bodies, in order to bring forward various Changes, Regenerations and Tranſmutations, *&c.* Whence the origin and appearances of Meteors; the generation of Hail, Snow, Rain, Metals, Minerals, *&c.* And thus all Vegetation, Animalization and Mineralization (if theſe Words are allowable) may be conſidered and accounted for, as operations or effects of *Natural Chemiſtry.*

Conſidering of natural and artificial Tranſmutations,

(4.) The buſineſs of *Natural and Artificial Tranſmutations* falls the more particularly under the *Rationale* of Chemiſtry, as little elſe but conſideration and reaſoning is required to underſtand and apply it. Theſe Tranſmutations may be *entirely Natural*, or *entirely Artificial*; or *partly Natural* and *partly Artificial*. Under the entirely natural come ſuch as thoſe produced by Putrefaction, long ſtanding or digeſting in the Air, Water or any natural Fluid; whence Animal Subſtances are converted into Vegetables, Wood into Stone, Metals into one another, Bodies into Air, Water, Fire, *&c.* and theſe are again into Bodies.

The Tranſmutations effected by the joint Concurrence of Nature and Art, are ſuch as

thoſe made by Fermentation; where Art puts the ſubjects together, and rightly diſpoſes them, but Nature performs the buſineſs: ſo in the making of Paper, Art ſtamps the Rags, but Nature half putrefies the Matter; and thus contributes to change it.

The *Tranſmutations* purely Artificial are ſuch as thoſe made by Triture, Mixture, long Digeſtion, and other Chemical Operations; as in extracting the Mercuries of Metals: and ſeveral other inſtances in the ſublimer Metallurgy.

Whether theſe Artificial Tranſmutations be real or only apparent, is not ſo much the queſtion; thoſe who will not allow them for Tranſmutations, may call them alterations or changes of one Form into another: and perhaps they may be no more at the bottom; for if the changed body be not always artificially reducible to its priſtine ſtate again, (which is ſuppoſed the Criterion of an Artificial Tranſmutation) this may be owing not to any impoſſibility in the thing, but to the want of a ſuitable method for doing it.

And ſettling the Theory of Phyſic.

(5.) A juſt *Theory* of many *Medical Matters* will naturally flow from the foregoing Conſiderations, or from a particular application of the *Rationale* of *Philoſophical Chemiſtry* to the human Body; with a view to obſerve its natural ſtate, its diſorders, and the effects of Remedies. Thus in particular it helps to clear up the diſputes about Animal Digeſtion, Chylification, Sanguification, Nutrition, *&c.* ſhews how the Blood and Humours are altered by Heat, Cold, Motion, Attrition, *&c.* whence the Origin, Nature, Duration and Phænomena of Diſtempers, and their Manner of Cure.

Applicable, in the way of Experiment, to the eſtabliſhing a Theory of chemical Matters.

6. In the *way of Experiment*, *Philoſophical Chemiſtry* is univerſally applicable, and many times abſolutely neceſſary to the farther examination, illuſtration and confirmation of the preceding parts, or the whole Theory of the Art; which indeed cannot ſubſiſt without it. For tho' ſome kind of Theory might be formed of Philoſophical Matters independant of Experiments; yet ſuch Theories have uſually been found barren, unſound or uſeleſs; ſo as in no reſpect to be ſafely truſted *.

Bringing Inventions to the Teſt.

7. It is the peculiar province of this part of *Philoſophical Chemiſtry* to bring new Inventions and Theories to the Touch-ſtone; diſcover their validity or their inſufficiency; and when found juſt and ſolid, to confirm or ſtamp them with a Character that makes them univerſally current, and fit to be employ'd for farther uſes.

The advancing of new Trades,

8. Thus when any hint is ſtarted for a new Trade, or Chemical Method invented for the improvement of an old one; before the leaſt attempt is made to apply it in real buſineſs, the proper Eſſay or Experiment muſt be performed in Miniature; which proving ſucceſsful, upon repeated Examination, with due variation of Circumſtances, may now encourage the application, or advancement of this diſcovery into an Art.

And finding the Practicability of Things.

9. And thus *Philoſophical Chemiſtry* works in Miniature, to try the Truth, and find out the practicability of things; an Example or Model of which procedure is preſerved and particularly retained in the buſineſs *of Aſſaying*; which beforehand determines the yield of an Ore, and ſometimes the beſt way of working it in large, by previous Experiments made in *Miniature*.

10.

* Omnem Philoſophiam ab experientiæ radicibus, ex quibus primum pullulavit, & Incrementum cepit, avulſam, rem mortuam eſſe. BACON.

10. By thus confining it ſelf to work in ſmall, or in the way of Trial, Inquiry or Specimen only, *Philoſophical Chemiſtry* has the opportunity of fully commanding its Subject; which it chuſes of a proper ſize for the external Senſes to view, and examine on all ſides; and obſerve the phænomena, effects and relations, without being oppreſs'd with too unwieldy a bulk, or having the Mind diſtracted with too many Conſiderations; which might attend a large Work, and retard its advancement to a regular and ſtated perfection. *Advantages of Philoſophical Chemiſtry.*

11. But when thus the Experimental part of *Philoſophical Chemiſtry* has perfected any diſcovery, in ſmall, with relation to Arts or Trades; and clearly and ſolidly ſhewn how it may be wrought to advantage in large, it has now performed its Office; and here leaves the thing, or turns it over to the other branches of Chemiſtry, whoſe end is advantage, to be carried on in the form of a buſineſs. So *Cornelius Drebbel*, when he had fairly eſſayed and proved the Invention of the Scarlet Dye, gave it up to thoſe who afterwards exerciſed it as a Trade. And this appears to have been the general way wherein Arts and Trades were originally invented, or firſt brought into uſe; for it cannot be ſuppoſed, that large Expenſive Works ſhould have been ſet up, before any trial had appeared to encourage them. *Contributes to eſtabliſh larger Works.*

12. 'Tis a particular happineſs in this buſineſs of Experiments, that when an inquiry is made by their means, a proper ſet, or competent number, of them, gone thro' in due order, will uſually give the diſcovery, or as it were a ſpontaneous Solution of the Problem. But to practiſe this method to advantage, requires a judicious Head and a dextrous Hand; with a due obſervance of of the rules laid down by the *Lord Verulam* in his noble Work *de Augmentis Scientiarum*, and *Novum Organum*. *In what manner to be proſecuted.*

The joint Effects of all the parts of Philoſophical Chemiſtry.

13. As the ſeveral parts of *Philoſophical Chemiſtry* are thus ſeparately applicable to ſuch good purpoſes; much greater advantage may be reaſonably expected from the joint uſe and mutual aſſiſtance which they are capable of affording each other; eſpecially by a prudent management and application. A great deal has been already done in this way, but more remains to be done. The Lord *Bacon* ſeems to have gone as far as Mortal could, without the aſſiſtance of new ſets of Experiments in all the parts of Philoſophy, but principally in *Chemiſtry*; up to which Experiments his attachment to Nature directly led him: but at the *fiat Experimentum* he judiciouſly choſe to ſtop, rather than to advance farther by the help of Conjecture, or ſuppoſing the Event of Experiments which it would require ſome Ages to make. As if the *fiat Experimentum* had been directed to Mr. *Boyle*, he took up *Philoſophical Chemiſtry* where the Lord *Bacon* left it; and to what lengths he carried it, the preſent ſtate thereof may witneſs.

Chemiſtry cultivated in Germany,

14. But the *Engliſh* Philoſophers ſeem at preſent to be got a little out of this *Chemical Vein*; and applying cloſer to other Studies, leave the Cultivation of Chemiſtry to the Philoſophers of other Nations. We have had our *Bacons*, our *Digby* and our *Boyle*; Men as eminent in *Chemiſtry*, as in other parts of uſeful knowledge: but *Germany* ſeems more diſpoſed to encourage this Art, where every *Court* has its *Laboratory*, and every *Mountain* its *Mine*; whence it has been uſually well ſupplied with a competent Set of Original Chemiſts; ſuch as *Agricola*, *Ercker*, *Kunckel*, *Becher*, *Homberg* and *Stahl*.

And Holland.

15. Hence alſo their contiguous Neighbours the *Dutch* have derived ſo much of this Art, as ſuits their purpoſe; and fits them to ſupply all

Europe

Europe with Commodities of greateſt conſumption, new fabricated and refined by their induſtrious Hands. Nor has leſs Induſtry been uſed of late, to promote the Knowledge of this Art in their Univerſities; and tho' it be there taught with a view to Medicine only, yet ſome have hence took occaſion to launch into the Ocean of *Philoſophical Chemiſtry*; but particularly *Boerhaave*, that Learned and Aſſiduous Profeſſor of *Leyden*.

Extent and Office of Philoſophical Chemiſtry.

16. But not to leave this buſineſs of *Philoſophical Chemiſtry* too looſe, it may be neceſſary to curb and confine it within its own Bounds; ſo as to keep it from entrenching upon the exerciſe of certain Mechanic *Arts*, or Trades, on the one hand; and upon the common *Experimental Philoſophy* on the other.

Diſtinguiſhed from Arts.

17. *Philoſophical Chemiſtry* ſeems ſufficiently diſtinguiſhed from the Exerciſe of Arts by that obſervation already made, as to its confining it ſelf to work in Miniature, by way of Inquiry, Trial and Specimen only; whereas Arts produce in large, upon a formed and ſettled Diſcovery, to ſupply the Demands of Trade and the Calls of Commerce. So that, for example, there is the ſame difference betwixt a Subſtance produced in a Chemical Experiment, and the Commodity produced in the way of an Art, as betwixt the Aſſay of an Ore in a private Chamber, and the working of the Ore for its Metal in the ſmelting-Huts. The diſtinction might otherwiſe appear from the Invention, Diſcovery and Reaſoning which conſtantly precede and direct all the original Chemical Experiments; but are wanting in the Exerciſe of Arts: which have all that done to their hand, and only conſiſt in a repetition of the ſame uniform Action, or Operation.

From Experimental Philoſophy.

18. The Diſtinction betwixt *Philoſophical Chemiſtry* and the common Experimental Philoſophy lies here, that *Philoſophical Chemiſtry* is the buſineſs of practically, or experimentally, examining into the internal Structure and Compoſition, not only of natural, but likewiſe of artificial and accidental Bodies; ſeparating their conſtituent parts, differently combining theſe again, and thus producing new Concretes, and new modifying or changing both the internal or external forms of the old ones *; whereas the *Common Experimental Philoſophy* is employed in the ſearching after and diſcovering the more obvious properties, and external uſes of natural Bodies; the groſs integrant parts, or entire aggregates, whereof it experimentally orders, arranges, diſpoſes and applies, in their natural Form and Subſtance, to the promotion of Knowledge, and the uſes of Life: but thus produces no new Bodies, nor enters into the Subſtance, Structure, and Compoſition of the old ones; nor changes their external and internal Forms; nor ſeparates their conſtituent Parts; nor variouſly combines theſe afreſh; nor regards bodies at all as they are reſolvable and combinable, or as they are Simples, Mixts, Compounds, Aggregates or De-compounds: all which is the peculiar buſineſs and office of Philoſophical Chemiſtry.

And from Natural Philoſophy.

19. Thus again, 'tis conceived that *Natural Philoſophy* cannot, with propriety, be ſaid to extract and purify Metals, analyſe Vegetable, Animal and Mineral Subſtances, tan Leather, brew Beer, dye Cloth, make Glaſs, produce Oils, Spirits, Soaps, *&c.* but theſe and all ſuch are the direct and proper Operations of *Chemiſtry*.

So

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* *See* Pag. 1.

So, likewiſe, Natural Philoſophy diſcovers the obvious, external and general Properties of the Air, Fire, Water, Heat, Cold, Moiſture, Wind, *&c.* by means of various Experiments, made with the Air-Pump and other ſuitable Contrivances; but it is *Philoſophical Chemiſtry* which more intimately and eſſentially examines into the internal Nature, Structure, Compoſition, Relations and Uſes of the Elements; and thence finds ways of applying them as Engines and Inſtruments of actual Buſineſs: and thus, in a more particular manner, it applies thoſe two grand Inſtruments, *Heat and Cold.*

The whole of Chemiſtry an Artificial Philoſophy.

20. In ſhort, there ſeems to be nearly the ſame difference betwixt *Chemiſtry* and the preſent *Natural Philoſophy*, as there is betwixt *Art and Nature*; ſo that perhaps it might not be amiſs, if, by way of diſtinction, *Univerſal Chemiſtry* were allowed to paſs under the name of *Artificial Philoſophy.*

21. This Diſtinction might not only ſerve to reſtrain *Chemiſtry* to its proper province, and ſettle a juſt notion of the real extent and immediate buſineſs thereof; but in ſome meaſure alſo contribute to remove the prejudice too commonly affix'd to the Name, and thro' habit apt to ariſe in the mind upon all occaſions, when Chemiſtry is mentioned.

Whence the diſrepute of Chemiſtry.

22. The immoral practices of many, who have taken up the name of Chemiſt, has greatly contributed to bring a diſrepute upon the Art; whereto the abandon'd and the diſſolute have uſually made their pretenſions with no more knowledge of it, than would ſerve them to cheat dextrouſly under its appearance. And ſo odious has *Chemiſtry* been render'd by this means, as to deter many from the due ſtudy and exerciſe thereof; whence it has been too much left in bad

bad hands. But the damage from this Quarter is more ſenſibly perceived in the Sublimer Metallurgy; whence Golden Mountains having been too often ſeriouſly expected, the Indigent and the Knaviſh Pretenders to the Art, have hence been furniſhed with a fine handle to practiſe upon the Unwary, or ſuch as they found actuated by ſuperſtitious Credulity, or blinded by an immoderate Paſſion for Gain: Inſomuch that numerous and repeated Abuſes, flowing from this Fountain, have occaſion'd the inſtructive, and truly Philoſophical Art of *Alchemy*, to be currently eſteem'd as a juggle, or a trick on the one ſide; and as an Infatuation or Deluſion on the other.

Whence its farther advancement retarded.

23. Theſe, and the like abuſes, are indeed no way juſtly chargeable upon the Art it ſelf, but entirely upon the Artiſt; yet ſuch is the fate of human Affairs, that the faults of Men are often laid at the door of the Arts they profeſs; as thoſe Arts may prove occaſional Cauſes of the Ill: whence *Chemiſtry* perhaps gives more occaſions of public and private Abuſes than other Arts; as being leſs generally underſtood, and attended with the proſpect of larger Profits and Advantages.

24. But as the beſt things are capable of the greateſt abuſe, this miſ-application of *Chemiſtry* could hardly, of it ſelf, have removed it from the Care and Patronage of the *Engliſh* Philoſophers, if more tempting Studies had not come in the way; particularly the higher Geometry, and ſpeculative Philoſophy: which of late ſeem to have employ'd moſt of our great Genius's. But if upon full examination theſe more ſublime Studies ſhall be found of narrow uſe; *Chemiſtry* again may chance to be cultivated, as an Art whoſe Eſſence is Action, and whoſe End is Uſefulneſs in Life.

25.

25. And if the Genius of the *Britiſh* Philoſophers ſhould in earneſt turn this way, the Art it ſelf might thus be nobly reſcued from the hands of ſuch as diſhonour it; and be ſet in its true light, unſullied by Chicane, Impoſition or Deluſion: new Improvements would be daily made therein; many valuable Secrets diſcovered; new Trades advanced; Commerce enlarged, and uſeful Knowledge increaſed. And tho' our Philoſophers were to be thus employ'd for Ages yet to come, no fear of exhauſting this rich Mine of Philoſophy and Arts: which may be now dug to greater ſatisfaction and advantage, as there is no want of Mechanical Hands in *England* to execute in large, or bring into Works, ſuch Diſcoveries as ſhall give the Encouragement. For, as much as the *Engliſh* Philoſophers excel in Contrivance, Invention and Accuracy of Experiment, ſo much are our Mechanical People allowed to excel in adroitneſs and truth of Work. And ſince the new opening, draining and working of Mines among us, we ſeem to be call'd upon afreſh to the exerciſe and improvement of this Art; whence it may in time come to meet with that eſteem and application it deſerves in a Country ſo juſtly famous as ours for its Philoſophy and its Trade: and thence one day appear in a due Body and Form of *Artificial Philoſophy*. *Reaſons for the revival of* Chemiſtry.

26. But ſuch a Fabric cannot be erected without a number of Hands, ſet to work upon the ſeveral parts; and indeed all the aſſiſtance that can any way be procured, is little enough for the purpoſe. Nor is it eaſy to ſay, before ſome farther advancement is made, what materials and what helps are wanting to carry on the Work: It may not however be amiſs here to point out ſome of the more immediate *Deſiderata* for the farther application and advancement of *Philoſo-* *The aſſiſtance required thereto.*

Philoſophical Chemiſtry; leaving the reſt to be ſpecified occaſionally.

Deſiderata of Philoſophical Chemiſtry; *with the ways of ſupplying them.*

27. (1.) And firſt, a method of facilitating the Experimental part of Philoſophical Chemiſtry is greatly wanted; and may be ſupplied by the introduction of a *ſmall Apparatus for an Extemporaneous Philoſophical Laboratory.*

The difficulties, inconveniences and encumbrance that attend the erecting, procuring and uſing the common Chemical Furnaces and Veſſels, have been found a conſiderable diſcouragement to the exerciſe of this Art, in the way of Experiment and Inquiry; ſo that it might be of good ſervice, if a Philoſophical or *portable Furnace* were at all times eaſily procurable, for the ready and commodious performance of all the Operations in Chemiſtry; the Furnace, with its Apparatus of Veſſels and Inſtruments, being made capable of ſtanding, and working in a common Room, or Chamber, without danger. And whoever conſiders what has already been done in this way by *Glauber* and others, but particularly by *Becher* and *Vigani*, will not find reaſon to think ſuch an Engine, and Apparatus impracticable.

Along with this general, portable Furnace, and juſt Apparatus of Veſſels and Inſtruments, might go a ſuitable Collection of the more neceſſary and uſeful parts of the *Materia Chemica*, ranged under proper Claſſes; with their deſcriptions and more general uſes: and thus all the preparatory Matters to the exerciſe of Philoſophical Chemiſtry, might, without any farther trouble, be at once put into every one's hands.

28. (2.) In order to direct the more neceſſary Inquiries, it might be uſeful to have *a juſt Collection of all that is hitherto known and done in Chemiſtry* conciſely drawn up, to ſhew the preſent

ſtate

ſtate and condition of the Art with regard to what is delivered in Books. And this perhaps would be found an eaſier Task than it might at firſt appear: for tho' the Authors in Chemiſtry are exceeding numerous; yet the original experimental Writers, who alone are here to be regarded, are very few in compariſon of the Speculative Theoriſts, Plagiaries and Tranſcribers. The more difficult and laborious part of the Work would be to collect from unwritten Traditions, and deſcribe the daily Practices of mechanical Operators in their ordinary buſineſs of Smelting, Refining, Aſſaying, tempering of Steel, working of Glaſs, boiling of Sugar, preparing of Colours, refining Commodities, *&c.* all which require particulr *Encheireſes*, that the Workmen in moſt Caſes ſtudiouſly keep ſecret *.

29. (3.) There is farther wanting to the advancement of *Philoſophical Chemiſtry*, *a Set of Practical Rules for conducting all the Chemical Operations, and teaching the Neceſſary Encheireſes.* For tho' a Hand cannot by ſuch Rules alone, without practice, be formed to buſineſs; yet the underſtanding may be directed by them to procure the habit in the beſt and ſhorteſt manner. And beſides the uſefulneſs of ſuch Rules to thoſe unacquainted with Chemical Operations, they may be of farther advantage to Perſons of Experience; as the failure of particular Experiments, in particular hands, ſeems principally owing to a neglect or non-obſervance of particular *Encheireſes*; which in delivering Experiments are ſometimes omitted by deſign, and ſometimes by neglect

* A good deal is already done towards this Collection in Dr. *Stahl's Philoſophical Principles of Univerſal Chemiſtry.*

neglect or overſight. Thus the particular ſucceſs of many Experiments in the ſublimer Metallurgy, has at firſt been thought contingent; as thoſe who endeavour'd to repeat them could not make them ſucceed: which has been afterwards found owing to in-attention, miſ-conduct, or the want of a particular *Encheireſis*, in ſome part of the Operation. And this kind of failure will frequently be found in Chemiſtry, without a particular ſagacity and dextetity, in the conducting of Experiments, or a deliberate and ſober regard to *Encheireſes*; which, in reality, make Operations and Experiments the things they are and ought to be.

30. (4.) Another thing wanted to the advancement of *Philoſophical Chemiſtry*, is a *General Liſt of the Chemical Deſiderata, or Defects, in all Arts and Trades*; with ſuitable conjectures at the readieſt ways of ſupplying them, upon ſolid and experimental Grounds. And to this might be added, by way of Appendix, *a Liſt of Hints for the Introduction of new Mechanic Arts*; upon the like rational and ſolid Foundations: All which are a kind of Problems, the ſolution whereof naturally belongs to the *Philoſophical Chemiſt*. Thus in the Iron-Works, for example, it has been a *Deſideratum* to run Metal from the Stone without Bellows, another to make malleable Iron with Pit-Coal, and a third to work it, or ſoften it for the Hammer, without Fire. 'Tis a *Deſideratum* in the Tin-works to get the Silver out of Tin, as 'tis now got out of Lead. In the Glaſs-works, 'tis a *Deſideratum* to ſolder up the Cracks or Flaws in the Pots, whilſt detain'd in the Fire; and another to make Glaſs without Veins, *&c.* A taſtleſs and inodorous Wine is wanted by the Vintner: and a taſtleſs and inodorous Spirit by the Diſtiller. The Painter wants

a permanent Green, and the Callico-printer a permanent blue Colour: and in ſhort all Arts have their reſpective wants and defects. So *Chemiſtry* it ſelf is greatly defective in an Experimental Hiſtory of general Fermentation, ſeparatory and combinatory, in Subjects of all the three Kingdoms; Putrefaction, Rancidneſs, Muſtineſs, Mouldineſs, Glews, Mucilages, and a thouſand things of the like general nature. In particular, the ſublimer Metallurgy wants a more facile Method of extracting the Mercuries of Metals; and a cheaper one for Meliorations: and all the other parts ſeem equally defective.

The Hints for new Trades will riſe occaſionally, and almoſt without ſeeking. Thus 'tis natural from the common Operations of Brewing and Sugar-baking, to ſuggeſt that Sugar may be procured from Malt, and other Vegetables; that Nurſeries of peculiar Ferments, native and foreign, may be rais'd, *&c.* The introduction of which new Trades would alſo greatly alter and improve the Arts of Brewing and Sugar-baking.

31. (5.) When a general Knowledge is gain'd in the Theory and Practice of this Art, ſo that its uſes and manner of applying to the purpoſes of Life, are become ready and familiar; it ſeems principally neceſſary to its farther advancement, *That there ſhould be a free Communication of Studies, Experiments and Trials, among a ſelect number of Perſons thus qualified:* For as it is naturally impoſſible that any ſingle Man ſhould have a competent Knowledge in all Arts and Sciences; ſo is it expedient, that as much thereof as can be acquired ſhould be lodged in ſome few, who may freely draw out of each other as occaſion requires. Whence they might be enabled to furniſh out, not jejune repetitions

of things already currently known and practiſed: but reſults of new Inquiries, real Improvements, and methods of ſupplying the defects of particular Arts; or Eſſays well fraught with experimental Facts, and uſeful Diſcoveries, after the manner of *Bacon*, of *Boyle*, of *Homberg*, and of *Stahl*. Nor will ſuch a *ſelect body* of men fail of procuring all the aſſiſtance that can be had from uncommon Books, Papers, and Accounts of particular Facts and Experiments; even from ſuch as relate to the making malleable Glaſs and Philoſophical Gold, down to the little œconomical Obſervations of Spots and Tarniſh. The ſearch after the Philoſophers Stone has produced abundance of curious, and ſome very profitable diſcoveries: and the vulgar obſervation of Iron-mould in Linen has given origin to a *fix'd* and durable *Yellow* in the buſineſs of Callico-Printing.

And in this manner *Philoſophical Chemiſtry* ſhould be kept continually open, or in a ſtate of improvement; only permitting, as it advances, that *Arts* and *Trades* be ſupplied, detached, or drawn from it occaſionally.

SECT. II.

Of TECHNICAL CHEMISTRY.

Technical Chemiſtry. BY *Technical Chemiſtry* is underſtood the Application of *Philoſophical Chemiſtry* to the immediate ſervice of *Arts*; ſo as to invent, form, aſſiſt, promote and perfect them.

Divided. The *Chemical Arts* may be divided according to their Subject-matters; or as they work upon animal, vegetable and mineral Subſtances: whence

whence the whole of *Technical Chemiſtry* will fall under *animal*, *vegetable*, *mineral* and *mix'd Arts*.

To give a ſhort view of the Method wherein this Subject is propoſed to be treated, we ſhall here ſet down a few *And treated*

Hints for the Improvement of certain CHEMICAL ARTS: *And firſt for thoſe exerciſed on* SUBJECTS *of the* ANIMAL KINGDOM.

Under ANIMAL ARTS.

1. *The Art of Preparing* SIZE *and* GLEW.

viz. Size and Glew-making.

The Manner of diſſolving the Leather, and boiling the Productions to their due conſiſtence; with the ways of caking and drying the Glew.

The Manner of preparing fine *Glews* from Iſinglaſs, *&c.* for particular Uſes.

An Inquiry into the beſt Methods of preventing the loſs of tenacity from the long boiling of the Glew.

The Uſe of *Papin*'s *Digeſtor* in the making of *Size* and *Glew*.

An Attempt for preparing *Glews* from ſome cheap Vegetable Subſtances, without much heat.

The Manner of preparing and improving the fine Animal Glew, or Pocket-Soop.

The natural Diſpoſition of all Animal and ſome Vegetable Matters for turning to *Glews*, ſhewn by Experiments; with a philoſophical Inquiry into this Buſineſs, for laying the foundation of a Natural and Experimental Hiſtory of Glews, Mucilages, Ropineſs, Viſcidity, Sizineſs, Mouldineſs, *&c.* in animal and vegetable Liquors; but particularly the Blood, Saliva, *&c.* Wines, Vinegars, *&c.*

2. *The Art of Staining and Working of Horn, Bone and Ivory.*

Staining of Horn, &c.

The Ways of ſoftening theſe hard animal Subſtances, ſo as to render them capable of Stamps, Figures and Emboſſments, by Moulds and Preſſure.

The Chemical Preparations, Mixtures and Treatment required in this buſineſs, as to the giving a beautiful and fix'd Blue, Yellow, Red, Green, and other perfect Colours, to Bone, Ivory, and other Animal Subſtances.

The Methods of bleaching, whitening and ſtaining of Hair, as depending on the ſame Foundation; or the ways of turning Hair of any colour at pleaſure; but particularly from red to brown or black, from yellow to perfect white, *&c.* by means of Chemical Liquors, or chemical Fumes.

Ways of preventing the ſplitting and cracking of thin *Horn and Ivory-Wares.*

Hints for the more advantageous Uſe of the Horner's Shavings.

How far the Proceſſes for ſtaining Horn, Hair and Ivory are applicable to the ſtaining of Leather, Wood, Stone or Marble.

The Experiments and Improvements in this Art applied to promote the Philoſophy, or practical Doctrine of Light and Colours.

3. *The Art of Tanning.*

anning.

The beſt manner of preparing the Hides and Skins of Animals, making the Tan-Liquor, putting them together, and drying the Subject.

The Hiſtory of the principal Materials and Ingredients employed in this *Art*; their manner of preparing, extracting, condenſing and preſerving for uſe.

An Inquiry into ſome farther Uſes of the Tan-Liquors, and the refuſe Stuff, after the Operation is over.

The Application of this buſineſs to the *Art of Embalming*, or preſerving the Fleſh and other parts of Animals, for certain purpoſes, by a ſuitable Tan-Liquor and Drying.

The Uſe of this Art in explaining the nature of *Corruption* or *Putrefaction*, either in general, or at leaſt in Animal Subjects; as it ſupplies a ſimple remedy to prevent it: and hence an Inquiry into the Methods of applying it to other uſeful purpoſes in Life.

4. *The Art of the Skinner.*

Skinnery.

The beſt Ways of preparing and preſerving the Skins of *Beaſts* and *Birds*, with their natural Furs and Plumage.

How far this Art coincides with the Art of Tanning; and how far 'tis improveable by the Arts of Staining and Dying.

The uſefulneſs of this Art in the buſineſs of *Anatomical* Preparations, and that part of natural Hiſtory which more particularly relates to Animals.

Preſerving Fleſh.

5. *The Art of curing and preſerving the Fleſh of Animals for Food*, both in a dry and a moiſt Form, or by Fumes, Salts, and Pickles; without indurating the ſubject too much, deſtroying its natural reliſh, or rendring it too ſaline.

The Improvements to be made in this *Art* by the due uſe of Sugar, Nitre and ſome diluted acid Spirits.

The *Dutch* manner of pickling Herrings, wherein their ſuperior excellency depends.

The *Engliſh* manner of preparing Red Herrings, and the principal Methods uſed in our own

Country to preſerve Proviſions both at Sea and Land; with various Improvements in theſe particulars, by the uſe of certain chemical or compound Liquors.

Refining Fats. 6. The Art of *preparing, purifying and meliorating Animal Fats*; as Tallow, Train-Oil, *Sperma Ceti*, *&c.* ſo as to render them fit for the finer uſes.

Inquiries after ſome particular Methods of taking off the nidorous odour, and rankneſs of the groſſer Animal Oils and Fats; ſo as to render them ſweet and fit, in ſome caſes, to ſerve inſtead of Vegetable Oils and Wax.

Methods advanced for edulcorating *Train* or *Seal-Oil*, for the purpoſes not only of the Clothier, Soap-boiler, *&c.* but for the ordinary uſes of Oil-Olive.

A particular Inquiry into the Method of purifying Butter by Separation, and converting it into a durable and perfect Sallad-Oil.

7. *The Art of Dying in Wool and Silk.*

PRELIMINARIES to this Art.

Dying. (1.) An account of the *Materia Tinctoria*, Dying-Stuffs or Dry-Salters Wares; with ſo much of their natural Hiſtory as relates to this Buſineſs.

(2.) The various Ways of extracting the Tinging Parts of theſe Ingredients; condenſing, preſerving and making them into Colours, ready for uſe.

(3.) The different Methods of preparing the Subject, according to its nature, and fitting it to receive the Dye.

(4.) The various Ways of diſcharging the Colours once given to Silks or Stuffs.

The ART itſelf.

1. The Ways of preparing the ſeveral Dye-Liquors for Blacks, Blues, Reds, *&c.* with the means of opening the Colours.

2. The Manner of applying the Subject to the Dye; with the particular *Encheireſes* requiſite to the full imbibing and fixing the Colour.

3. The Method of waſhing and treating the Subject when it comes out of the *Dye.*

4. Attempts for improving the ſeveral Branches of this Buſineſs; as Fulling, Scowring, Diſcharging, opening the *Materia Tinctoria*, condenſing the tinging parts, fixing the Colours, and changing them ſo as to imitate the fineſt fix'd Colours of the *Indies.* With a particular Inquiry into the Methods of improving the Grain-Colours, and rendring them cheaper.

5. To conſider how far this Art is applicable to the Dying of Leather, Feathers, Paper, Shells, *&c.* with its farther uſes in natural Hiſtory and Philoſophy.

8. The *Art of Converting refuſe or excrementitious Animal Subſtances to chemical uſes.*

Turning refuſe animal matters to uſe.

The Methods of preparing *Nitre*, *Sal-armoniac*, and *Phoſphorus* from theſe animal Matters.

The Way of procuring Nitre in the *Eaſt*, and ſeveral *European* Countries: with an Inquiry whether it may be practiſed to advantage in *England.*

The Method of making *Sal-armoniac* in the *Levant*; with the ways of producing the ſame Salt to profit in other places.

The Art of making *Phoſphorus* from Urine and other cheap excrementitious animal Matters.

Hints

Hints for the Improvement of certain ARTS *exerciſed in the* VEGETABLE KINGDOM.

1. *The Art of Timber.*

Timber. The chemical Cauſe of the Decay and Rottenneſs in Timber; with the artificial means of preſerving it ſound, ſtopping the Rot, and killing the Worm.

An Inquiry into the beſt Methods of careening and *caſing* of *Ships*, and preſerving the Timbers from the injuries of the Sea.

The Methods of fitting Wood to endure long under ground, in watery places, or when expoſed to the viciſſitudes of the Weather.

An Attempt towards turning one Species of Wood into another, or making *Artificial Cedar*, from the more common ſorts of Timber.

The Method of Bending large Timbers for the uſe of the Ship-wright, *&c.* with the ways of repairing the Damage they may receive in the Operation.

Tar, &c. 2. *Art of Reſolving certain kinds of Wood by Fire*; viz. into Tar, Pitch, Turpentine, Oil of Turpentine, Roſin, Charcoal, and Pot-aſh.

The Method of doing each of theſe to beſt advantage in different places; with an Inquiry how far they are practicable in certain parts of *England*, and our own Plantations.

A particular Inquiry into the whole Affair of Pot-aſh; with the Ways of making it cloſe, hard, and ſtrong in *England*, and the Plantations; or nearly equal to that of *Ruſſia*.

The different kinds of Pot-aſh and Kelp of different Countries; whence their vicioufneſs, ſtrength,

ſtrength, and other good and bad qualities; with the beſt and eaſieſt Ways of proving their goodneſs, for the uſes of the Soap-boiler, Dyer, Glaſs-maker, *&c.*

3. The *Art of Wax*; with the Method of Bleaching the common *Bees-Wax*, or turning it to *white Wax*; whence the Art of the Wax-Chandler, the ſeveral ſorts of *Sealing-Wax*; and compound Wax for Stamps, *&c.* With an Attempt towards leſſening the price of *Wax* in *England*; by the Introduction of certain new Subſtances, to anſwer the ſame ends. *Wax.*

4. *The Art of Bread.*

This Art conſider'd in different Countries as practiſed upon various mealy vegetable Subjects. *Bread.*

The common manner of making Bread in *England*, compared with that of *France*, and other *European* Nations.

The Methods of improving the Art of Bread-making, by raiſing Nurſeries of Yeaſt, or introducing new Means of preſerving it freſh and ſound.

The Art applicable alſo to ſubjects of the animal Kingdom, to good advantage in ſome caſes.

5. *The Art of Starch and Powder.*

The common Proceſs for Preparing Starch, from Wheat-Flower, by Fermentation. *Starch.*

The ſame Proceſs applied to other mealy, and ſome glutinous, vegetable Subſtances; as Potatoes, Rice, *&c.*

The Method of reducing Starch to Powder of different kinds; with the adulterations and abuſes commonly practiſed in this Art.

Inquiries into ſome more advantageous Uſes of the Starch-maker's Liquor; and methods of ſhortening the Proceſs.

6. *The*

6. *The Art of Malt.*

Malt. This Art, as commonly practiſed in *England*, traced from the ſteeping Ciſtern to the Granary.

Some Improvements made therein by other Nations, particularly the *Germans*, and of late among the *Engliſh*.

The Methods of advancing this Art ſtill farther, and applying it to the malting of Buckwheat, *Virginia* Wheat, Rice, and other glutinous Grains, Pulſe, Legumens, and ſome cheap Seeds of eſculent Roots and Plants, for various purpoſes.

The Method of drying *Malt* to perfection, with any kind of Fewel, by means of the *Balneum Mariæ*; ſo as not in the leaſt to alter its natural Taſte and Colour.

7. *The Art of Brewing and Fermenting.*

Beer. The Common Proceſs of Brewing for *Malt-Liquors* improved in its ſeveral parts.

The Uſe of ſome particular Additions, in the buſineſs of Brewing.

The Art of Fermenting by Compreſſion recommended.

The Uſe of Hops improved.

Glauber's Method of Condenſation, ſhewn practicable to advantage in the Buſineſs of Brewing.

The beſt manner of Brewing for Exportation and long Voyages.

The improv'd State of this Art in *Germany* conſider'd.

The Methods of reducing brew'd Liquors to their leaſt Volume, without impairing their Virtues.

The Sophiſtications and Abuſes often practiſed in this Art.

The Methods of Brewing, to vary with the Intention of the Operator.

The

The Application of this Art to various new Subjects.

The practical Hiſtory of Fermentation in its full Latitude.

8. *The Art of Wines.*

Wine. Various Improvements in the common Methods of preparing Wines, both in *England*, and in the proper Wine-Countries.

Several Methods of making as excellent Wines in *England*, or other more Northern Countries, as thoſe of the prime Growths of *France*, *Italy*, *Greece* or *Hungary*.

Inquiries into the true Methods of producing taſteleſs Wines, of any aſſignable Degree of Strength or Richneſs; and of giving them the perfect Colours and Flavours of any particular foreign Wines.

The Methods of condenſing Wines, or reducing them to their utmoſt perfection; without admitting any ſuperfluous part.

The Art of converting *Engliſh* Cyder, and the Tappings of certain Trees into tolerable Wines.

The whole Buſineſs of Wines ſhewn practicable to great advantage in *England*; whether Wines be conſidered as natural, or as artificial Productions.

Attempts upon ſome Methods of making extemporaneous portable Wines, that, in a ſmall quantity, ſhall turn Water into a vinous Liquor of the Nature of genuine Wine.

The beſt Methods of remedying the various Diſeaſes of Wines.

9. *The Art of Vinegars.*

Vinegar. Shorter Methods than the common, of turning Beer or Wines into Vinegar.

An

An Attempt upon ſome profitable ways of preparing Vinegar without Wine, or the trouble of Brewing.

An extemporaneous way of making Vinegar.

The ways of recovering decayed Vinegar, or making it of any degree of Strength.

The Method of condenſing Vinegar, or reducing it to its leaſt volume.

An Attempt towards producing a ſolid Vinegar.

10. *The Art of Diſtillation.*

Spirits. Improvements of this Art in its ſeveral Parts, *viz.* Brewing, Fermenting, ſimple Diſtilling, Rectifying, and Compounding; ſo as to make it anſwer the different Intentions of the Operator.

How to Brew in perfection.

How to raiſe Nurſeries of Yeaſt, or preſerve it long for the Malt-Stiller.

How to work with expedition, and how to greateſt advantage.

How to make a clean Malt Spirit.

The Buſineſs of *Proof* in Spirits particularly examined.

The way of diſtilling Wine-Lees to great advantage.

The beſt Methods of rectifying all Spirits, recommended.

The beſt Form wherein to export and preſerve Spirits, inquired into.

The beſt Ways of judging the Goodneſs and Purity of Spirits.

Inquiries into the beſt Acid, for giving a true vinoſity to vulgar rectified Spirits.

The Ways of colouring Spirits, and fitting them for Sale.

The

The principal Uſes of the common Spirits extended.

The Hiſtory of Spirits, foreign and domeſtic.

The Method of turning common Spirits into Brandies or Arracks, undiſtinguiſhable from the foreign.

The true Method of working in compound Diſtillation.

11. *The Art of Sugar-making, and Refining.*

The common Proceſs of making *Sugar* from the natural Juice of the Sugar-Cane, philoſophically and chemically conſidered. *Sugar.*

Attempts for ſhortening this Proceſs.

The whole Buſineſs of boiling Sugars to their proper height; the more certain ways of taking of Proof, preventing of burning, and making the matter granulate to the beſt advantage.

An Inquiry after a Method of converting the *Melaſſes* or *Treacle* into tolerable *Sugars.*

This Art applied to Honey and other Vegetable Juices; with a particular Inquiry if Sugar-Works might not be ſet up to advantage in Wine-Countries, and Countries productive of Corn, or certain Trees, that yield plenty of a ſaccharine Liquor by tapping.

The Art of refining the Sugar into the different kinds of Clay'd, Lump, Loaf, *&c.* with the Methods of different Countries, but particularly of *Germany* for this purpoſe.

Some Attempts towards diſcovering cheaper and more expeditious Ways of refining Sugars, and bringing them with eaſe to a perfect Whiteneſs.

To ſhorten the Proceſs of making Sugar-Candy; or to perform it without heat, and the Cockle-Room.

An

An Attempt to introduce ſeveral new and profitable Uſes of Sugars, both in *England* and the Plantations.

12. *The Art of Soap.*

Soap. The common Methods of making the different kinds of *Soap* in *England*, chemically conſider'd.

To ſhorten the common ways of preparing the Lixiviums, and the long Operation of Boiling.

The Methods of making the hard Oil-*Soaps* at *Venice*, *Caſtile* and *Marſeilles*; with attempts to produce as excellent in *England*.

To prevent or take off the rank ſmell of certain kinds of Soap, and give it any agreeable ſcent and colour.

An Attempt to perfect ſome extemporaneous Methods of making either ſolid or liquid Soaps.

An attempt to prepare and introduce certain Medicinal Soaps of uncommon virtues and uſes.

The manner of making *mild Soaps* for the fineſt Lace and Linens.

13. *The Art of Tartar.*

Tartar. The Method of producing *Tartar* from different Matters.

The vulgar Method of refining *Tartar* in *Languedoc*.

An Attempt to convert Red *Tartar* into White.

The beſt and moſt expeditious Ways of Refining or bringing it into what is vulgarly called *Cream of Tartar*; ſo as to make it perfectly tranſparent, and clear as well as white.

Hints

Hints for the Improvement of certain MINERAL ARTS.

The Mineral Arts may be conſider'd as they regard *Salts*, *Earths* and *Metals*.

The Art of Salt.

The beſt Manner of Working Salt from the Sea-Water, and Salt-Pits, in *France* and *England*. *Salt.*

The Uſes of the Bitter Liquor of the Salt-Pits called *Bittern*.

The Ways of refining Salt both at home and abroad.

The Improvement of Salt-making by means of Congelation.

Some new Methods of obtaining Salt in its greateſt purity and perfection.

The Art of Copperas and Vitriol.

The Proceſſes of making the common *green* and *blue Vitriols* in their preſent ſtate of Improvement; with an Inquiry into the beſt ways of ſhortening theſe Proceſſes. *Vitriol.*

Attempts for an advantageous Method of converting green Vitriol into blue, or the Vitriol of Iron into that of Copper.

Some particular Uſes of the Raw-Liquor of the Pyrites, before 'tis boiled into *Copperas*.

Uſes of the refuſe Copperas, or Ciſtern-Bottoms.

The Art of Borax.

A Philoſophical and Chemical Enquiry into the origin, nature, and uſes of this *Salt*, as found in the *Eaſt*, and thence brought into *Europe*, under the form of *Tincar* or *Tincal*. Whether it be a natural or factitious thing; with the man- *Borax.*

ner of collecting, preſerving and packing it up. Whether it be not naturally procurable in *Europe*. Whether the *Venetians* have any Secret relating hereto: And in what condition this Affair ſtands with the *Dutch*. Whence the imperfect Knowledge of the Subject among the *Natural Hiſtorians*, *Chemiſts*, and *Literati*.

Attempts to imitate this Salt; more particularly with a View to ſoldering, and the buſineſs of Metals.

The true Method of refining this Salt, and bringing it to its utmoſt Purity and Beauty.

The Art of Burning Stone and Earths.

Brick. The beſt Materials of *Lime* for the Uſe of the Builder; with the moſt perfect Methods of burning the ſame, ſo as to make firm and durable Mortar, Plaiſter, *&c.*

The beſt manner of burning different Clays into Brick and Tile for Building.

An Attempt for burning of Brick, ſo as to make it reſemble Stone.

The way of burning Alabaſter, Talc, *&c.* for Plaiſter of *Paris*, and to make it of a ſtony hardneſs.

The Art of *Enamelling* or Staining applied to Brick-making; ſo as to make *Bricks* of any Colour at pleaſure.

The Ways of burning Clay-Earth for Manure.

The Art of Pottery.

Earthen Veſſels. The State of this Art in different Countries, as it works in *Clay*, *Stone*, and the *finer Earths*, for the forming of Veſſels.

Attempts in *England* and elſewhere, to imitate or exceed the *Indian* Porcellane; with Accounts of their Failure or Succeſs.

The

The whole Buſineſs of Glazing, conſidered and nproved.

Attempts to improve upon *China Ware*, by ıe uſe of ſome new Compoſitions, or Mixtures of arthy Matters.

The Art of Metals, vulgar.

The Buſineſs of finding, judging and digging *Metals.* f Mines; and ſeparating, purifying and working ıe Metals, from the Ore to the Utenſil; with the ter Diſcoveries and Improvements made in this ıbject.

An Inquiry into the beſt Methods of working ıe ſtubborn Ores; with the Ways of improv- g the Buſineſs of *Fluxes.*

The ſeveral Ways of making the Compound Artificial Metals; as Braſs, Pewter, Bell-me- l, *&c.* The various Method of blanching opper; and giving it the appearance of Silver or old.

Improvements in the Compound Metals; ſo to imitate Gold and Silver in ſeveral Works, to eater exactneſs.

The Methods of making Iron with Pit-coal, d ſoftening Caſt Iron; with ſome Attempts for ndring Iron malleable without Heat, or to ake it work like Copper.

Attempts for ſeparating Silver from Tin; and find how large a Proportion of the Tin is con- rtible into Silver.

The Chemical Hiſtory of Solders, with Im- ovements.

The beſt Methods of tinning Iron-Plates, Cop- r-Plates, *&c.*

An Inquiry into the Nature, Phænomena and ffects of *Stahl*'s *Phlogiſtic*, in the affair of Me- ls.

The Buſineſs of gilding and waſhing of Metals.

An Inquiry into the Methods of making the red and white Copper of *Japan.*

The more certain Methods of detecting Adulterations and Abuſes in Metals.

The higher Art of Metals.

Alchemy. Attempts for procuring the Mercuries of the ſeveral Metals, to profit.

A ſet of new Experiments to ſhew how far one Metal is tranſmutable into another.

Some Endeavours to fix common Mercury into a real metalline or ductile Matter; and to ſoften the Regulus of Antimony.

The common Method of turning *Iron* into *Copper* examin'd.

Mr. *Boyle*'s Method of tranſmuting *Gold* into *Silver* examin'd.

A ſummary View of the *ſublimer Metallurgy* in all its parts; with ſome particular Obſervations and Improvements upon ſuch things therein as appear ſolid and uſeful.

The Art of Smithery.

Smithery. This Art chemically conſidered in the hands of the *Gold-ſmith*, *Silver-ſmith*, *Copper-ſmith*, *Tinman*, *Pewterer*, *Plumber*, and *Iron-ſmith*; with ſome Attempts for ſupplying their reſpective *Deſiderata.*

The Art of Foundery.

Caſting. To find the beſt Mixtures and Methods for caſting large Ordnance, Bells, *&c.*

Inquiries into the moſt direct means of making the Metal run ſmooth, cloſe and ſound.

The common Buſineſs of Foundery in *Braſs*, improved.

The

The Ways of caſting Iron Guns, Stove-backs, *&c.* at the Iron Furnace, with a view to their mprovement.

The Art of Practical Minerology.

The chemical Methods of examining the va- *Examining* ious Mineral Bodies, to diſcover their Nature and *Minerals.* ontents.

The principal Uſes of ſuch Bodies; as Cadmia, rſenic, Mundic, yellow Zink, *&c.*

The various metallic Compoſitions to be made ith them; and the manner wherein they affect nd alter the perfect *Metals.*

Hints for the Improvement of certain Mix'd Chemical Arts.

By *mix'd Arts* we underſtand thoſe which are xerciſed upon Subjects of more than one King- om.

The Art of Paper, in Wool, Silk, and Linnen.

The common Methods of making the different *Papers.* inds of Paper.

This Buſineſs conſidered with a Chemical View, order to ſhorten and improve the Proceſs.

The Methods of making the whiteſt Paper, and iving any kind of Colour thereto; with the uſual Iethod of making that called *Marble-Paper*, nd its Improvement, both at home and abroad.

Some Attempts to render Paper more durable, nd leſs apt to be gnaw'd, or torn by Domeſtic nimals.

The State of this Art in *China*, *France*, *Hol- nd* and *England.*

The Ways of Emboſſing and Printing of Pa- er for Hangings, *&c.*

The Application of this Art to the *Asbeſtos*, ſo as to make incombuſtible Paper.

An Attempt towards a Method of diſcharging the Printers Ink out of Paper.

The beſt Way of making *Filtring-Paper* for Chemical Uſes.

The Art of Inks.

Inks. Ways of preparing Inks of all Colours; ſolid and fluid.

Methods of diſcharging moſt kinds of Ink.

Ways of recovering the Colour of decay'd Ink; ſo as to render old and almoſt effaced Manuſcripts legible.

The *Sympathetic Inks* chemically conſider'd.

The *Printers Ink* improved.

The Ways of curing the Imperfections of the common *Writing Ink*; ſo as to render it undiſchargeable; preſerve it from ropineſs, mouldineſs, and being prey'd upon by Time, and Vermin, that would otherwiſe deſtroy the *Paper*.

The Art of Japanning.

Varniſh. The State of this Art in *England*; with its means of Improvement.

An Attempt to introduce the Amber-Varniſh, ſo as to give a thick Coat of real *Amber*.

The Japanning of *Europe* compared with that of the *Eaſt*.

The Art of Glaſs.

Glaſs. The common Proceſſes for making the different kinds of *Glaſs*, chemically examin'd.

The State of this Art in different Countries.

The late Improvements in the Art of Glaſs carried ſtill farther.

Attempts to prevent Veins in the finer Glaſs.

Attempts

Attempts to diſcover ſome Material for the Glaſs-houſe Pots, not ſubject to crack or flaw in the Fire.

The moſt probable Ways of ſtopping ſuch Cracks, when they happen.

The Methods of ſtaining and colouring Glaſs.

The Ways of imitating Gems in Glaſs.

Attempts to make Glaſs approach the hardneſs of the Diamond.

Attempts to mollify Glaſs, or render it in ſome Degree ductile or malleable.

Art of Pharmacy.

The preſent State of *Chemical Pharmacy* conſider'd. *Medicines.*

How far it extracts, and how far it fails of extracting the ſpecific Virtues of the *Materia medica.*

Attempts to introduce various new and effectual Methods of Treatment into this Art; with a view to procure the real Virtues of Simples, and render them ſpecific.

An Attempt to regulate and aſcertain the Buſineſs of Compoſition in this Art.

The Art of Pigments.

This Art chemically conſidered, in the hands of the *Dry-Salter*, *Colour-man* and *Painter*. *Pigments.*

The beſt and ſhorteſt Methods of preparing the ſeveral Pigments; as White-Lead, Red-Lead, the Lakes, the Blues, the Greens, the Reds, *&c.* with the ways of grinding, mixing, and fitting them for the Painter's Pallet, and other Uſes.

Attempts to introduce ſeveral new kinds of artificial *Pigments.*

The Art of Fire-Works.

Fire-works. The beſt Methods of preparing *Gunpowder*, for its ſeveral Uſes.

Attempts for making the whole parcel of Gunpowder take fire inſtantaneouſly in large Charges.

Some Attempts for the Improvement of Gunpowder, and increaſing its Force: with the beſt Ways of preſerving it from Accidents.

The whole Buſineſs of Fire-Works chemically conſider'd.

Some Attempts for imitating the Phænomena of the Sun and fix'd Stars, by Fire-Works.

An Inquiry into the *Chineſe* Method of *Fire-Works.*

The Art of Printing on Callico and Linen.

Staining. The uſual Methods of preparing the Subject, laying on the Colours, or giving and fixing the Stain.

An Inquiry into the Durability, Nature, and Changes of theſe Colours; and the ways of diſcharging them.

The Ways of imitating the fine fix'd Reds and Blues of *India.*

The Chemical Hiſtory of Stains and Mildews.

The Chemical Hiſtory of *Madder*; and its Uſes in this Art.

The ſeveral *Colours* at preſent uſed in Callico-Printing, how chemically prepared, and improved.

An Attempt to ſupply the Defects of this Art; by ſtriking certain Stains, without the aſſiſtance of *Alkali* and *Acid.*

An Inquiry into the State of Callico-Printing in the *Eaſt-Indies*; and the *Chemical Artifices* there made uſe of for it.

he Art of Printing on Paper, with Metalline Types.

The beſt Ways of preparing, caſting and working the mix'd Metal for the *Printers* Types; o as to give the Letter a full Face. *Printing.*

The moſt expeditious Methods of cleanſing the *orms.*

Attempts to improve the *Printers Varniſh.*

Certain Attempts to diſcharge the *Printers Ink.*

Beſides the various Arts of this kind, which eem more directly chemical, there are many o-hers, capable of receiving improvement from *Chemiſtry*; and among theſe may be reckon'd ainting, Sculpture, Statuary, Architecture, griculture, Husbandry, Navigation, Aſtrono-ny; and all the practical Arts, both of Peace nd War.

Upon a ſmall Survey of the preſent State of the *hemical Arts* in *England*, there appears to be oom for the introduction of ſeveral new ones; nd among others the following.

The refining of *Animal Fats*, for more curious Uſes.

The making of *Sal-ammoniac* from Refuſe Matters.

The improved Method of refining *Camphire.*

The refining of *Tartar*, into beautiful Cry-tals.

The compleating of *Borax*; or the perfect manner of refining *Tincar.*

The boiling down *Malt-Wort* to a TREACLE, or Diſtillation, Brewing, and Exportation.

New Art of *Brewing*, with cheap Materials.

New Art of WINES.

New Art of VINEGARS.

New Art of *producing* and *rectifying* SPIRITS.

The

The perfect imitation of *French Brandies*, and *Indian Arracs*.

The preparing of new ENGLISH BRANDIES, and ENGLISH ARRACS.

The raiſing Nurſeries of FERMENTS of different Kinds.

The *Art* of recovering *eager Wines*, and *muſty Drinks*.

New Manufacture of WINE-LEES.

The Manufacture of *White-Lead*, without Vinegar, Horſedung, or Grinding; or without prejudice to the Health.

The making of *Engliſh* LIQUERISH.

The making of *Engliſh* OPIUM.

The Art of TEAS.

New Art of SNUFFS.

The making of OIL-SOAP.

The making of BLUE VITRIOL.

The ſeveral preceding Articles are not propos'd as bare Hints, or ſuperficial Glances at things, unwarranted by Experiments or Obſervation; but as a Proſpect of ſome real Advantage to be rationally expected from a due Proſecution of this Subject.

SECT. III.

Of COMMERCIAL CHEMISTRY.

Commercial Chemiſtry. BY *Commercial Chemiſtry* we mean the application of *Philoſophical* and *Technical Chemiſtry*, to the founding, ſupporting, and improving of *Trades* and *Commerce*.

Its Parts. In this View *Commercial Chemiſtry* will conſiſt of three principal Parts, *viz.* (1.) The Exerciſe of all the *Chemical Arts* in ſuch a manner as to ſupply

ſupply beyond the Demands of a ſingle Nation, and afford a ſurplus of Commodities for Exportation, and foreign Conſumption. (2.) The ſeveral Ways of condenſing, curing, preparing, ſecuring and fitting natural and artificial Productions, or Commodities, for Tranſportation and Carriage: And (3.) The means of ſupplying the Chemical Neceſſaries to Voyagers and Travellers, in founding, ſupporting and improving the Buſineſs of Trade, Traffic and Commerce in different Countries.

Hints for extending the CHEMICAL ARTS, *and rendring them* COMMERCIAL *in* ENGLAND.

This Subject is of too complex, and intricate a Nature to be adjuſted from bare philoſophical and chemical Conſiderations: a Knowledge of the different Policies, Laws, Intereſts, and Cuſtoms of Nations is here required; or the joint Abilities of the *Stateſman* and the Merchant. Thus perhaps it might not, tho' it were practicable, be the Intereſt of *England* to rival *France* in *Wines* and *Brandies*; *Germany* and *Sweden* in *Metals*; nor *Holland* in the Production of *Corn-Spirit*, and the cheap Preparation, and Refinement of certain other Commodities. *How to be extended.*

But ſuppoſing *England* at full liberty, and the Cuſtoms, Duties and Draw-backs in her favour; then it is a Point of Philoſophical and Chemical Conſideration, to ſhew what Arts may be render'd commercial, for the Benefit of our own *Kingdom*. And among others of this kind may come the following, *viz.*

The Arts of *Wines* and *Brandies*; from Grapes of *Engliſh* Growth.

The ſame *Arts*, without *Grapes*, to ſtill greater Profit; and practicable with much leſs Trouble and Expence.

The Art of producing *Corn-Spirit* to better Advantage than the *Dutch*; and under-ſelling them at the foreign Markets.

The Art of producing VINEGARS, cheaper than in *France* or *Holland*.

The Art of producing ARRACS, equal or ſuperior in goodneſs to thoſe of *India*.

The Art of REFINING CAMPHIRE to more Perfection, than the *Dutch*.

The Art of making HARD OIL-SOAPS, equal to the *Foreign*.

The Arts of *curing ſeveral ſorts of* FISH *and* FLESH, to greater advantage than among the *Dutch*.

The *Art of refining* BORAX, to greater profit and perfection, than in *Holland*.

The *Art of making* WHITE-LEAD, to greater advantage, than in *Holland*.

It is not neceſſary to be large in the enumeration of many other *Chemical Arts*, no leſs improveable than theſe, for the purpoſes of Commerce; becauſe a ſingle one, when fully advanced and extended, may often prove the principal buſineſs of a whole COUNTRY; as the *Art of* Wines in *France*, *Spain*, and *Portugal*; the *Art of Sugar* in the Plantations; the Art of *Metals* in *Germany*, &c. And in this large View it is that Arts come to be conſider'd under the Head of *Commerical*, as, in a leſs extenſive way, they fall under that of *Technical Chemiſtry*; to which we therefore refer.

CHEMICAL CONSIDERATIONS *on the more perfect Ways of* CONDENSING *Commodities for Exportation, without impairing their Virtues, or leſſening their Goodneſs.* *Commercial Condenſation.*

Before Goods are ſent abroad, 'tis proper they ſhould be reduced to the leaſt volume they are capable of, without injury; and put into a Condition of receiving the leaſt damage from the Weather, Salt-Water, and other Accidents.

Thus Metals are tranſported inſtead of their Ores; Sugar inſtead of the Sugar-Cane; dry Raiſins inſtead of Grapes; High Spirits inſtead of Low-Wines; Salt inſtead of Sea-Water, *&c.* with care to ſecure each Subject, that requires it, in a ſuitable Fuſtage, or Futail. And thus by means of *Commerical Chemiſtry*, different Countries are ſupplied with *Pitch*, *Tar*, *Roſin*, *Turpentine*, *Brimſtone*, *Wax*, *Oil*, *Tallow*, *Tann'd Hides*, *Wines*, *Brandies*, *Salt*, *Sugars*, *Treacle*, *Paper*, *Books*, *Lead*, *Tin*, *Iron*, *Silver*, &c. whereby all Trade, Traffic, and Commerce is ſupported.

Hints for the Hiſtory of COMMERICAL CONDENSATION.

The Method of *Condenſing* WINES, ſo as greatly to leſſen their Bulk, and at the ſame time improve their Virtue and Goodneſs, and render them much more durable, or leſs ſubject to change or decay; either by *Land* or *Sea*.

The Way of *Condenſing* MALT LIQUORS and VINEGARS for Exportation; in the form of a rich fermented *Beer* or *Ale*; not ſubject to ſpoil in the longeſt Voyage.

The Art of condenſing all kinds of Spirits, Brandies, Rums, and Arracs, without loſing of their natural Flavours.

The

The Art of condenſing the Juice of foreign *Grapes*, and leaving it fit to be made *Wines* in Countries that produce no Wines of their own.

Methods of reducing the *tinging Parts* of the more bulky DYING-STUFFS, to a kind of Extract; for *Dyers*.

The Reduction of *Pot-Aſh*, *Tincar*, and *Borax*, to a leſs volume or weight; yet retaining all their eſſential Parts.

Hints for the Hiſtory of COMMERCIAL CURATION.

Commercial Curation.

The beſt Ways of curing Animal Subſtances; but particularly Fleſh, Fiſh, and animal Oils or Fats, for Exportation, and long Voyages.

The beſt Ways of curing various Vegetable Commodities; as Fruits, Woods, Gums, Hops, Tobacco, and animal, vegetable, and mineral *Drugs*.

Hints for the Hiſtory of COMMERCIAL PACKAGE.

Commercial Package.

When Goods are cured and reduced to their ſmalleſt Bulk for Exportation, the next Conſideration is the manner of *Packing* them up, and ſecuring them to beſt advantage.

Goods are reducible to two Species, fluid and ſolid; according to the Nature whereof, they require a different Package: whence an Inquiry into the beſt Ways of ſecuring *Oils*, *Wines*, *Brandies*, *Treacle*, *Malt-Liquors*, *Tar*, *Turpentine*, *Quickſilver*, &c.

An Inquiry into the beſt Methods of ſecuring *ſolid*, but *liquifiable Goods*; as *Kelp*, *Pot-Aſh*, *Sugar*, *Soap*, *Nitre*, *Vitriol*, *Borax*, *Alum*, &c.

The Methods of ſecuring volatile and ſtrong-ſcented *Solids*; as *Camphire*, *Muſk*, *Aſa-fœtida*, &c.

to

o prevent their avolation, or affecting other kinds f *Goods.*

The beſt Methods of ſecuring TEAS, and all ine Goods that are apt to catch and retain any eterogeneous Odour.

The beſt Ways of preparing Wrapping-Cloths or dry Goods; as the *Eaſt-India Wax-Cloth*, *utenag Caniſters*, &c. the *Engliſh* Oil-Cloth, Tar-awling, *&c.*

Hints for a Hiſtory of the Uſes of Chemiſtry to Travellers, or in long Voyages at Sea, with a View to COMMERCE. *Chemical Apparatus for Voyages.*

The Neceſſaries for long, trading Voyages; as articularly a Chemical Cheſt; and a Portable urnace; with a ſmall Apparatus, conſiſting f a Screw-Preſs for Oils, Flux-Powders, Quick-ſilver, and Antimony, *&c.* for aſſaying f Gold, Silver, and Ores.

The more certain Signs of MINES; from the hemical Examination of *Mineral Waters*, and ne Evaporation of *Mineral Juices.*

The more expeditious Ways of aſſaying ani-al, vegetable, and mineral Subſtances; to ſhew hat Proportion of valuable or merchantable ommodities they hold: illuſtrated in Oils, Eſ-nces, mineral Liquors, Drugs, Ores, and other ineral or metalline Matters.

Heads of Inquiries to be made by Travellers to the Chemical Productions of different Coun-ies; as particularly into the manner of prepa-ng *Arracs*, *Nitre*, *Borax*, and *Porcellane*; the uring of *Teas* in the *Eaſt*; making Sal-Ammo-iac in the *Levant*; Vitriol in *Germany*; Bran-ies in *France*; Pot-Aſh in *Ruſſia*, &c.

An Account of certain *Chemical Contrivances*, apable of deceiving Travellers and Merchants the condition of the Commodities; with

the

the moſt expeditious Ways of detecting ſuch Impoſitions; as the Sophiſtication of Wines, Brandies, Vinegars, and Arracs; the Debaſement of Gold-Sand, Gold-Bars, or Ingots, Silver, Copper, and Tin, counterfeit Gems, *&c.*

The *more certain*, and expeditious Chemical Ways of diſcovering the Goodneſs, or Genuineneſs of moſt merchantable Commodities: with the beſt Methods of aſſaying *Pot-Aſh*, *Tincal*, *Amber*, *Ambergreaſe*, *Musk*, *Opium*, *Aloes*, the natural *Balſams*, *Bezoar*, and various other kinds of *Drugs*.

The more ready Ways of examining whether unexperienced *Waters* be wholeſome.

The beſt Methods of preſerving *Fruits*, *Flowers*, and *Seeds* in their perfection, during a long *Voyage*.

The beſt Methods of preſerving *Freſh-Water* at *Sea*.

The beſt and moſt expeditious Ways of edulcorating the *Sea-Water*, ſo as to render it potable, or fit for common Uſes.

The beſt Methods of preſerving freſh Proviſions.

The beſt Pharmaceutical Methods of curing certain Diſeaſes incident to Sailors and Travellers in long Voyages; and ſome particular Countries.

SECT. IV.

Of OECONOMICAL CHEMISTRY.

Oeconomical Chemiſtry.

BY *Œconomical Chemiſtry*, is underſtood the Application of Philoſophical, Technical, and Commercial Chemiſtry, to the particular Uſes of a FAMILY.

Hence *Œconomical Chemiſtry* is of great extent; as bringing into practice, tho' in a ſmall way, moſt of the larger Works of *Commercial* and *Technical Chemiſtry:* from the latter whereof, it differs only as that does from Commercial *Chemiſtry*; the firſt producing to ſerve a *Family*, the ſecond a ſingle *Nation*, and the third the *World*. *Its uſe and extent.*

This Branch of *Chemiſtry* may be conſider'd with regard to the ſeveral *Offices* of a Houſe, wherein, as in ſo many different Laboratories, 'tis uſually practiſed; that is, with regard to the *Brew-houſe*, *Cellar*, *Store-room*, *Kitchen*, *Dairy*, *Laundry*, and their reſpective Stores, Furniture, and Apparatus.

Hints for the Œconomical Hiſtory of FERMENTATION: *or the Management of the* BREW-HOUSE *and the* CELLAR.

The beſt *Methods* of brewing with *Malt*, for the ſervice of a *Family*. *Oeconomical Fermentation.*

The Method of Brewing with *Honey*, for Mead, Metheglin, and a Liquor reſembling *Canary*.

The Method of Brewing with *Treacle*, Sugar, and mix'd Matters.

The beſt Method of making *Cyder* and *Perry*; either ſimple, or by mixture.

The Method of Brewing with ſome particular *Vegetable Juices*.

Certain new Methods of making *particular Drinks*.

The Art of preſerving *Yeaſt*, for ſome Months, freſh and ſound.

The whole Buſineſs of making perfect and ſound Wines of *Engliſh Grapes*.

The beſt Ways of imitating foreign Wines, without Grapes, or Raiſins.

The Art of MADE-WINES, with Raiſins, or without, to great perfection.

Some Methods of curing foul and ropy *Wines*, and recovering eager Drinks.

The beſt Ways of defending a Vault or Cellar from *Froſt*; and of reſtoring Wines or Drinks that have been frozen.

The Methods of preſerving the *Casks* and *Brewing Veſſels*, in their greateſt Purity and Perfection: with certain Ways of recovering muſty Veſſels.

The beſt Method of erecting a Brew-houſe; ſo as greatly to leſſen the Labour and Expence uſually attending the making of Drinks.

The Art of *Vinegar* and *Verjuice*; from *Malt*, *Raiſins*, *Wines*, *Cyder*, *Crabs*, &c. with the beſt Methods of making them durable, and preſerving them at all times fit for uſe.

Hints for the Hiſtory of the STILLATORY, and the STORE-ROOM.

The Family Stillatory and Store-Room.

The perfect Ways of making the moſt uſeful *Simple Waters*.

The beſt Manner of diſtilling *Spirits* from the Grounds of Beer, Ale, or Wine-Lees, for the ſervice of the Lamp; and the making of *Compound* or Cordial *Waters*.

A Set of the moſt uſeful *Cordial Waters*, for the ſervice of a Family; made either by *Diſtillation* or *Infuſion*.

Certain eaſy and cheap Ways of imitating *French* Brandy, and *Indian Arrac*, for Family Uſes.

The kind of Still moſt proper for œconomical Purpoſes; with the Method of ſetting and working it to advantage; eſpecially in large Families, and Gentlemen's *Country Seats*.

The beſt Methods of drying and preſerving *Flowers*, *Fruits*, *Herbs*, *Roots*, and *Seeds*, for Family Uſes.

The

The Art of conſerving Fruits and other vegetable Productions in *Vinegar*, or compound Pickles.

The Art of conſerving *Fruits*, and vegetable Juices with *Sugar*; for the Table, and certain medicinal Uſes.

The *Art of conſerving* certain *Animal Subſtances* with *Salts* and *Sugar*, and acid *Fumes* or *Smoke*, for the Table.

Hints for a Chemical Hiſtory of CULINARY ARTS.

To determine the beſt *Fewel* for *Kitchen* Uſe; and a Method for rendring it cheap, and inoffenſive. *Culinary Arts.*

The moſt expeditious Methods of lighting a Fire.

The beſt Methods of preventing the Inconveniences ariſing from Smoke and Soot in a *Kitchen.*

The Art of edulcorating the refuſe Fat of a *Kitchen*, for Lamps, or other œconomical Uſes.

The manner of introducing the *Balneum Mariæ*, and *Papin*'s Digeſtor, into the *Kitchen*; with their Advantages.

The beſt Methods of preſerving all the metaline Furniture of a Kitchen from *Ruſt* and *Tarniſh.*

The Method of expreſſing Sallad-Oils from various Seeds; but particularly from the Seed of *Muſtard.*

The Method of making the fineſt *Salt* for the *Table.*

Hints for the Chemical Hiſtory of the DAIRY.

The Chemical Hiſtory of *Milk*, and its different Parts.

Methods of procuring the largeſt Yield of *Dairy Productions.* *Arts of the Dairy.*

The Chemical Hiſtory of *Rennet*; and ſom certain vegetable Acids in the making of *Chee* and *Butter*.

The proper Application of Cold, Heat, Reſt and Agitation in the Buſineſs of the DAIRY.

To determine the beſt kind of *Veſſels* and *Uten ſils* for the DAIRY.

Ways of flavouring and colouring theſe Pro ductions to any particular Taſte, or Fancy.

Hints for the Chemical Hiſtory of the LAUNDRY.

Arts of the Laundry.

The beſt Family Methods of making SOAPS for different kinds of Linen and Laces.

The beſt Family Ways of preparing the fineſt BLUES and STARCH.

The beſt Methods of taking Spots, Stains Iron-moulds, Mildew, *&c.* out of *Linens*, an *Laces*.

The Art of *Bleaching*, or whitening of Linen.

The Method of ſoftening hard Waters; o making them fit for the Uſes of the *Laundry Dairy*, and the *Kitchen*.

Hints for the Chemical Hiſtory of certain Pleaſurable or Profitable OECONOMICAL MATTERS.

Various Family Matters.

An Account of ſeveral curious and uſeful Œco nomical Experiments.

To preſerve *Paintings*, and all kinds of *Furni ture* within doors.

To preſerve *Wood-Work* expoſed to the Wet and Weather.

The Hiſtory of *Manures*, and the beſt Ways o preparing Grain for the Ground.

To render potable *Liquors* cool and pleaſant in the *Summer*; or in hot *Countries*.

To find pleaſant and profitable Subſtitutes for TEAS in *England*.

The

The Ways of procuring grateful *Odours* in particular ROOMS, or large *Aſſemblies.*

The Ways of exhibiting many curious chemical Phænomena at public Entertainments.

The Ways of extracting Gold and Silver out of baſe Materials.

Thus we have lightly touch'd ſome principal Heads, under which we purpoſe to conſider *Chemiſtry*, with a view to its farther Advancement in *England.* And hence, 'tis conceiv'd, may be derived a general Notion of the Art; which, in ſo comprehenſive a View, we would call UNIVERSAL CHEMISTRY; on account of its extenſive Uſefulneſs in human Affairs.

AN

ESSAY

Upon the BUSINESS of

DISTILLATION:

OR,

The Beſt METHODS of Producing, Rectifying, and Compounding *Inflammable Spirits*, according to the Ends they are intended to anſwer.

WITH

A View to Improve the ſeveral Branches of this Art, in the Hands of the *Malt-Stiller*, *Rectifier*, *Compounder*, and *Apothecary*

ADVERTISEMENT.

THE Purport of this little Piece is practically to unfold and apply the *Doctrine of Diſtillation*; not ſo much by relying upon what others have done, as by attempting to improve and enrich the *Art* with ſome new Hints and Diſcoveries.

'Tis wrote in purſuance of the preceding *Scheme*, for the advancement of various *Chemical Trades*, that lay the Foundations of *Artificial Philoſophy*; and publiſh'd as a Specimen of the manner wherein the Author would gladly ſee many other *Chemical Arts* treated, in execution of his general Deſign.

But ſuch a Work being very unequal to the Abilities of a ſingle Perſon; the Aſſiſtance of thoſe that approve the Undertaking is earneſtly requeſted.

The Attempt will proceed, as in weak Hands it may, whether any Aſſiſtance be received, or not; but if the Author ſhould happily find ſome uſeful Hints left with his Bookſeller, the Work might thence be animated, Arts farther improved, and ſome new ones invented for the Benefit of Mankind.

An ESSAY *upon the Buſineſs of* DISTILLATION, *&c.*

COmmon *Diſtillation* is the way of ſeparating *inflammable Spirits* from prepared Vegetable Matters, by means of the *Veſica*, *hot Still*, or *Alembic*; ith its proper *Worm*, and *Refrigeratory*. Common Diſtillation, *what.*

But as no *Vegetable Subjects* are capable of afrding *ardent Spirits*, without *Brewing* in many ſes, and without *Fermentation* in all; 'tis neſſary that theſe Operations be previouſly conlered, as the *Foundations* of *Diſtillation*. *Founded upon* Brewing *and* Fermentation.

SECT. I.

he Buſineſs of Brewing, as it relates to the Production of Brandies, *or* INFLAMMABLE SPIRITS.

BY *Brewing* is meant the Method of extracting the more ſoluble parts of Vegetables, with hot Water; which thus comes a Tincture, Solution, or Decoction, ſpoſed and fitted for *vinous Fermentation*. Brewing, *what.*

2.

The Subjects beſt fitted for it.

2. Such a *fermentable Solution* is obtainable from any Vegetable whatever, under proper Management and Regulation; but the more readily and perfectly the Subject diſſolves, the better it is diſpoſed for Fermentation, and the Production of Brandies. Thus *Sugar*, *Honey*, *Treacle*, *Manna*, and other inſpiſſated vegetable Juices, which totally unite with Water, into a clear and uniform Solution, are more immediate, more perfect, and better adapted Subjects of Fermentation, than Roots, Fruits or Herbs in Subſtance, the Grains, or even Malt itſelf: all which diſſolve but very imperfectly in hot Water.

Malt *commonly choſe for cheapneſs.*

3. Yet *Malt*, for its cheapneſs, is generally preferr'd in *England*; and brewed for this purpoſe, much after the common manner of brewing for Beer: only the worſt Malt is uſually choſe for Diſtillation; and the Tincture, without the addition of Hops, and the trouble of boiling, is here directly cooled and fermented.

The advantage of Malting.

4. The *Grain* intended for Brewing, is previouſly *malted*, to prepare it for diſſolving more eaſily and copiouſly in the Water; ſo as to afford a richer Tincture, or Solution: which after due Fermentation, will yield about one half more of *proof Spirit*, than the Tincture of an equal weight of unmalted Corn. Whence we may underſtand the difference betwixt the *Starch-makers Liquor*, and the *Diſtillers Waſh*, as they phraſe it.

Malted Corn, *how* brewed *to advantage.*

5. To *brew with Malt* in the moſt advantageous manner, 'tis requiſite, (1.) That the Subject be well prepared: (2.) That the Water be ſuitable and duly applied: and, (3.) That ſome certain additions be uſed, or alterations made, according to the Seaſon of the Year, or the Intention of the Operator.

By

By an exact regulation in these respects, all the fermentable parts of the Subject will be brought into the Tincture; and thus become fit for Fermentation.

6. The due *preparation of the Subject* consists in its being *justly malted*, and well ground. When the Grain is not sufficiently malted, 'tis apt to prove hard and flinty, so that the Water can have but little power to dissolve its Substance; and if it be too much malted, a part of the fermentable matter is lost in the Operation. *The Subject, how prepared by* malting.

7. The harder and more flinty the Malt, the finer it ought to be ground; and perhaps in all cases, when design'd for Distillation, it ought to be reduced to a kind of coarse Meal. For 'tis found by experience, that if it be ground thus fine, good part of the trouble, the expence, and the time usually consumed in Brewing, may be saved; and a greater Yield of Spirit procured. For thus the whole Substance of the Malt may all along remain mixed in among the Tincture, and be fermented and distilled along with it: which is a particular that deserves the attention of the *Malt-Stiller*; as he principally consults dispatch, and making the most of his Subject, without sollicitously regarding the purity and perfection of the Spirit. *How by* fine grinding, *with the advantage thereof.*

8. The Secret depends upon thoroughly mixing, or briskly agitating and throwing the Meal about, first in cold, and then in hot Water; and repeating this brisk agitation after the fermentation is over: when the thick turbid wash being immediately committed to the Still, already hot and dewy with working; there is no danger of burning, unless by Accident, even without the farther trouble of stirring: which in this case is found needless; tho' the quantity be almost ever so large, provided the requisite care and clean-

cleanlineſs be uſed. And thus the Buſineſs of brewing and fermenting may very commodiouſly be perform'd together; or reduced to one ſingle operation *.

How by ſprinkling with ſaline Solutions.

9. There are ſome alſo, who, the better to *prepare their Malt*, ſprinkle it before grinding, with an aqueous Solution of Nitre, or common Salt: for the ſame purpoſe others uſe Lime-water; which ſeems not ſo well adapted, if the deſign, beſides preventing the avolation of the finer flower in the grinding, be to promote the Fermentation, increaſe the quantity of Spirit, or add to its pungent, acid vinoſity.

The Water, *how to be choſe for brewing.*

10. The beſt or moſt profitable *Water* for the purpoſe of brewing, is that of *Rain*; as being not only very thin, ſoft, and thence well fitted to extract the Tincture of the Malt, but alſo abounding in fermentable Parts; whereby it quickens the Operation, and adds ſomething to the Yield of the Spirit. Next to this is that of Rivers or Lakes, eſpecially ſuch as waſh any large tract of a fertile Country, or receive the Sullage of populous Towns; eſpecially if taken up near the place where great Brewing or Diſtilling Works are conſtantly carried on.

11. But where neither of theſe Waters are commodiouſly procurable, or only a hard, aluminous, or vitriolic Spring-water is to be had; this may be made fitter for the purpoſe, either by laying a chalk bottom, for it to run upon; or by adding ſome particular Preparation to a parcel of it, after it is pumped. A prudent uſe of Quick-lime and fixed Alkali, will in ſuch caſe be of ſervice, and precipitate the offending mineral Matter. There are alſo other ſimple Preparations, and ſome Compoſitions made with the Liquor of calcined Flints,

* For farther Directions as to this new Method, ſee pag. 61.

Flints, &c. that anſwer this end ſtill better; but they come too dear to be uſed in that quantity they are here required.

12. Whatever *Water* is made choice of, it muſt ſtand in a hot State upon the prepared Malt; eſpecially if a clear Tincture be deſigned: but a known and very conſiderable Inconvenience attends its being applied too hot, or near to a ſtate of boiling, or even ſcalding, with regard to the Hand. *How to be applied.*

13. To ſave time in this caſe, and prevent running the Malt into Clods or Lumps, the beſt way is to put a certain meaſured quantity of *cold Water* to the Malt firſt; and ſtir that very well in with it, ſo as to form a kind of thin uniform Paſte; after which the remaining quantity of *Water* required, may be added, in a ſtate of *boiling*, without the leaſt danger of making what, in the Language of Diſtillers, is termed a *Pudding*. And thus the proper or preciſe degree of heat, neceſſary to extract the full virtue of the Malt, with all advantages, may be very expeditiouſly hit, or aſſign'd, to a great exactneſs; as the heat of boiling Water is a Standard, which may at once be let down to any deſired Point of warmth, by a proper addition of *cold Water*; due allowance being made for the Seaſon of the Year, and the Temperature of the Air. And this little obvious Improvement, applied to the Method juſt above hinted, for reducing *Brewing* and *Fermentation* to a *ſingle Operation* *, will render it practicable to conſiderable advantage.

14. The *quantity of the Water employed* muſt be ſuited to that of the Malt: the Rule is, that a clear Tincture, or turbid Mixture be made ſo dilute and thin, as to ferment with eaſe and expedition, *In what quantity.*

* See Pag. 60.

pedition, yet not needleſsly increaſe the Bulk of the whole. Too little Water makes a viſcous, clammy Tincture or Mixture, ſcarce at all diſpoſed to ferment, before 'tis let down lower with *Water*; nor can the *Water* ſo clogged extract all the ſoluble parts of the *Malt:* on the other hand, when the Tincture is too thin and aqueous, it takes up too much room, and adds to the trouble and expence of all the parts of the operation. A due Medium therefore is here to be choſe: And in general, the Goodneſs or Richneſs of the Malt-Stillers *Waſh* ſhould be much the ſame as of the weakeſt *French* Wines, or that ordinarily deſign'd by the Brewers of *London* for ten Shilling Beer. But if a more exact Standard is required, recourſe muſt be had to the Eſſay-Inſtrument, Water-Poiſe, Hydroſtatical-Balance, or other Methods of trying the Strength of Solutions, and finding their ſpecific Gravity or Tenacity: which afford a ſurer Rule than that obtain'd by weighing the Malt, and meaſuring the Water; becauſe of the different goodneſs of different parcels of Malt, and the accidents of the Operation. But if a fine Spirit be the thing in view; 'tis much better to make the *Waſh* too weak, than in the leaſt too rich.

And with what circumſtances.

15. Under the right Application of the *Water*, muſt alſo be conſidered the proper manner of agitating the Maſs; ſo that all the Parts of the aqueous Fluid may come fully and frequently in contact with all the ſoluble particles of the Subject: and when once the Water is thus well ſaturated, by ſtanding the proper time, it is to be drawn off, and freſh poured on; and the agitation repeated, till at length the whole virtue, or ſaccharine ſweetneſs of the Malt is extracted; and nothing but a fixed huſky Matter remains behind, uncapable of being farther diſſolved by the

he action of hot or boiling Water; or of being dvantageouſly waſhed, or rinſed by the bare af-uſion of cold. This artificial and external agi-ation is requiſite, as well in the ordinary way of brewing, as the ſhorter above-mentioned; nd may to advantage be repeated more than nce in both caſes, towards the beginning of the Operation, and at each affuſion of freſh Water; but eſpecially in the ſhort Method which has a great lependance thereon *.

16. The *Difference of Seaſons* is found to require ſome alteration in the direction and management of the buſineſs of *Brewing*: thus it is particularly found neceſſary to uſe the Water colder n the Summer, than in Winter; to cool the Tincture ſuddenly in cloſe ſultry Weather, leſt it hould turn eager; and to check the too forward liſpoſition which Malt has to ferment, when he Air is hot, by a ſuitable addition of unmalted Meal; which being much leſs diſpoſed to Fermentation than Malt, thus helps to * reſtrain nd moderate its impetuoſity, ſo as to render the Operation ſuitable and effectual to the Production of Spirit; that might otherwiſe, in great meaſure, be diſſipated and thrown off by an over-haſty and violent Fermentation; eſpecially when the warm Air is ſuffered freely to come at he fermenting Liquor. Others, for the ſame purpoſe, uſe Rye-meal; but this gives the Spirit a moſt diſagreeable and nauſeous Flavour; not eaſily to be got off or altered to advantage, by any known method of Rectification.

Different Seaſons *require different management in* brewing.

17. It has likewiſe been thought of ſervice, in general, or at ſome particular Seaſons eſpecially, to *acidulate the Water* employ'd in Brewing, with a ſmall proportion of ſome vegetable, or light

* See Pag. 60.

light mineral acid; which is ſuppoſed to curb and regulate the Fermentation of the Tincture, improve the acid vinoſity of the Spirit, and occaſion ſome ſmall increaſe of its quantity; and with the ſame view, common Salt, Nitre and Tartar have likewiſe been employ'd in the manner hinted above *.

And particular intentions require particular additions.

18. The particular Intention of the Operator may render various other Additions neceſſary: Thus ſome, to improve the Tincture, and diſpoſe it to yield more Spirit, or to give it a particular Flavour, add ſtrong and pungent *Aromatics* in the *brewing*; chuſing the cheapeſt for this purpoſe, ſuch as *Gran. Paradiſ. Cort. Winteran.* Ginger, *&c.* But in the common way, 'tis to be fear'd theſe Additions do not effectually anſwer the Intention; becauſe a particular Encheireſis is requiſite to make the Practice advantageous †. Upon this Foundation ſtands a very inſtructive Method, uſed abroad for preparing *Geneva ab Origine*, by mixing the bruiſed Berries of the Juniper among the Malt, and brewing them together; whence they procure a compound Tincture, which by Fermentation and Diſtillation, affords a Spirit much more intimately and homogeneouſly impregnated with the fine Eſſence of the Berry, than that prepared in the common way of Diſtillers.

The inconveniences of brewing with Malt, how remedied.

19. The *Inconveniences that attend the Brewing directly with Malt*, are very conſiderable; the Malt being of a very large Bulk in proportion to the ſoluble, ſaccharine, or truly fermentable Parts it affords; whence numerous large Veſſels, much Labour, and conſequently great Expences are required to conduct and manage ſuch a Buſineſs in the large way. The Remedy here, as in

* See Pag. 60.

† See this farther conſidered in the next Section.

in all other caſes, may be much eaſier ſtarted than effectually applied. However, the Foundation for it ſeems to reſt in practically reducing the perplexed Buſineſs of the *Malt-Stiller*, to the ſimple Buſineſs of the *Fine Stiller*; or in other Words, in reducing *Malt* to a *Treacle*. The thing in itſelf may be done to perfection; but how, in the large way, it will anſwer as to Expence, muſt be left to thoſe who think it worth their Care to conſider. The Experiment is no more than this; when a parcel of *Wort*, brewed in the common manner, is become fine by ſtanding; let it be decanted clear, and directly boil'd in a common Copper, till it begins to inſpiſſate, or change a little towards a brown or duſky Colour: at which time it muſt be directly emptied, into a *Balneum Mariæ*, where it may be exhaled to the full Conſiſtence of Treacle; which is a proper Form to preſerve it in, till occaſion calls for it.

20. If the Operation were finiſhed in the Copper, the Matter would be in great danger of burning, or unavoidably contracting an Empyreuma, that could ſcarce ever be got off again; whence the whole might come to be abſolutely unfit for the purpoſe: or if it eſcaped this accident, it would ſtill, through the Unſuitableneſs and Violence of the Heat, or Fire, now acting immediately upon the containing Veſſel, be greatly indiſpoſed to ferment; ſo as if it fermented at all, not to yield one fourth of the Spirit the *Wort* itſelf would otherwiſe have afforded *.

21. But if the operation be dextrouſly and carefully performed, (which perhaps is not quite ſo eaſy a thing as it may at firſt ſeem) the Saccharine Matter, tho' of as full a body, will be abundantly

* See this Subject farther touched, pag. 69, 70.

dantly paler than Treacle, a little more glutinous, very ſweet, pleaſant, and finely bitter, tho' no Hops were uſed in the preparation. In this ſtate it will keep long, without any alteration; and remain capable at all times of being brought back by water, to a *Wort* again, that will ferment fully, and yield a Spirit after the manner of Treacle. *Glauber* and *Becher* have both aim'd at ſome ſuch thing; but neither of them brought it to perfection. Nay, *Becher*, after a whole year ſpent in the enquiry, with a view indeed to Wines as well as *Malt Liquors*, publickly declares, he could by no means credit what *Glauber* ſays about it; and offers a round reward to any one, who ſhould poſſeſs him of the Secret *.

22. If upon full Experience this method ſhall be found advantageouſly practicable in large; plentiful years, convenient ſituations, proper helps, *&c.* may be pitched upon for ſetting up a new *Trade of Treacle-making*, for the *Diſtillers* at leaſt; if it ſhall not be found farther practicable, to turn this new Treacle into potable Liquors or *Sugars:* which might poſſibly, under due regulation, lay the Foundations of a *Work*, not unlike the Sugar-works of our Plantations; tho' manageable with abundantly leſs trouble and expence.

Subſtitutes for Malting.

23. *Such Grain, or Pulſe, as cannot be commodiouſly malted* by the common methods, hitherto known and practiſed; may be boil'd in water, inſtead of being brew'd. Thus the *Indians* diſſolve their Rice into a thin pap or jelly by boiling it with water; and afterwards ferment it into a potable Liquor or Wine, which they preſerve under ground for many years ſucceſſively. And in the ſame manner may the *Virginia* Wheat, or *Indian* Corn be treated; till the ingenious way of malting

*See *Phyſic. Subterran. Becher.* Sect. V. *de Fermentatione.* Cap. II.

malting it, by ſowing it in the ground, and there ſuffering it to ſprout, be more generally known, and brought into practice. But this indiſpoſition ſcarce affects any of the *Engliſh* Grains, which are now uſually malted to advantage. Tho' *Buck-wheat* perhaps remains ſtill to be experienced; and how far a particular method of malting may tend to alter the very diſagreeable flavour of *Rye*, ſeems not hitherto generally known.

The buſineſs of Brewing, *how ſhortened.*

24. All other Vegetables intended for *Brewing*, ſhould, as much as poſſible, have their fermentable parts prudently reduced to the ſtate of a *Treacle*, *Sugar*, or *inſpiſſated Juice*; not only for the ſake of preſerving them perfect, but for the greater eaſe and convenience of working. Thus the *Juices of various trees*, as particularly the *Birch*, the *Sycamore*, *&c.* are readily boiled up to ſuch a treacly, or ſaccharine Subſtance. And in the ſame manner, where it is worth the labour, the juices of all *ſweet Roots*, *Fruits*, *Canes*, *Plants*, *&c.* might be thickned and preſerved.

25. When once the fermentable parts of Vegetables are thus concentrated, and brought together into a ſmall compaſs, the buſineſs of Brewing becomes very facile; as being now no more than mixing, diſſolving, or ſufficiently diluting the inſpiſſated Juice with lukewarm water: whence the Solution, either alone, or with additions, is now perfectly fitted and prepar'd for *Fermentation*.

SECT. II.

The Buſineſs of Vinous FERMENTATION, *and the raiſing and preſerving of* FERMENTS; *ſo far as relates to the Production of* VINOUS SPIRITS.

Fermentation, *what.*

1. BY *vinous* FERMENTATION is underſtood that phyſical action, or inteſtine commotion of the parts of any of the preceding Vegetable Tinctures, or Solutions, which fits them to yield an inflammable Spirit upon *Diſtillation.*

That of the Diſtiller differs from the common.

2. This *Fermentation* under the hands of the Diſtiller differs from the common, which is uſed in the making of potable Malt Liquors and Wines; as being much more violent, tumultuary, active, and combinatory than that. A large quantity of ferment or yeaſt is here added, the free Air is admitted, and every thing contrived to quicken the operation; whence it is ſometimes precipitately finiſhed in the ſpace of two or three days.

Its inconveniences.

3. This great diſpatch has its great inconveniences with regard to the Spirit, which hence becomes not only fouler, or much more groſs and really terreſtrial, than if the Liquor had been ſlowly fermented; but alſo ſuffers a diminution in its quantity, from the violent and tumultuary admiſſion, conflict, and conſtant agitation of the free Air in the body, and upon the Surface of the Liquor; eſpecially if not immediately committed to the Still, as ſoon as the Fermentation is fairly ſlackened or fully ended.

4.

4. 'Tis a difficult Task to render the buſineſs of *Fermentation* at once perfect and advantageous. To ferment in perfection, of neceſſity requires length of time, proper attendance, and cloſe veſſels; beſides ſeveral particular *Encheireſes* and contrivances, which one cannot reaſonably expect ſhould be received and practiſed in the large way of buſineſs, on account of the charge: unleſs it could be made appear, as there is ſome reaſon to ſuſpect it may, that the increaſe in the quantity of Spirit, (not now to mention the improvement of its quality) might be brought to pay the additional expence: But it requires farther experience to reduce the thing to a certainty. In the mean time, it may not be amiſs to try how much of the more perfect Art of vinous Fermentation, is profitably practicable by the Diſtiller, in the preſent circumſtance of things. *Difficulty removed to profit.*

5. The Improvements to be made in this affair will principally regard; (1.) *The Preparation or previous Diſpoſition of the fermentable Liquor.* (2.) *The Additions tending to the general, or ſome particular end.* (3.) *The Admiſſion or Excluſion of the Air.* (4.) *The Regulation of the external Heat or Cold.* *And*, (5.) *A ſuitable degree of Reſt at laſt.* When proper regard is had to theſe particulars, the liquor will have its due courſe of Fermentation; and thence become fit to yield a pure and copious inflammable Spirit by Diſtillation. *Attempts to remove them.*

6. It has been already obſerved, that the Tincture, Solution, or Liquor deſign'd for Fermentation and the Still, ſhould be made thin, or very conſiderably aqueous; as this property not only fits it to ferment readily, but alſo to yield more of a pure vinous Spirit in proportion, and part with it eaſier in diſtillation, than if it were richer, more glutinous, or clammy: The groſs, foul, viſcid, and earthy particles of *By making the Liquor dilute.*

* See Pag. 65, 66.

ſuch glutinous Liquors, being after Fermentation apt to riſe with the boiling Heat employ'd to raiſe the Spirit; which thus of courſe comes over foul and fetid. There is another Advantage attending this thinneſs of the Liquor; *viz.* that it will the ſooner fall fine, by ſtanding, before Fermentation: whence it may be commodiouſly drawn off from its Fæces, or Bottom; which muſt always, in caſe of Corn, Malt, or other Mealy Subſtances, be kept out, where the Purity of the Spirit is conſulted.

And of a due Warmth.

7. A certain degree of *Warmth* ſeems requiſite, in the Northern Climates, to all artificial Liquors intended for immediate Fermentation, eſpecially in the Winter: but the natural Juices of Vegetables that have never been inſpiſſated, as that of Grapes, and other Fruits, when fully ripened, will uſually ferment as ſoon as they are expreſs'd, without any external Aſſiſtance. But as a certain degree of Inſpiſſation prevents all tendency to Fermentation in vegetable Juices, otherwiſe ſtrongly diſpoſed to ferment; ſo a long Continuance or Increaſe of the inſpiſſating Heat, eſpecially if it acts immediately through a metalline or ſolid Body, upon the Juice, will deſtroy its fermenting Property; and this the more effectually, as the Heat employ'd approaches to that of ſcorching, or the Degree capable of giving an *Empyreuma*; according to what was hinted above, with relation to *Wort* in particular *. After the ſame manner, ſeveral Experiments make it appear, that there is a certain degree of Heat; the continuance, or leaſt increaſe whereof, proves detrimental, or deſtructive to Fermentation; as there is another that wonderfully encourages and promotes it. Theſe two degrees

* See pag. 65, 75.

degrees of Heat, ought to be carefully noted and ſettled by the Thermometer, or other more certain Method, for philoſophical and chemical Uſes; but for common, or œconomical Occaſions, they may be limited to what we uſually underſtand by a *tepid* and a *fervid Heat*: A *fervid Heat* is the Bane of all vinous Fermentation; as a tepid one, or rather an imperceptible Warmth, is the great promoter thereof. In this neutral ſtate therefore, with proper contrivances to preſerve and continue it, the Liquor is to be put into a ſuitable Veſſel for Fermentation; at which time, if it work not of itſelf, it muſt be quickned by additions; and in general, by ſuch things as are properly called *Ferments*.

8. By *Ferments* is here meant any Matter, which, put to a rightly diſpoſed Fermentable Liquor, will cauſe it to ferment much ſooner, and faſter, than it would of itſelf; and thus greatly ſhorten the Operation. Thoſe are called Ferments in an abuſive ſenſe, which, when added to the fermentable Liquor, only correct ſome fault therein, and thereby fit it to ferment the better, yield the more Spirit, or give ſome particular Flavour. *By improving the buſineſs of Ferments.*

9. The primary uſe of *Ferments* therefore, is to ſave time, and make diſpatch in buſineſs, whilſt they only occaſionally and accidentally give a flavour, or increaſe the quantity of Spirit. And, accordingly, all fermentable Liquors may, without the leaſt addition, and only by a proper management of Heat, be brought to ferment, more perfectly, tho' more ſlowly, than with the aſſiſtance of *Ferments*.

10. Theſe *Ferments*, in general, are the Flowers and Fæces of all fermentable Liquors; generated and thrown up, or depoſited, either in the Fermentation itſelf, or after the Operation is finiſhed.

11. There are two of theſe procurable in large quantities, and at a moderate expence, *viz.* *Beer-Yeaſt*, and *Wine-Lees*; a prudent and artificial management, or uſe whereof, might render the Buſineſs of Diſtillation much more facile, certain, and advantageous. It has been eſteem'd a conſiderable difficulty and diſcouragement in this Buſineſs, to procure a ſufficient Stock of theſe Materials, and preſerve them, at all times, ready for uſe. Hence, ſome have been driven to invent *Artificial Ferments*, or to form Mixtures, or Compounds of particular fermentable Ingredients; but with no great ſucceſs: theſe uſually falling ſhort in their effects, even in compariſon of *Bakers Leaven.* And indeed whoever has any talent at Experiments, in this way, will ſoon find it much eaſier, cheaper, and better, in all reſpects, to preſerve the uſual, and natural *Ferments*, or raiſe Nurſeries thereof, than to invent artificial Compoſitions, or good ſerviceable Subſtitutes for them.

The way of preſerving them.

12. That common *Yeaſt* may be preſerved freſh and perfect, for ſeveral Months, is Matter of experience; and neceſſity has put People upon inventing ſeveral Expedients for the purpoſe. The foundation of the thing reſts wholly in dextrouſly freeing the Matter of its ſuperfluous Moiſture, and bringing it out of a ſemi-fluid State, wherein 'tis always expoſed to a farther Fermentation, or deſtructive Alteration; and thus of courſe runs into what is vulgarly called Corruption: at which time, it becomes intolerably fetid and cadaverous. The Method of drying it in the Air, is ſubject to great inconveniences; and requires the due obſervance of ſeveral circumſtances, and particular *Encheireſes*, to render it perfect and effectual. The beſt way, in all reſpects, is ſlowly and gradually to preſs

it,

it, in a thick, close, and strong Canvas Bag; after the manner of Wine-Lees, by the *Tail-Press*, till at length it comes into a kind of Cake; which, tho' soft, will easily snap, or break dry, and brittle betwixt the fingers. And in this state, being well pack'd up, or closely secured in a tight Cask, it will long keep uncorrupted, fragrant, and fit for the finest uses.

And raising new supplies.

13. The same Method is likewise practicable to the same advantage in the *Flowers* or *Yeast of Wine*; which may thus be commodiously received from abroad. Or, in defect of these *Flowers*, others of equal goodness, may be raised from fresh *Wine-Lees*; barely by mixing, and stirring them into a *proper warm Liquor:* whence the lighter, or more moveable and active parts of the Lee, will be thrown to the top, and may be taken off, and preserved, as above-mentioned, in any quantity that shall be desired.

14. And hence a facile Method of raising an inexhaustible Fund, or perpetual Supply, of the most useful *Ferments*, may be readily form'd, in the way of *successive Generation*; so as to cut off all future occasion of complaint, for want of them in the Business of Distillation.

The manner of chusing them suitable to the occasion.

15. It must be observed, that all *Ferments* abound in essential Oil, much more than the Liquors that produce them; whence they very strongly retain the particular Scent and Flavour of the Subject. 'Tis therefore requisite before the *Ferment* is applied, to consider what Flavour ought to be introduced; or what Species of *Ferment* is best suited to the Liquor. The Alteration thus caused by *Ferments* is so considerable, as to determine, or bring over any neutral fermentable Liquor, to be of the same Species with that which yielded the *Ferment:* which is an Observation of greater moment, than will presently be

be conceiv'd; as opening not only a new Scene in the Buſineſs of Diſtillation, but alſo ſome other Buſineſſes depending upon Fermentation. The Benefit of it does not, however, extend to *Malt*, treated in the common way; nor to any other Subject but what affords a Spirit tolerably pure, and taſteleſs: as it otherwiſe makes not a ſimple, pure, and uniform, but a compound, mixed, and unnatural Flavour. How far the *fine Stiller* may apply it, well deſerves his Conſideration; and whether our native *Cyder-Spirit*, *Crab-Spirit*, &c. which have little Flavour of their own, may not by this Artifice, or a little farther Improvement of it, be brought nearly, or intirely into the State of ſome highly eſteemed foreign Brandies, is recommended to Experience.

In what quantity to be uſed.

16. When the proper *Ferment* is thus pitch'd upon, ſuitable to the Deſign; *its Quantity*, *Quality*, *and Manner of Application*, are next to be conſidered.

Its *Quantity* muſt be proportioned to that of the Liquor, its Tenacity, the degree of Flavour it is intended to give, and the diſpatch required in the Operation; from which Conſiderations, every one will form a Rule to himſelf: But till ſuch a Rule is obtain'd, or in order to obtain it, proper Trial will ſhew how much ſuffices for the purpoſe; beginning with a little, and obſerving to add more occaſionally; the Weight of the whole being noted before-hand. *Treacle* is found to require a large Proportion of *Ferment*; and even ſometimes needs the aſſiſtance of other Additions. Indeed the manner wherein this inſpiſſated Juice is obtain'd, tends greatly to unfit it for Fermentation. The Strength, long continuance, and almoſt immediate Contact of the Fire in *Sugar-making* and *refining*; and the frequent uſe of Lime, or other alkaline or terreſtrial Bodies, ſo condenſe, indurate, and ſcorch the Body

of

of this Juice, and abſorb its Acid; that one would ſcarce expect it ſhould ferment at all; even with the addition of *Jalap*, or other powerful, ſaline, and acid, or acrid Stimulators; which tend to break the viſcous and aduſt Connexion, or ſtrong Combination of its Particles*.

17. More Circumſpection is neceſſary, with regard to the *Quality of the Ferment*, if a pure Spirit be required; for in caſe of the leaſt Muſtineſs, or Corruption, which all *Ferments* have a ſtrong and natural Tendency to, unleſs carefully cured and preſerved, it may deeply impreſs itſelf, and communicate a finewy or fetid, nauſeous and cadaverous Smell and Taſte to the whole Body of the Liquor and Spirit. Great Care is therefore required, that the *Ferment* be perfectly freſh, and fragrant, nor in the leaſt inclinable to Acidity, or Eagerneſs; which might prevent its riſing, or forming a head, and give the Liquor an acetous, inſtead of a vinous Tendency. *Of what qualities to be choſe.*

18. When thus the *proper Quantity* of a *good-conditioned* and *ſuitable Ferment* is got ready, it muſt be put to the fermentable Liquor in the bare tepid, or ſcarce luke-warm State above-mentioned. The beſt manner of bringing them together, for raiſing the *Fermentation* quick and ſtrong, ſeems to be this. When the *Ferment* is ſolid, it ſhould be broke into ſmall pieces, and gently thinned, with the hand, or otherwiſe, in a little of the luke-warm Liquor. But a compleat uniform Solution ſhould not be here endeavour'd; becauſe this would, in ſome meaſure, weaken the Power of the Ferment, or deſtroy its future Efficacy. The whole intended Quantity, therefore, being thus looſely mix'd with a moderate parcel of the Liquor, and kept near the Fire, or elſewhere, in a tepid State, free from the too rude Com- *How beſt applied to the Liquor.*

* The nature and effects of this kind of proceſs have been already touched upon, pag. 65, & 70.

Commerce of the external Air; more of the inſenſibly warm Liquor ought, at proper intervals, to be added, till at length, the whole Quantity is well ſet at work together. And thus, by dividing the Buſineſs into parts, it may be much more ſpeedily and effectually done, than by attempting it all at once: in which caſe, 'tis very apt to miſcarry, and require a Reparation in the Method already deſcribed.

19. When thus the whole is ſet at work, ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external Air; it becomes, as it were, the ſole Buſineſs of Nature to finiſh the Proceſs, and render the Liquor fit for the Still; and thus the general end of the *Fermentation* would be anſwer'd. But during the whole courſe of the Operation, there are ſeveral other things that may be added, with ſome particular View; as either to improve the Vinoſity, increaſe the Quantity of the Spirit, or give a particular Flavour. And ſuch Additions may require ſome particular Alterations in the general Method above ſet down.

Particular Additions, beſides Ferments, required, to give vinoſity, flavour, and an increaſe of ſpirit.

20. Theſe *Additions* may be included under the four Heads of *Salts*, *Acids*, *Aromatics* and *Oils*. The uſe of *Salts* for this purpoſe has been already touched upon *; but when they are omitted in the previous Preparation, they may be commodiouſly added now. Thus a little finely powdered *Tartar*, *Nitre*, or common *Salt*, might be thrown into the fermenting Liquor, at the beginning of the Operation: or in their ſtead a little of the *vegetable*, or *fine mineral Acids* may be dropt in, at different times, where they are found neceſſary; as particularly in the caſe of Treacle, Honey, and other ſweet and rich *vegetable Juices*; which either want a natural Acid, have

Viz. Salts *and* Acids, *to increaſe Vinoſity.*

* See pag. 61, 64.

ıve been robbed of it, or hold it but in a ſmall roportion. To this end may be uſed *Juice of emmons, Oranges*, &c. *Spt. Sal. Glaub. Ol. Sulur. per Campan.* &c. But the moſt effectual ing for the purpoſe is a *particular aqueous Solution of Tartar*; a *Succedaneum* for which, may e *Tamarinds*, or the *Robs of ſome very acid Fruits*; better ſtill, the *Media Subſtantia Vini*. On which oundation ſtands that ingenious Practice of conantly uſing a ſuitable Proportion of the Stillottoms, or remaining *Waſh*, in the ſubſequent rewing. Theſe Additions are manifeſtly degn'd to give a vinous Acidity, or improve that aturally afforded by the Subject; without any xpectation of conſiderably increaſing the quanity of the Spirit: which is the more immediate Uſe and Deſign of *Aromatics* and *Oils*; at the ſame ime that they give, alter or improve a Flavour.

21. All the pungent *Aromatics* have a ſurpriing Property of increaſing the quantity of Spirit; but their uſe requires a *cloſe or compreſs'd Fermentation*; and if the Quantity intended be large, hat the Addition be not made all at once, leſt the Oilineſs of the Ingredients ſhould hinder the Opeation. But if Flavour be the only thing required rom them, their Addition ſhould be delay'd till owards the end of the Fermentation. After the ame manner a very conſiderable quantity of any *ſſential vegetable Oil* may, by the proper *Enheireſis*, be converted into a ſurprizingly large Quantity of inflammable Spirit: but great care muſt here again be had not to drop it in too faſt, or too much at a time; which might eaſily damp the Fermentation: and is one of the known ways of checking, or totally ſtopping this Operation at any point of time required. The beſt Method of introducing the *Oil*, ſo as to avoid all Inconvenience, is to bring it into an *Elæoſaccharum*;

And Aromatics and Oils, to increaſe the quantity of ſpirit, and give a flavour.

rum; which will readily enter the Body of the Liquor, and directly ferment along with it. In the like prudent manner of proceeding, a large proportion of Brandies, or highly rectified Spirit of Wine, may be introduced into any fermenting Liquor: but the full Proſecution of this Subject, with the Uſes and Advantages thereof, do not directly belong to this place. Enough is already ſaid to ſhew, that an advantageous Method may hence be form'd for increaſing the quantity of the Spirit; and at the ſame time, improving its quality.

22. In all theſe, and the like Caſes, great regard muſt be had to the *containing Veſſel*; the *Excluſion of the Air*, and the *Degree* of the *external Heat or Cold*. The ſame ought likewiſe to be underſtood, in a degree, with regard to the general Method of working, above delivered.

Cautions required, with regard to the fermenting Veſſel.

With regard to the *containing Veſſel*; its Purity, and the Proviſion for its occaſional Cloſeneſs, are principally to be conſidered. In cleanſing it, no Soap, or other unctuous Body ſhould be uſed, for fear of checking the Fermentation: all ſtrong alkaline Lixiviums ſhould, for the ſame reaſon, be avoided; the Lime-water, or a turbid Solution of Quick-lime, is without any ill effect employ'd for this purpoſe; particularly to mortify or aboliſh a prevailing acetous Acid, which is apt to generate in the Veſſels, if the warm Air has free acceſs to them: and thus tends to pervert the order of Fermentation; and inſtead of a *Wine*, or genuine *Waſh*, produce a *Vinegar*. Special care muſt alſo be had, that no corrupt or putrefied Yeaſt, or cadaverous Remains of former fermented Matters hang about the Veſſels, which might thus infect whatever ſhould be afterwards put into them; and cannot, when of long ſtanding, be perfectly cured and ſweetned without the

tmoſt difficulty, or ſome particular, and hitherto
ıt little known, *Encheireſes.*

23. The *occaſional Cloſeneſs of the Veſſels* may
e provided for, by well-adapted *Covers*, in the
rge way of Buſineſs; and by the uſe of *Valves*
the ſmaller, where common light Caſks will
rve the purpoſe: whilſt the *Valve* occaſionally
ives the neceſſary Vent to preſerve the Veſſel;
hich otherwiſe remains perfectly cloſe and im-
ervious to the Air, but at diſcretion.

24. 'Tis a prejudicial Miſtake in the Buſineſs of *Fermentation*, to ſuppoſe the free Concurſe or admiſſion of the external Air, of abſolute neceſſity to the Operation. The expreſs contrary the Truth, and a great Advantage will be ound in practiſing upon this Suppoſition. A onſtant Influx of the open Air, if it does not arry off ſome part of the Spirit already gene-ated, yet certainly catches up and diſſipates he fine, ſubtile, or oleaginous, and ſaline parti-les, whereof the Spirit is made; and thus con-derably leſſens the Yield. This Inconvenience avoided in the way of *cloſe Fermentation*; hereby all Air, but that included in the Veſſel, kept out. The *Secret*, or true *Encheireſis* is to ave a moderate Space for this Air, at the top f the Veſſel, unpoſſeſs'd by the Liquor; when he Liquor is once fairly at work, to bung it own cloſe, and thus ſuffer it to finiſh the Fer-nentation, without opening or giving any more ent than is afforded by the Valve: which how-ver is not of abſolute neceſſity, when the empty pace, or rather the Space poſſeſſed by the na-ural Air, is about one tenth of the Gage; the *rtificial Air* generated in the Operation, being n this caſe ſeldom ſufficient to force a ſtrong Valve, or at moſt not to endanger the Caſk. This method is practicable to good advantage in the

The exclu-ſion of the Air.

the ſmall way of buſineſs; but requires ſuch length of time as cannot well recommend it the large Dealers, who are in a manner forc to admit the free Air, and thus ſuſtain a conſic rable loſs in their Spirit, to finiſh the Ferme tation with that expedition they require. might otherwiſe be ſaid that the ſilent, ſlow a almoſt imperceptible vinous *Fermentation*, univerſally the moſt perfect and advantageous.

Preſerving the Liquor *and* Veſſel *from too great cold or heat.*

25. During the whole courſe of this operatic the veſſel ſhould be kept from all external *co* or conſiderable *heat*, in an equable, uniform, a moderate temperature, that is not remarkab cognizable by the Senſes. In the winter, a Stov room, ſuch as are frequent in *Germany*, wou'd very convenient for this purpoſe; the veſſel bei placed at a proper diſtance from the Stove: b at other Seaſons no particular apparatus is orc narily neceſſary, with us in *England*, if the pla allotted for the buſineſs be but well defended fro the Summer's heat, and the ill effects of the col bleak or Northern winds.

The Liquor to grow fine by ſtanding.

26. The operation thus performed *in occlu* is known to be perfectly ended when the hiſſi or ſmall bubbling noiſe can no longer be hear upon application of the Ear to the veſſel; well as by the clearneſs of the Liquor to t eye, and its pungent vinous ſharpneſs upon t tongue.

27. And that it may fully obtain theſe pr perties, and be well fitted to yield a pure ar perfectly vinous Spirit by Diſtillation, it ſhou be ſuffered to ſtand at reſt in a ſomewhat cool place, if practicable, than where it ſtood ferment; till it has thoroughly depoſited ar cleanſed it ſelf of the groſs Lee and become pe fectly tranſparent, vinous and fragrant: in whic

ſta

State it may be rack'd or drawn off from its bottom, and directly committed to the Still *.

SECT. III.

Of SIMPLE *or* SEPARATORY DISTILLATION.

Simple Diſtillation in general.

SIMPLE Diſtillation is the method of ſeparating and collecting the *inflammable Spirit*, clear of all the other parts of *fermented Liquors*, by means of Fire and the Alembic.

This Operation includes not only what in the language of *Diſtillers* is called *working from Waſh*, and the *producing of Low-Wines, or Spirits of the firſt extraction*; but alſo *ſimple Rectification*, or the production *of ſimple proof-Spirit*, and *ſimple Alcohol*.

The common ways of charging, working and managing a Still, regulating the fire, *&c.* are here ſuppos'd to be underſtood: but in order to improve this operation, and bring it to a truth, ſeveral obſervations and methods are required, beſides thoſe vulgarly known and conſidered.

Fundamental obſervations relating to it.

(1.) 'Tis remarkable that the action of Fermentation works ſuch a change in the body of the Tincture or Solution, as to render it ſeparable, by the action of the fire, into parcels of matter that are ſpecifically different; and of a nature entirely foreign to what, by the ſame means, the Liquor would have afforded before Fermentation. (2.)

* The uſes of the remaining groſs Lee, which is here ſeparated from the clear vinous Liquor, will be conſidered hereafter.

(2.) The Still being charged, luted and brought to work, with a ſoft boiling heat, there firſt comes over a quantity of intenſly pungent, aromatic, nidorous Liquor; which if receiv'd into a large proportion of cold water, throws off a copious, *eſſential*, *acrid* or *Aromatic Oil*; tho' the original Subject were ever ſo cooling, mild or contrary to a ſpicy nature.

(3.) This *eſſential Oil* is, by Experiment, found to be the principal thing that gives the predominant or peculiar flavour to Spirits; which are hence by their taſte and odour, denominated *Malt-Spirit*, *Melaſs-Spirit*, *Cyder-Spirit*, *Wine-Spirit*, *Arrack*, &c.

(4.) The fineſt, moſt ſubtile, and moſt efficacious part of this *eſſential Oil* is what comes firſt; the ſucceeding Portions growing gradually more ſluggiſh, viſcous, reſinous, nauſeous and terreſtrial.

(5.) The Spirit running in a continued Stream from the noſe of the worm, being examined at different intervals, will be found greatly to differ from it ſelf, both in ſmell and taſte; as changing the nature of its *Oil*, much oftener than, without trial, could have been expected.

(6.) Beſides this *eſſential Oil*, the Spirit of the firſt running contains alſo an *Acid*, more or leſs in quantity, and more or leſs pungent, volatile and ſenſible to the noſe, as the Fermentation has been more or leſs continued; or according to the degree of Acidity acquired in the operation. And this *Acid* alſo, may along with the aqueous part that riſes with it, be in plenty kept back upon a gentle rectification; tho' where the acid is very volatile, ſome part thereof is ever apt to riſe along with the totally inflammable Spirit ſo as to give it a vinoſity, not unlike a dilute *Spiritus Nitri dulcis*.

(7.

(7.) It is manifeſt, both *a priori*, and *a poſteriori*, that Brandies are a compound, conſiſting of at leaſt four different parts; *viz.* totally *inflammable Spirit*, *eſſential Oil*, *Acid* and *Water*.

(8.) And as theſe ſeveral parts do not differ greatly in their ſpecific gravity, or degree of volatility; a ſtrong, tumultuary, boiling heat will drive them all over promiſcuouſly together.

(9.) As, at the beginning of the Operation, there uſually riſes more totally inflammable Spirit than Water; ſo after ſome time, the Stream contains more water than inflammable Spirit: and this gives the foundation for what they call *Low-wines*, *Proof-Spirit* and *Faints*: *Low-wines* being the whole quantity of Spirit, weak and ſmall mix'd together; *Proof-Spirit*, a mixture of about equal parts of totally inflammable Spirit and Water; but *Faints* all that runs after the Proof is fallen off, where the proportion of water is much greater than of the totally inflammable Spirit *.

(10.) Theſe Low-wines are commonly rediſtill'd, to make what they call *Proof-Spirit*, by leaving out their ſuperfluous Phlegm: And in the ſame manner may the *Faints* alſo be ſerved; by which means they are ſuppos'd reducible to a certain Standard, or ſtated merchantable degree of Strength, called *Proof*.

(11.) When once the Stream falls off from *Proof*, the Liquor contains a groſſer *eſſential Oil*, which tho' not ſo communicative as the firſt, never fails to impregnate the whole with its flavour.

(12.) Hence all common *Spirits* or *Brandies* are really dilute *Quinteſſences*, as the Chemiſts call them; that is, a mixture of the ardent

* Fort he methods of taking Proof, or diſtinguiſhing by certain marks or ſigns, the Strength of Brandies and Spirits, See hereafter pag. 89——91.

Spirit and eſſential Oil of the Concrete; only here let down to *proof* with water, and impregnated with a ſmall proportion of a volatile Acid.

(13.) When the *Proof* falls off, the liquor grows milky; that is the oil, which before remain'd diſſolv'd by the ſtrong Spirit, is ſet looſe from it by an over-proportion of water; and may now be commodiouſly ſeparated by the Chemical Glaſs fitted for that purpoſe.

(14.) 'Tis cuſtomary to continue the Diſtillation ſo long as the Liquor that runs will take fire at the flame of a Candle, applied to the vapour of a ſmall quantity thrown upon the hot Still-head: and indeed there is a certain point of time, when the *Spirit* obtain'd will not pay the fire, and labour; *viz.* when not above a twelfth or fourteenth part of totally inflammable Spirit comes over in the water.

(15.) With other views however, as particularly the obtaining a more fix'd vegetable acid, and a groſſer *eſſential oil*, the operation might be continued, till the danger of an Empyreuma comes on.

(16.) The matter remaining in the Still, after the operation is ended, has ſeveral uſes; and might in particular be made to afford Mr. *Boyle*'s *acid Spirit of wine*.

(17.) When by repeated Diſtillation, without addition, any Spirit is entirely freed of its aqueous parts; 'tis then call'd totally inflammable Spirit, *Alcohol*, or perfect Spirit of wine.

Upon theſe general obſervations may be form'd ſome new practical methods for the improvement or perfection of Diſtillation.

Means of improvement.

(1.) And firſt, as the fermented Liquor affords different parcels of matter, of different ſpecific gravities or degrees of volatility; when a pure Separation of the lighteſt part is intended, the Fire ſhould never riſe to a boiling heat, which jumbles

umbles and confounds all the parts together, rather than ſeparates them.

In the Chemical way this Rule may be practiſed to advantage; but great difficulties will attend the obſervance of it in the common buſineſs of Diſtillation.

To render it more commodiouſly practicable, theſe two methods are propoſed; *viz.* (1.) Either to increaſe the height of the Still above the Liquor; or (2.) To work *in Balneo Mariæ*.

(1.) By running the Still-head to the height of two or three yards above the Liquor, it has been expected that a boiling heat would carry up the pure inflammable Spirit, without any great mixture of phlegm, and yet continue to run a full Stream. But this does not perfectly anſwer upon Experience; tho' the thing is ſtill improveable, and has been attempted by the addition of a tall Serpentine pipe, for the Spirit to creep thro' and depoſite the phlegm as it aſcends. And thus indeed the Spirit may in a good meaſure be dephlegm'd: But the great objection againſt this method, is, that it requires a boiling heat; which in the caſe of ſimple ſeparatory Diſtillation ſhould never be uſed: becauſe it throws up ſo much oil, as to foul at leaſt the breaſt and head of the Still and bottom of the pipe; whence it infects the ſubſequent Spirit that waſhes them.

(2.) The other way by the *Balneum Mariæ* is preferable on many accounts; ſo that by a proper regulation, we might hope for a pure ſimple Spirit almoſt at the firſt extraction. Such an expectation will not appear unreaſonable to one who has ſeen what Spirit is obtainable even in the common method of the *Balneum Mariæ*, (where the water of the Bath is made to boil with the utmoſt violence,) and compared it with another parcel of Spirit, prepared from the ſame fermented Liquor in the common way of the hot Still. Indeed the

difficulties of working from Waſh in this way of the *Balneum Mariæ* are very conſiderable; eſpecially if cheapneſs and diſpatch be the principal thing in view. For at once to work both quick and perfect, ſeems hitherto impracticable in the buſineſs of Diſtillation. The whole Affair has a great dependance upon a ſuitable *Engine and Apparatus*. And perhaps a large or long rectangular *Boiler* might commodiouſly be turned into the *Balneum* we ſpeak of; and fitted with a number of low Alembics, that ſhould all work, day and night, with a little fire and leſs attendance. The Contrivance in general is obvious; but to avoid encumbrance and loſs, is the principal difficulty. A large number of veſſels or alembics is abſolutely neceſſary; but no Worms and Refrigeratories are required. And by an eaſy Apparatus the whole number of the ſmall Veſſels may be charged with nearly as much eaſe as a large one. When the operation proceeds ſo ſlow as not to quit the coſt, all the bottoms may be emptied into a common Still, and work'd in the uſual way, for a coarſer commodity, that may afterwards be rectified at pleaſure. The heat of the *Balneum* ſhou'd only be tepid, or at moſt but ſcalding.

By this means a ſurprizingly cool, and almoſt inſipid Spirit has been obtained, at the very firſt extraction; tho' mix'd with a conſiderable proportion of Phlegm; ſo that it needed no manner of rectification to fit it even for the finer uſes. The method, therefore, at leaſt is curious, and in ſome caſes uſeful, tho' it ſhould never be brought into a general practice. And indeed a thing of this nature deſerves to be kept in curious hands; as by a due application it may furniſh productions fit for the Cloſets of Princes.

In the common Method of *Simple Diſtillation* all proper Means ſhou'd be uſed to prevent the groſſer *eſſential Oil* from getting into the Spirit.

Theſe

Theſe Means have regard, (1.) To the preparation of the fermented Liquor: (2.) The regulation of the fire: (3.) The uſe of Percolation: and (4.) To the keeping out the Faints.

(1.) For the manner of preparing the fermented Liquor, and clearing it of its groſs oleaginous fæces, before 'tis committed to the Still, we have already ſpoke to it above: And have only farther to add, that the liquor, thus fined, ſhould not poſſeſs above two thirds of the Still; that the groſſer oleaginous matter may the better be kept down; and the whole have free ſcope to work, riſe and purge itſelf in the operation: which it never can do, if it wants room. (2.) As in this Diſtillation a *boiling heat* is neceſſary, care ſhou'd be had that the liquor only boil gently and uniformly; without raiſing the fire by ſtarts; which never fails to throw over the coarſe Oil in plenty, and foul the Spirit: ſo that if poſſible the operation ſhou'd be begun and ended with the ſame uniform and invariable degree of heat.

(3.) The groſſer Oil may in ſome degree be kept from mixing among the Spirit, by ſtretching a piece of very thick woolly Flannel over the mouth of the Still; or by ſuffering the Stream to paſs thro' ſuch a Flannel, ſeveral times doubled and placed at the noſe of the worm: and 'tis ſurprizing what a quantity of groſs, offenſive, fetid, unctuous matter may thus be collected; eſpecially in the Diſtillation of Malt Spirits.

(4.) The *Faints* ſhou'd never be ſuffered to run among the *finer Spirit*, on account of the large quantity of this *groſs oil*, or greaſy matter they contain; eſpecially if the fire be increaſed, as it uſually is to bring them over: Tho' ſome, who value *proof* more than purity, will uſually have a doſe thereof to give their goods a face. Which

prevailing fondneſs for a ſtrong hanging Proof, however abſurd in itſelf, is one principal reaſon why the common malt-Spirits are no cleaner.

This Caution of keeping out the *Faints* ſhould likewiſe extend to the keeping out a little of the firſt running, which too, in this operation, is a kind of *Faints*; as containing largely of the oil of the concrete; tho' much more ſubtile than that in the proper *Faints*. A farther regard muſt alſo be had to the *Still-head*, and *Worm* thro' which the *Faints* have once paſſed; as theſe all along depoſite ſuch a copious, infecting oil, as gives a predominant flavour to an almoſt incredible quantity of pure Spirit. Nor is this Oil eaſily diſlodged from the Pores of the ſpungy Metal, by running hot water through the worm; but either requires a quantity of boiling Lixivium or elſe ſome highly rectified Spirit to ſtand in the worm all night, to imbibe, diſſolve and carry it away. And if theſe cautions are carefully obſerved, a much better and purer Spirit may be obtained after the common method, than thoſe who have not tried it would expect.

When now the *Faints* have run off, and it becomes unprofitable to continue the operation longer, the original maſs of *fermented Liquor* is ſeparated into *Still-bottoms* and *Low-wines*, or *Spirit of the firſt Extraction*. The ſeveral parcels of ſpirituous Liquor come over, are then uſually mixed together, and thrown into another Still, to be rectified into what they call a ſaleable *Commodity*, or *proof Goods*.

This operation is a *Second* Species of *ſimple Diſtillation*, which without any addition tends to cleanſe the whole body of the *Spirit* from the *groſſer Oil* of the *Faints*; provided the work be carried on in a mild and gentle manner: Otherwiſe it ſerves but to keep back the ſuperfluous

Phlegm

Phlegm, that ſunk the Spirit much below proof, rather than to improve its quality.

Here again, therefore, the operation ſhould be ſlowly performed with an uniform, well-regulated Fire, or rather *in Balneo Mariæ*, with a due obſervance of the preceding Cautions to keep out of the Spirit the groſſer Oil of the Faints; and inſtead of theſe, to *make up*, as they call it, to Proof, with pure diſtill'd or ſimple water. But here a conſiderable difficulty will occur as to fixing the proof, when the *groſs Oil* that gives it, is left out: A difficulty no leſs perplexing to the Diſtillers, than to his *Majeſty*'s Officers of *Cuſtoms* and *Exciſe*. This point being ſo material, and ſo little underſtood, as to the true gounds and reaſons of it, deſerves to be fully explained.

Proof may be diſtinguiſhed into *perfect*, *more than perfect*, and *leſs than perfect*.

The Foundation, Nature, Doctrine, and Uſes of Proof explain'd.

By *perfect Proof* is vulgarly underſtood a certain crown of *Bubbles*, of a certain ſize, ariſing as a head, upon a ſmall parcel of well-qualified Spirits, ſhook in a ſlender vial; which bubbles, upon permitting the vial to reſt, remain a while, then go off in a certain full and ſtrong manner; ſuppos'd to be known only by thoſe who thro' uſe and cuſtom have obtained the faculty of judging the Strength of the Spirits by this means.

Proof more than perfect is that wherein the Bubbles are larger, and go off more ſuddenly than in the *perfect*; that is, according as the Spirit is higher, or approaches nearer to what is commonly called *Spirit of Wine*.

Proof leſs than perfect is that wherein the Bubbles are ſmaller, and go off quicker and fainter than in perfect proof; the Spirit in this caſe being mixed with above its own quantity of Phlegm.

The *Commercial Notion* of *Perfect Proof* runs ſo high, that the people in trade, both at home and abroad,

abroad, ſeem to place the chief excellence of Spirits and Brandies in it; and buy and ſell upon this weak and ridiculous Foundation. 'Tis much that people attached to profit, and watchful againſt impoſitions, have not reflected that *Arrack* is *proof*, though it contain no more than one fourth of totally inflammable Spirit; that wines have their proof, tho' they hold but about a twelfth; and that many aqueous liquors, eſpecially thoſe wherein ſaponaceous bodies have been diſſolved, are *proof*. Nay, what is more, the *higheſt rectified Spirit of wine* will, by the addition of a very ſmall proportion of ſeveral different kinds of taſteleſs, or grateful ſaponaceous bodies, be made to appear perfectly *proof*; and even deceive ſome more rational ways of trial, ſo as to paſs current for Brandy.

This Hint duly proſecuted will unfold the whole myſtery, and ſhew the fallacy of what is now generally eſteemed and uſed as a moſt authentic evidence of the ſtrength or goodneſs of Spirits.

Proof, or the *Crown of Bubbles in Spirits, is no more than a particular temporary kind of ſpume or froth, generated by the oil, diſſolved in the totally inflammable Spirit, and thence rendered miſcible with a certain quantity of water:* So that this *Spume* or *Crown* of *Bubbles* is really owing to the tenacity of the Spirit, in this caſe occaſioned by the *Oil*. And accordingly when this *Oil* is left out, or its viſcoſity leſſened, by repeated diſtillations, or by ſome common ways of rectification, the *proof* is advanced nearer to the *Proof more than perfect*; and by due proſecution, a Spirit conſiſting of half *Alcohol* and half *Water*, will be made to give no ſigns of *perfect proof* at all: as on the other hand, the moſt ſubtilized and highly *rectified Spirit of Wine* will, by a ſlight and inconſiderable

derable *addition*, tho' ſufficient to increaſe its tenacity, be made to exhibit the fair and full Phænomenon of perfect *proof*. Nay, ſo very precarious a thing is *perfect proof* in a *Spirit*, that the ſmalleſt addition of its own Oil, or other unctuous body, above its own doſe, ſhall inſtantly deſtroy it, and make the Spirit which is really of full ſtrength, appear as if it were largely debaſed with water. Hence it is evident, how eaſily thoſe may be deceived who rely wholly upon *proof*, as they call it, in the buſineſs of Spirits *. And indeed this kind of proof, tho' univerſally received, is the moſt uncertain and fallacious of all thoſe in practice for aſcertaining the ſtrength and goodneſs of Brandies; being in reality, and without unfair practice, no other than a certain Sign of a particular degree of foulneſs, or a *certain quantity of groſs* eſſential Oil contained in them †.

Inſtead therefore of making Spirits up to this fulſome and uncertain *Proof*, we would recommend that of bringing them into the form of totally *inflammable Spirit*; whoſe purity is much greater; whoſe ſtrength may be readily found to exactneſs; whoſe bulk, carriage, ſtowage, and encumbrance wou'd be only a half in compariſon of Brandy; and might at all times, as occaſion called for it, be extemporaneouſly mixed into a great variety of uſeful Liquors, of any preciſe degree of ſtrength. This *operation* in the common way proves indeed ſo tedious, expenſive, and after all ſo unſatisfactory and ſhort of perfection, that it is not to be expected *Diſtillers*, till they are ſhewn a better manner of working, ſhould

* For the beſt ways of judging the qualities or goodneſs of different Spirits, ſee pag. 92, &c.

† See this affair of proof, farther conſidered under Brandies, hereafter.

ſhould come into the propoſal: but if they will try the large rectangular *Boiler* above recommended for a *Balneum Mariæ*, with a proper ſet of *tall conical Veſſels*; they may not perhaps be diſpleaſed with the Contrivance. For they here need no addition of Salts, but may work expeditiouſly and more effectually without them; as thus preſerving the fine eſſential vinoſity of the Spirit, which, in the common way, they conſtantly loſe. At leaſt this method might be practiſed for the finer uſes of the *Apothecary*, *Compounder*, &c. who require a pure vinous Spirit, not already doſed and impregnated with a *fulſome oil*.

The *proof* by which this Spirit is bought, need, for common uſe, be no exacter than to burn perfectly dry in a Spoon.

Or if our new method ſhould never obtain, but all Spirits muſt needs be bought or ſold by the bubble *proof*; ſome other ways of Trial may be recommended, to confirm that which of itſelf is ſo very fallacious and uncertain.

Ways of judging the ſtrength of Spirits.

The ſureſt methods of determining the Strength of Spirits, are principally three; *viz.* (1.) The Hygrometer, Water-poiſe or Balance; (2.) Diſtillation; and (3.) Deflagration.

The ſpecific gravity of totally inflammable Spirit, is ſo much leſs than that of phlegm or common water, as to be ſenſible upon the balance; whence an exact Hygrometer, well graduated and furniſhed with a proper ſcale and weights may be of uſe to aſſign the proportions in which Alcohol and Water are mixed. Tho' perhaps a more ready way for this purpoſe is that advanced by M. *Homberg* ‡ for determining the different gravities of different fluids, by means of a bottle with

‡ Vid. Memoir. de l'Academ. An. 1718.

with a very long and ſlender neck; which being filled to a certain height with any mixture of Spirit, is weigh'd againſt the ſame Bottle filled with pure water.

Diſtillation, however, is a method leſs ſubject to error; but as it requires a good deal of time and trouble to dephlegm any Spirit to perfection, this cannot be of ready uſe, tho' it might determine the Point to the utmoſt exactneſs. The beſt method therefore, when all things are conſidered, ſeems to be that of *Deflagration*, which M. *Geoffroy* has been at ſome pains to adjuſt and improve. The common experiment is to take a certain meaſured quantity of the Spirit propoſed to be aſſay'd; then to heat it and ſet it on fire; whence it will continue burning ſo long as any inflammable part is left in the mixture: and now if the remaining phlegm meaſures half as much as the original Spirit; then is the Spirit merchantable, or what ought to be underſtood by proof Spirit. But ſo much as the phlegm falls ſhort or exceeds of that meaſure, ſo much does the Spirit either approach to Alcohol, or recede from the proof of ſaleable Brandy.

To make this experiment with the greater exactneſs, M. *Geoffroy* adviſes a cylindrical veſſel two inches high, and as much in diameter, conſiſting of thin plate-ſilver; as being leſs ſubject to ruſt than Copper. This veſſel he fits with a little rectangular Gage, exactly graduated into Lines, half Lines, *&c.* Then the veſſel being ſet level, upon the bottom of the Copper-caſe made to contain it; a parcel of Brandy to be examin'd is pour'd to the height of 16 Lines. This height is exactly hit by pouring in more than enough at firſt, and with a ſmall tube taking out what is ſuperfluous. Then the veſſel being heated a little,

ſo

ſo as juſt to make the Liquor fume, 'tis ſet on fire and ſuffer'd to burn out of it ſelf. At the inſtant the flame expires, the Gage is plunged perpendicularly into the veſſel, and the Lines and Quarters exactly noted, which the liquor wants of its former height. And this difference gives the preciſe quantity of Alcohol originally contain'd in the Liquor. Thus if eight Lines of phlegm are found remaining, the Brandy was good, proof and merchantable; but if there remain no more than four lines of the phlegm, the ſpirit was double, or of a middle ſtrength betwixt common Brandy and Alcohol; and ſo of other Proportions.

Thus much of ſimple Diſtillation, in general; we come next, by way of Example, to conſider it in the particular Production of Malt-ſpirit.

Simple Diſtillation in particular.

Of SIMPLE MALT-SPIRIT.

Malt-waſh, being of a mucilaginous or ſomewhat glutinous nature, requires a particular Encheireſis to prevent its ſcorching, and to make it work kindly in the Still. If it ſhould happen to be burnt in the operation; this would give the Spirit a moſt diſagreeable flavour, or empyreuma, that cannot be got off again, without the utmoſt difficulty, or ſome very particular treatment. To prevent any ſuch ill effect, (1.) The waſh ſhould be made dilute; (2.) The fire be well regulated; and, (3.) The Liquor kept in a conſtant agitation.

The manner of making the waſh dilute, has been already touched upon; ſo likewiſe has the regulation of the Fire: And as for the conſtant agitation of the waſh, this may be effected three different ways; *viz.* (1.) By ſtirring

with a Paddle or Oar, till the Liquor begins to boil, then immediately luting on the head. This is the common way. (2.) By putting ſome move-able ſolid bodies into the Still. And, 3.) By placing ſome proper matter at the bottom and ſides, or where the Fire acts the ſtrongeſt.

(1.) The uſual method of ſtirring with the Paddle, is very defective; as being of no uſe after the Still is once brought to work; whereas it often burns in the working. This method is greatly improveable by an addition to the Structure of the Still; whence the agitation may be commodiouſly continued during the whole operation: and this tho' the waſh were made very thick; or Wine-Lees themſelves were to be diſtilled. The method is this. Solder a ſhort Iron or Copper-Tube in the Center of the Still-head; and below, in the ſame head, place a croſs-bar, with a hole in the middle, correſponding to that a-top; thro' both which, is to run an iron-pipe, deep down into the ſtill; and thro' this an iron rod: to the bottom whereof wooden ſweeps are to be faſtened; ſo that this rod being work'd a-top, backwards and forwards, with a Winch, they may continually rake and clear the bottom plate and adjacent ſides of the Still: The interſtices of the Tubes being at the ſame time well cram'd with tow a-top, to prevent any evaporation thereat.

(2.) The ſame effect may in good meaſure be ſecured by a leſs laborious way; *viz.* by placing a parcel of cylindrical Sticks lengthwiſe, ſo as to cover the whole bottom of the Still; or elſe by throwing in a parcel of looſe Faggot-ſticks at a venture: for thus the action of the fire below moving the Liquor, at the ſame time gives motion

tion

tion to the Sticks, and makes them continuall act like a parcel of Stirrers upon the bottom an ſides of the Still; ſo as to prevent the Liquo from ſcorching.

(3.) But a better method ſtill, is upon a parcel o large cylindrical Sticks to lay looſe hay, to a conſi derable thickneſs; ſecuring it from riſing by tw aſh-poles laid a croſs, and preſſing hard againſ the ſides of the Still; which might, if neceſſary be furniſhed with buttons or loops, to ſecure th poles from ſtarting. But care muſt here be had not to preſs the hay againſt the ſides, for tha would preſently make it ſcorch; which being otherwiſe defended by the Sticks, 'tis not apt t do.

Theſe are ſimple, but effectual contrivances; which in point of elegance are eaſily improveable at pleaſure.

There is a farther inconvenience attending the diſtillation of *malt-ſpirit*, when all the bottoms or groſs mealy feculent Subſtance is put into the Still, along with the waſh: which thus coming to thicken a little, like Starch in the boiling, and loſing the thinner Liquor, wherewith it was diluted, as the Still works off; the mealy maſs at length grows ſo viſcous, as ſometimes to ſcorch towards the end of the operation. To prevent this ill effect, 'tis very proper to have a Pipe, with a ſtop-cock, leading from the upper part of the *Worm-tub* into the *Still*; ſo that upon a half or a quarter turn, it may continually ſupply a little ſtream of hot water, in the ſame proportion as the Spirit comes off, by which means the operation will be no ways check'd or hinder'd.

But in *Holland*, where they work their waſh thick, with all the malt and meal along with it, they commonly uſe no art at all to prevent burning; only charge whilſt the ſtill is hot and moiſt,

moiſt, after having been well waſh'd and cleanſed. And yet they very rarely ſcorch; unleſs it be now and then in the winter. When ſuch an accident happens, they are extremely ſollicitous to ſcrape, ſcrub and waſh off the leaſt remains of the burnt parts; by which means they effectually avoid the danger there would otherwiſe be of burning a ſecond time.

But moſt effectually to prevent any accident of this kind, there is nothing comparable to the way of working by the *Balneum Mariæ*; if the Diſtillers could have the addreſs to find their account in it.

All *ſimple Spirits* may be conſidered in the three different States of *Low-wines*, *Proof-Spirit*, and *Alcohol*: the intermediate States being of leſs general uſe; and to be judged of according as they approach to or recede from theſe. *Low-wines*, at a Medium, contain a ſixth part of totally inflammable Spirit; five times as much water as perfect Spirit, neceſſarily riſing in the operation with a boiling heat. *Proof-Goods* contain about a half of the ſame totally inflammable Spirit; and *Alcohol* entirely conſiſts of it. *The three States of Spirits.*

Malt-Low-wines, prepared in the common way, are exceeding nauſeous, fulſome and diſagreeable. They have however a natural vinoſity, or pungent acidity, that would render the Spirit agreeable, were it not for the groſs Oil of the malt, abounding therein. When this *Oil* by ſuitable contrivances, as mentioned above, is kept from running in among the Low-wines, they prove conſiderably ſweeter, both to the ſmell and taſte; and leſs thick and milky to the eye.

When diſtill'd over gently, in order to their rectification into *Proof-Spirit*, they leave a conſiderable quantity of this groſs fetid oil behind, with the phlegm, in the Still. But if the fire be

made fierce, this oil is again thrown over, mix'd with the Spirit; and being now broke ſomewhat fine, impregnates it rather in a more nauſeous manner than at firſt. And this is the uſual fault committed not only by the *Malt-ſtiller*, but even the *Rectifyer*; who inſtead of ſeparating and keeping back the foul parts, according to the deſign of the operation, really brings them over in greater vigour. Whence it is not unuſual, after repeated *Rectifications*, as they call them, both ſimple and compound, to find the Spirit much more nauſeous and diſagreeable than it came from the hands of the *Malt-ſtiller*. The remedy is plainly, either gentle and ſoft working in the common Engine; or the prudent uſe of the *Balneum Mariæ*.

Malt Low-wine, when brought into Proof Spirit, appears bright and clear, without the leaſt cloud or milkineſs; no more oil being contain'd in the mixture than is perfectly diſſolved by the Alcohol, weakned with its own quantity of phlegm. Its taſte alſo is much cleaner for the ſame reaſon; *viz.* becauſe no groſs parts of the oil can, in their own form, hang upon the tongue; but now paſs readily and ſlightly over it: which is not the caſe in Low-wines and Faints; where the Oil remains diſtinct and undiſſolved.

When *Proof Malt-Spirit* is diſtill'd over again, in order for *Alcohol*, if the Fire be raiſed when the *Faints* begin to come off, a very conſiderable quantity of *Oil* will be brought over, and run in the viſible form of *Oil*, from the noſe of the worm. Tho' this is not peculiar to *malt-ſpirit*; but others alſo, and even *French* Brandies do the ſame; ſo that ſometimes half an ounce or more of this Oil may be collected from a ſingle *Piece of Brandy*.

Malt-Spirit, more than almoſt any other, requires to be brought into the form of Alcohol, before

before it can be uſed internally; eſpecially as it is now commonly made up, with as much fulſome Oil in it as will give it the ſtrongeſt proof. On which account it is, that in all compound Waters, not excepting thoſe of the Apothecary, an indifferent judge will eaſily find the predominant flavour of this fulſome Spirit, thro' that of all their Ingredients. For this reaſon, it ought at leaſt to be rectified *in Balneo Mariæ*, to a perfect *Alcohol*, before 'tis uſed in the finer Compoſitions.

And when once brought, with a due care and art, to a perfect Alcohol indeed, 'tis then preferable to the *French Brandies* for all curious internal uſes; as being a much more uniform, hungry, taſteleſs and impregnable Spirit than thoſe uſually are.

This *Alcohol* ought to be kept in cloſe earthen Vaſes or Jars; not only to prevent its evaporation, but alſo its colouring it ſelf with the reſinous parts of the Oak, which it diſſolves powerfully when preſerv'd in *Casks*.

The quantity of Spirit yielded by Malt.

The quantity of pure *Alcohol* obtainable from certain quantity of malt differs according to the goodneſs of the ſubject, the manner of the operation, the ſeaſon of the year, and the ſkilfulneſs of the workman: According to which variations, a *Quarter* of malt may afford from eight or nine, to thirteen or fourteen Gallons of *Alcohol*; which ſhould encourage the *Malt-Stiller* to be careful and intelligent in this buſineſs. As after each operation in the common way, there is always a Remainder of Faints, which never ought in their foul Sate to be mix'd among the cleaner *Spirit*; they ſhould either be converted to other uſes, or treated in a particular manner, ſo as to make a pure Alcohol: The uſes they are otherwiſe fit for, being principally external; or when

rediſtill'd to a proper height, burning in Lamps: ſorwhich purpoſe they may have their diſagreeable odour corrected by proper Aromatics, or other Ingredients, uſed in Diſtillation.

But to make them into pure and perfect *Alcohol*, is a work of greater difficulty; yet practicable, tho' not perhaps to advantage. One way of effecting it, is by ſlowly rectifying them from water into water; by which operation ſeveral times repeated, a pure Alcohol may be obtained from the fouleſt and moſt oleaginous Faints. But of this method, and others for the like purpoſe, more hereafter.

Uſes of the Still-bottoms.

The *Oeconomical Uſe* of the Still-bottoms of the *Malt-waſh* is ſufficiently underſtood by the Malt-Stiller; and being ſo profitable an Article, may, perhaps, render him leſs ſollicitous about the improvement of the other Branches of the buſineſs.

But theſe bottoms might have ſome farther, if not more advantageous uſes than feeding of *Animals*. Thus in particular, they might in a chemical way, afford a large proportion of an *acid Spirit*, an *Oil*, a *Fewel*, and a *fixed Salt*; and with ſome addreſs and good management a *Vinegar* or a *Tartar*. Beſides this, one uncommon uſe thereof has been already touched upon, where the refuſe *waſh* is obſerv'd to be very advantageouſly employ'd, inſtead of water, in the next brewing: as more readily diſpoſing the Subject to ferment; giving the Spirit a vinoſity, and ſomewhat increaſing its quantity. But the proportion for this purpoſe ſhould not exceed that of a fifth or ſixth of the whole Liquor employ'd.

The Liquor left behind in the Still, upon rectifying the Low-wines, is little more than mere phlegm or water, impregnated with a few acid and

and ſome oily parts; not worth ſeparating, unleſs for curioſity. And the ſame is to be underſtood of the Liquor left behind upon diſtilling *Proof Spirit* into *Alcohol*.

As a Species of *ſimple or ſeparatory Diſtillation*, we ought not to omit the diſtillation of *Wine-Lees*; which indeed has a near affinity with the diſtillation of *Malt-waſh*; eſpecially when all the mealy ſubſtance is left in it. The principal difference lies here; that as in the ſimple Diſtillation of *Malt Spirit*, the deſign is, as much as poſſible to keep back the *eſſential Oil*, becauſe of the foulneſs and ill flavour it communicates; the eſſential Oil of the *Wine-Lees* is ſtudiouſly to be brought over, and carefully preſerved, for ſome conſiderable uſes.

The Method of Diſtilling WINE-LEES.

Wine-Lees, how diſtilled.

By *Diſtilling Wine-Lees* is underſtood not only the method of obtaining their *Spirit* or *Brandy*, but alſo their *eſſential Oil*.

The treating of this matter will unfold a very profitable buſineſs, and render it practicable with great facility.

Glauber has a little Treatiſe upon the ſame Subject, wherein, without conſidering the moſt advantageous production of all, he makes the work ſo gainful, that it has generally paſſed for one of his Flights, rather than a ſolid buſineſs.

The Method of diſtilling a *Liquid Lee* for its Spirit, is commonly known and practiſed; but the thing here propoſed, is to diſtil a *ſolid preſſed Lee*, ſo as, at firſt or laſt, to procure and ſeparate all its valuable parts. The *ſolid Lee* meant, is that uſually ſold to the *Hatters* in *England*; and is the ſame thing, that in *France*, and other Wine

Countries, the *Vinegar-makers* diſpoſe of in Cakes, after they have preſſed out the Wine; and which is afterwards burnt into what they call *Cendre Gravellé*; or a Species of *Pot-Aſh*.

This *Lee* for the purpoſes intended ſhould be the *French*; and either freſh preſſed or well ſecured by cloſe packing in tight Casks; with ſome proper contrivance of dry ſand, or the like, to keep its external ſurface from the contact of the Air; which is very apt to corrupt or putrefy it, and thus abſolutely diſqualify it for the ends 'tis here propoſed to anſwer. And the better to ſecure it, if intended to keep for many months, 'tis proper, in the packing, to ſprinkle the Layers with *Brandy*, which will not be loſt in the operation.

It has been already obſerved, that the *eſſential Oil* of the Concrete is copiouſly contained in the *Lee*, depoſited upon Fermentation; and the preſent conſideration is, how to ſeparate this oil to advantage.

The Method is plainly no more than this. Firſt, ſteep the *ſolid Lee* in ſix or eight times its own weight of water, ſtirring them now and then very well together; by which means they will unite into an uniform ſolution, like Clay-water; the groſſer, terreſtrial and lumpy parts falling to the bottom. With this thinner fluid the Still is to be charged, and worked, exactly in the ſame manner as *Chemiſts* do to gain the light, eſſential oils of Vegetables.

If care be uſed in the mixing, charging, and regulating the fire; ſo as to make the Still hot and dewy before the matter is put in, there will be little danger of burning: Tho' this may be more effectually prevented by the methods above delivered for the purpoſe.

The

The time of ſtopping the Operation, the manner of ſeparating the Oil, rectifying the Spirit, again uſing the diſtill'd Water, with other Particulars of the like kind, are here ſuppoſed known: but it may be leſs obvious, that if the *eſſential Oil* be expected fine, the *Separating-Pot* ſhould be ſhifted ſoon; otherwiſe a groſs, reſinous, and much leſs agreeable *Oil* will mix with it, that cannot be ſeparated again, without a more careful Re-diſtillation.

Uſe of the Oil of Wine.

And this fine, ſubtile, ethereal *Oil*, of the firſt running, is the thing here principally intended; the Uſe whereof is ſo extenſive, that half an Ounce, or three quarters of it, may ſerve to determine and denominate a very fine and pure Malt-Spirit to be *French Brandy*; ſo as to ſtand the teſt of the niceſt Palate, and other exact ways of Trials; provided the thing be done in an elegant, ſcientifical, and workman-like manner.

To render this Experiment abſolutely ſucceſsful, there are ſeveral Cautions required: thus, (1.) The *Lee* muſt be of the right kind, or of the ſame nature with the *French Brandy* propoſed to be imitated: (2.) The Spirit muſt be exceedingly pure: (3.) The Doſe muſt be well proportioned: And, (4.) The whole muſt be artificially united into one ſingle uniform Liquor. Yet theſe Particulars only regard the Taſte; whereas there are ſeveral others to be obſerv'd with regard to Colour, Proof, Tenacity, Softneſs, *&c.* ſo that, in ſhort, the Operation has too much Nicety in it to be hit off by every ordinary Dealer. When this fine Oil is once obtain'd, it ſhou'd be mix'd into a *Quinteſſence* with pure *Alcohol*; to prevent its growing in the leaſt diſtaſteful, rancid, or reſinous: and thus it may be long preſerved in full poſſeſſion of its fine Flavour and Virtues. A Parcel of ſuch

Quinteſſence made with the true *Cognac Oil*, is a Preſent for a Prince.

Uſes of the Still-Bottoms, *or Refuſe Lee.*

The *Still-Bottoms*, in this caſe, are capable of affording many Productions, to great advantage; particularly *Tartar*, and *Salt of Tartar*; as alſo an empyreumatic Oil, and a volatile Salt; like that of Animals. But the particular Methods of obtaining and applying all theſe to profit, does not belong to this place. This only need be here obſerved, that ſome kinds of *Lees* afford all theſe Commodities in much greater proportion than others: thus but very little of them is procurable from the Lees of *Canary* or *Mountain Wines*; and indeed ſcarce any *Tartar*, or fixed Salt at all: but the white *French Lees*, of thoſe thin Wines that afford ordinary Brandies, yield them all copiouſly; inſomuch, that ſometimes a ſingle Hogſhead of dry and cloſe-preſs'd, white *French* Lee, ſhall afford three Gallons of Brandy, forty Pounds of clean Tartar, a good deal of Empyreumatic Oil, and volatile Salt; beſides Fewel, and four Pounds of pure *Salt of Tartar*. But every parcel does not yield at this large rate.

SECT.

SECT. IV.

Of RECTIFICATION; SIMPLE *and* COMBINATORY.

RECTIFICATION may be divided into *proper*, and *improper*. *Proper Rectification* is the Method of reducing a *Spirit* to its utmoſt Simplicity, and Purity. *Rectification, proper and improper.*

Improper Rectification, is that kind of Diſtillation, wherein ſome particular Ingredients are added to the charge; with a deſign to alter, improve, or aboliſh the natural flavour of the Spirit that comes over.

This Operation, as vulgarly managed, might otherwiſe be called *Combinatory Diſtillation*; becauſe ſome parts of the Ingredients employ'd, actually come over, and mix themſelves along with the Spirit, ſo intimately as not to be ſeparated again, without great difficulty: whence, inſtead of aboliſhing, they only obſcure, pervert, alter, or compound the Taſte and Odour of the Spirit, ſaid to be *rectified*.

The Foundations of *proper Rectification*, are laid in the preceding Section, where a clean Spirit is directed to be procured from the Waſh, and purified from the Low-Wines, and vulgar Proof, up to perfect *Alcohol*; which is nearly a ſimple and homogeneous Liquor. The principal buſineſs here, is to keep the *eſſential Oil* from entering the Spirit; whereto, when once admitted, it is very apt to cleave, and ſtrongly adhere: and as, by the means above-deſcribed, it is much eaſier to keep them aſunder, than to ſeparate them

them again, after they are mixed; their coming together ſhould, by all means, be prevented.

Simple or ſeparatory Rectification.

To disjoin them, when once mix'd, or to effect their entire ſeparation, there are ſome particular Methods; the more practical whereof are, *repeated Diſtillation*, and *Percolation*.

Theſe Methods are practicable, either upon Spirits below *Proof*, *Proof*, or *above Proof*; but to moſt advantage upon Low-Wines, or Spirits, not yet brought to proof: as the Oil to be got out, is not here totally diſſolved, and intimately mixed with the Spirit, on account of the over-proportion of the Water; which, diluting the Alcohol, will not ſuffer it to imbibe that quantity it otherwiſe would. In this ſtate therefore, there is a good opportunity, by gentle and ſlow working, to leave a large proportion of Oil behind, in the tall Body, or Alembic, placed in a *Balneum Mariæ*. But if, by this means, the Spirit becomes not ſufficiently pure, and ſimple, it may again be let down with fair Water, to the ſize of *Low-Wines*, and re-diſtilled in the ſame, ſoft, and equable manner. And thus it may be made of any aſſign'd degree of purity; eſpecially if the Spirit be ſuffered, in the working, to fall into ſeveral parcels of Spring-water; whence it will have the beſt opportunity of throwing off its eſſential Oil: The Operation being repeated ſo long as any Oilineſs, or Milkineſs, appears in the Water, or till the laſt Water employed remains perfectly inſipid, and inodorous. And in the ſame manner may Proof-Spirit, and *imperfect Alcohol*, be let down with clean Water, re-diſtill'd, and at laſt brought to the ſtate of *perfect Alcohol*. Something towards the ſeparation of this Oil may be likewiſe effected, by the uſe of proper Filtres, or Strainers. Thus, *Paper*, *Parchment*, *Sand*, *Stone*, *Woolly Matters*, *&c.* might be uſed for this purpoſe;

poſe; provided they contain nothing that is ſoluble by the Spirit, or capable of fouling it. And with this view, ſome have ſpread a thick folded Paper, or double Parchment, over the mouth of the Veſſel, in rectifying Spirit to pure Alcohol. This Operation by *Percolation*, may, at leaſt, be aſſiſting to the former. There are other Methods of reducing Spirits to their utmoſt Simplicity, tho' the Oil ſhould not be totally got out of them; or even tho' a large quantity were deſignedly lodged in them. The moſt ſimple Method for this purpoſe, appears to be that by *long Digeſtion*; which is beſt practiſed upon *imperfect Alcohol:* for this being already deprived of a large proportion of its groſſer eſſential Oil; only the finer part will remain to be attenuated by the Operation, and ground to the ſize of the Particles of pure *Alcohol*; whence the whole will become one ſimple, and nearly uniform fluid. But this Operation requires a gentle Heat, cloſe Veſſels, and a great length of time to compleat it; eſpecially if the quantity of Oil to be tranſmuted is large. To anſwer the ſame end, more expeditiouſly, it has been propos'd to re-diſtil the imperfect *Alcohol* a very great number of times ſucceſſively, till all its Particles are, by the Action, and Motion of the Fire, ground, comminuted, and reduced to the ſame ſize. But this alſo is a tedious and expenſive way.

The Inconveniences attending all theſe Methods of bringing Spirits to their utmoſt Purity, have occaſion'd another to be ſtudiouſly ſought after, that might effect the thing in a different manner: or in the way of *Inverſion*, which might, if once perfected, prove a very commodious Operation. By *Inverſion* is here meant, the Method of ſuddenly changing the eſſential Oil contained in a Spirit, to Spirit itſelf; or, at once, depriving any

any particular Spirit of its natural Flavour, and bringing it to a ſtate of Neutrality; whether by any particular Addition, Encheireſis, or Operation. A ſettled Method of doing this, perhaps remains hitherto undiſcover'd; but there are ſeveral known Phænomena of the like ſurprizing nature to countenance the thing. Thus Oil of Cinnamon is inverted, or abſolutely deprived of its Nature by Salt of Tartar; and *Alcohol* itſelf may, by a *particular Addition*, be inverted, or turned to Water. And an expectation of effecting ſome extraordinary change upon Spirits, by means of certain ſaline Bodies, has given riſe to the preſent Methods of *combinatory Rectification.*

Combinatory Rectification, in its various Methods.

The common Methods of Combinatory Rectification, are very numerous; almoſt every Diſtiller pretending to a particular *Noſtrum* for this purpoſe. But as the principal Subject of the Operation is Malt-Spirit, the ſeveral ways in uſe for rectifying it, are reducible to three general ones; *viz.* That by *fix'd Alkaline Salts*; that by *Alkaline Salts*, along with *Acid Spirits*; and that by *Saline Bodies*, and *Flavouring Additions.*

By alkaline Salts.

The moſt prevailing Method is that which turns entirely upon the uſe of *fix'd Alkaline Salts*; as being very cheap, and practicable. But it is ſurprizing to ſee with what negligence this obvious, familiar, and eaſy Operation is uſually perform'd by our *Diſtillers*; who, nevertheleſs, are allow'd, in the buſineſs of Rectification, to exceed thoſe of other Nations. The effect of this Operation, when carefully perform'd, and according to the Rules of Art, is greatly to attenuate and thin the Spirit; keep back a large proportion of its groſs, fetid Oil; and ſo far to alter the part that comes over, as to leave the Spirit ſcarce knowable for a *Malt-Spirit.* And this end is ſecured by a ſteady, prudent management of the Fire; and

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leaving out the *Faints*. But inſtead of this careful ſlow way of procedure, our Diſtillers commonly work their Still in its full force; drive over the Oil they ſhould keep back; and even ſuffer the *fulſome, bitter Oil*, now made into a kind of liquid Soap with the Salt, to run among their Spirit, with the Faints: whence the whole Operation is fruſtrated; and the Produce render'd much harder to cleanſe, than it was before.

This Operation is uſually perform'd upon *proof Spirit*, with the addition of eight, ten, twelve, or fourteen pounds of dry *Salt of Tartar, fix'd Nitre, Pot-Aſh*, or more commonly, *calcin'd Tartar*, to a Piece. The Tartar, being only roaſted to blackneſs, is often, for this purpoſe, ſold under the abſurd name and notion of a *vinous Salt:* whence you ſhall hear ſome Dealers praiſe the *Vinoſity* of their Spirit, rectify'd from this Salt; that never fails to give, inſtead of a pungent, acid Vinoſity, a ſaponaceous, urinous, or lixivious Taſte and Smell. And this, indeed, is the great imperfection of the Method by *fix'd Salts*; part whereof actually becoming volatile in the operation, (as may be ſhewn by particular Experiments) paſſes over the Helm, and intimately mixes with the Spirit, and that portion of Oil it ſtill contains: which Oil is, by this means, ſtill firmer united to the Spirit; and quits it with the greater difficulty in ſubſequent Operations. So that, in reality, the Spirit thus rectified, is no other than an alkaline, or *tartarized Spirit*, as the Chemiſts call it; a thing infinitely different from a true *vinous Spirit*. This Method therefore, tho' it were purſued to its utmoſt perfection, would, in great meaſure, become deſtructive of the end 'tis propoſed to anſwer; without ſome farther addition, or alteration.

Hence

By alkaline Salts and Acids.

Hence there appears a kind of neceſſity for the uſe of ſome *Acid*, to mortify the prevailing *Alkali* in the Spirit, ſo rectified: and this gives occaſion to the ſecond *Method by fix'd Alkalies*, and *Acids*. The Acids, uſually employ'd for this purpoſe, are various; but chiefly of the mineral kind, on account of their cheapneſs. Thus *Oil of Vitriol*, *Spirit of Nitre*, *Oil of Sulphur*, &c. have been tried, with indifferent ſucceſs; inſomuch, that the moſt celebrated Rectifyers owe their improvements to this Foundation. There is ſome choice, however, to be made of theſe Acids; for they have different effects upon the Spirit, and muſt not only be duly proportion'd, but incorporated, or introduced by ſuitable *Encheireſes*; which, every one is not maſter of. And indeed, without ſome skill, and judgment, in the management of theſe violent Corroſives, no Diſtiller ſhould be too buſy in the uſe and application thereof. Neither are theſe ſtrong, *mineral Acids* ſo well adapted to the work, as the weaker; particularly the *ſulphureons Spirit of Vitriol*, which comes over upon rectifying the *Oil of Vitriol*: and to this may be added, the common *Spiritus Nitri dulcis*; and Mr. *Boyle*'s *acid Spirit of Wine*, well rectified. Of kin to this Method, by *fix'd Alkalies*, is that by the uſe of *Quick-Lime*, which cleanſes and dephlegms conſiderably; but afterwards requires the aſſiſtance of *Acids* alſo, to take off, not only the alkaline diſpoſition, but alſo the nidorous odour it leaves behind. Leſs of this particular odour is given by Chalk, Virgin-Earth, calcin'd and well purified animal Bones, *&c.* which may have their uſe in rectification; without rendering the Spirit too alkaline for the purpoſes of the Diſtiller.

By ſaline Bodies and other Ingredients.

The Method by *ſaline Bodies*, and *flavouring Ingredients*, conſiſts either in the uſe of *fix'd*, *alkaline*

aline Salts; dry'd, or decrepitated *common Salt*; *alcined Vitriol*; *Sandiver*, *Alum*, &c. the fla-vouring Ingredient being applied afterwards, and he whole quantity of Spirit either drawn over gain or not, as the Addition requires. But heſe ſaline Bodies perform ſo extremely little, s uſually to leave the *Spirit* impregnated with diſagreeable flavour, that cannot be over-ower'd by *Mace*, *Orrice*, *Parſnip*, *Rhodium*, *Artichoak*, *Raiſin-Stalks*, *Damask-Roſes*, *Wine-Lees*, *Rape*, or *Grape-husks*, nor even the Oil of *French* Wine; or any artificial Mixture of va-ious ſuitable Ingredients: which if once the pirit were pure, might give, to tolerable Ex-ctneſs, the genuine Flavour of ſome foreign *Brandies*.

The ultimate Perfection aimed at in all theſe Methods of *Combinatory Rectification*, is at one ingle Operation, either to depurate *Malt Spirit*, o as to render it taſteleſs and inodorous, yet inous; or elſe to make it reſemble *French Brandy*, *Arrac*, or other very low-flavour'd *inous Spirits*.

That the thing itſelf is practicable, may ap-ear from what is deliver'd in the foregoing ages; and will be more particularly explain'd ereafter. The Buſineſs of flavouring, is at-ended with no great difficulty; the principal ne is to procure a cheap taſteleſs Spirit from Malt, fit to receive any particular flavour: nd this not in the tedious way of repeated Diſtillation, long Digeſtion, or the like; but n a much ſhorter, and more practicable man-ner.

The Method by fix'd *alkaline Salt* may be onſiderably improv'd, in this View; by ſteeping he Spirit, firſt brought near to the State of

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Alcohol, upon well dry'd *Salt of Tartar*, or other cheaper, but pure, fix'd *Alkali*; by which means it will be almoſt totally freed of its Oil, without volatilizing much of the Salt; as it does in the way of Diſtillation. And thus with the proper *Encheireſis*, a weak *Tinctura Salis Tartari* may be eaſily procured; and mortified with an Acid, ſuited to the purpoſe, and then diſtill'd. And if ſuch an Operation be conducted with the requiſite Care and Caution, a very tolerable Spirit may be thus procured, to advantage.

By neutral Salts. The Uſe of *neutral Salts* in Rectification, ſeems to be but little known. By *neutral Salt* is meant a fix'd alkaline Salt, compleatly ſaturated with an acid one. Such a Salt has indeed been expected from the *Caput mortuum*, or white ſaline Cake remaining upon the Diſtillation of the *Spiritus Nitri fortis cum Oleo Vitrioli*; but it proves too hard, chalky, ſtony, and inſoluble, to be of any great ſignificance for this purpoſe. A better effect may be expected from *ſoluble Tartar*, carefully prepared, well dry'd, and properly uſed; tho' 'tis apt to render the *Spirit* a little ſaponaceous. Some compound neutral Salts, however, have been made upon this Foundation, that would cleanſe or rectify common Malt-Spirit, from Proof, at a ſingle Operation, much better than other more laborious and expenſive Methods. Nor is a prudent uſe of fine, dry Sugar, to be deſpiſed for this purpoſe; as it readily unites with eſſential Oil, detains and fixes it, without imparting any urinous, or other nauſeous Flavour to the Spirit that is rectified upon it. Another Hint, to this purpoſe, is afforded us by the ingenious Method of Dr. *Cox*, for taking all the Oil out of the volatile Salts; by

by firſt bringing them to a neutral State with Spirit of Salt; and then ſubliming them with Salt of Tartar: which does the Buſineſs to perfection. In the caſe of Spirits, the Acid may be varied; and Virgin-Earth, Chalk, calcin'd Flints, or the like Abſorbents, uſed inſtead of Salt of Tartar. But this is recommended to farther Experience.

That the Buſineſs of *Rectification*, may in all Caſes proceed to the greateſt Exactneſs, a due regard muſt be had to it, even from the firſt Fermentation, or original Production of the Spirit; and continued through all the Stages of *Low-Wines*, *Proof-Spirit*, and *Alcohol*: and if the Rules hitherto laid down for that purpoſe, were but carefully obſerved, ſo far only as they might, without any great additional Trouble or Charge, we ſhould not hear thoſe frequent Complaints we now do, for want of a clean *Malt-Spirit*, fit for many of the more curious Uſes. *And* univerſally.

And the like careful Method of Proceedure we wou'd alſo recommend in the cleanſing or rectifying of other ordinary Spirits. For 'tis not only Malt-Spirit that requires Rectification: all the others require it in their turn, for ſome particular, though not for ordinary Uſes. And 'tis remarkable, that no one Method of combinatory *Rectification* is found to ſerve univerſally for all Spirits; nor hardly for any two. But the ſimple way of rectifying, by repeated Diſtillation, is univerſal: And may as well be applied to Malt-Spirit as Melaſſes, Cyder-Spirit, Wine-Spirit, Rum, *French*-Brandy, and Arrac: All which are then known to be perfectly rectified, when they not only prove totally inflammable, in a little Veſſel floating upon cold Water; but when poured into the pureſt Spring

Water, they leave not the leaſt trace of oilineſs, or unctuoſity; which, view'd in a certain light, exhibits the colours of the Rainbow.

SECT. V.

The Natural and Experimental HISTORY *of* SPIRITS, Domeſtic *and* Foreign.

BY the *Hiſtory of Spirits*, is here propoſed a ſhort account of their Origin, State, and Improvement; with the ways of imitating, adulterating, and judging thereof.

HISTORY OF MALT-SPIRITS.

Malt-Spirit. The *Hiſtory of Malt Spirit* has already been traced out occaſionally; but particularly as to its *Origin*. The *State*, wherein we commonly find it, is either *unrectified*, or *rectified*, and in both caſes *proof*; or elſe brought to an *imperfect Alcohol*. In the firſt caſe, 'tis juſt as the *Malt-Stiller* leaves it; in the ſecond, as improved by the Rectifier; and in the third, drawn high; or brought to the ſtate of what they call *Spirit of Wine*.

It was formerly obſerved, that the *Malt-Stiller* gives his Spirit a ſingle Rectification *per ſe*, in order to purify it a little, and make it up *proof*; but in this ſtate, 'tis not reckon'd fit for internal uſes; and ſo ſerves only for Spirit of Wine, or Lamp-Spirit; or to be diſtill'd with *Juniper Berries*, or other Ingredients, into *Geneva*, or other Compound Waters for the vulgar. And this

this is all the Rectification the *Malt-Spirit* made in *Holland* uſually undergoes: the Method there, being barely to diſtil their Low-Wines to full *Proof-Spirit*; and then directly make it into *Geneva*, or ſend it to *Germany*, *Guinea*, the *Eaſt-Country*, &c. For the *Dutch* have little notion of what we, in *England*, call Rectification; and making of double Spirit. Hence they uſually leave their common Spirit ſo foul, and coarſe, as renders even the *Geneva* made with it, very diſagreeable. This foul flavour alſo is greatly heighten'd by their immoderate uſe of *Rye Meal*, in the production of their Spirit; which, upon that account alone, would be highly nauſeous.

Unrectified.

In its *unrectified ſtate*, *Malt-Spirit* alſo is ſeldom found to want the common *Bubble-Proof*; this being requiſite to render it merchantable, *viz.* that it have a good, moderate doſe of the groſs Oil of the Malt, well broke, and mix'd in along with it. Whence it rarely fails to exerciſe the skill of the *Rectifier*, either to get out this Oil, or break it finer; ſo as to render the natural flavour of the Spirit leſs ſenſible. But when care has been uſed by the Malt-Stiller, both in his firſt and ſecond drawing, he often leaves his Spirit more grateful, than it comes from the hand of the coarſe Rectifier; who, inſtead of ſeparating the nauſeous Oil, frequently fixes it faſter; and, at the ſame time, deſtroys the native Vinoſity of the Spirit, left in it by the *Malt-Stiller*.

Rectified.

But when the *Rectifier* alſo performs his part maſterly, the Spirit receives conſiderable improvement under his hands; for thus, by means of his Salt, and a gentle *way of working*, he keeps back much of the groſs Oil: then alſo leaving out the Faints, and making up with fair Water in their ſtead, he renders the Spirit purer, more

dilute, and thin; without that hanging *Proof*, which, inſtead of being coveted, ought never to appear in *Malt-Spirit*; where the Oil is ſo exceedingly nauſeous, faint, and diſagreeable.

Reſtored to its Vinoſity. But this kind of *Rectification*, eſpecially where fix'd Alkaline Salts are uſed, being always apt to deſtroy the pungent, acid Vinoſity; and in its ſtead introduce an urinous or lixivious flavour; ſeveral Methods are practiſed, of giving an artificial Vinoſity in lieu of the natural one, loſt in the Operation. The principal Methods in uſe for this purpoſe, turn upon *Spirit of Nitre*; either the *ſtrong*, or the *dulcified*: By means whereof, they make their rectified Malt-Spirit into a dilute and weak *Spiritus Nitri dulcis*. Sometimes they put a ſufficient quantity of the *Spiritus Nitri fortis Glauberi* into the Still, along with the Spirit to be drawn over: and this method is ſuppoſed to make the Vinoſity more laſting, or not apt to fly off; as 'tis uſually found to do in a few weeks after the bare addition of *Spiritus Nitri dulcis*, to a parcel of Spirit. And this being a Phænomenon, whereon a good deal depends, with regard to the improvement of *Diſtillation*; it may not be amiſs to examine a little narrowly into it: for perhaps the Diſtillers could not well have hit upon a thing leſs prejudicial to health, or better fitted for their purpoſe, if its effects were durable: for, when uſed in a proper doſe, it gives a moſt agreeable, and true Vinoſity to a well cleanſed Spirit; at the ſame time that it coincides with the nature thereof, and promotes its medicinal virtues, as a Diuretic, Deobſtruent, and Lithontriptic.

The obſervations that have occur'd to me, as to the uſe of this fine, volatile Acid, upon rectified Malt and Melaſſes Spirits, are principally theſe.

1.

1. That there is a great difference in *Spiritus Nitri dulcis*, according to the manner of its preparation; ſuch being more apt to fly off, as has been leaſt incorporated by Digeſtion, or repeated Diſtillation.

2. That any rectified, clean *Spirit*, impregnated with a proper doſe of the common ſort of *Spiritus Nitri dulcis*, and kept cloſe ſtopp'd in a Glaſs; will very long retain its agreeable Vinoſity.

3. That the Casks, long uſed to receive rectified Spirits impregnated with this artificial Acid, appear yellow, and rotten on their inſide; like a Cork corroded by the fumes of ſtrong *Spirit of Nitre*. Whence 'tis manifeſt, why the Vinoſity is ſooner loſt in a Cask, than a Glaſs.

4. That when the inflammable Spirit has been rectified from fix'd Alkalies, it requires a much larger doſe of the Spirit of Nitre, to impregnate it with this acid Vinoſity; which alſo, is here loſt ſo much the ſooner, as the Spirit was more tartarized, or alkalized. And accordingly it uſually remains longer with Melaſs, than with Malt-Spirit; the latter, from the fix'd Salts plentifully uſed in its Rectification, being commonly render'd the moſt alkaline.

5. That the beſt way of making this volatile Acid, whether with, or without external heat, is not uſually practiſed; *viz.* ſo as to render it a perfectly homogeneous and uninflammable Liquor: whence it proves much more volatile than it ought to be. Thus when perfect Alcohol, and a well rectified, ſtrong Spirit of Nitre are, by degrees, put together, for the making of this vinous Acid; one half of the mixture evaporates, or may be made to diſtil in the violent conflict ariſing in the Operation, ſo as to leave the other half more fix'd.

6. The common Method alſo is improveable, by uſing in the Preparation, a Spirit of Wine impregnated with ſome certain Ingredient of a fine flavour, without much Oil; for Acids do not mix with Oils, in any conſiderable proportion.

7. That in the Preparation of this dulcified Spirit of Nitre, the longer it ſtands in digeſtion with the Alcohol, the milder it grows; by which means alſo even the violently corroſive and acid Oil of Vitriol may be blunted, and render'd almoſt undiſtinguiſhable.

8. In fine, a particular *Spiritus Nitri dulcis* has been made more effectual than the common, and not diſpoſed to quit the Spirit, otherwiſe than the native Acid is to quit *French Brandy*; which in time it always ſeems to do: though this be principally owing to a ſlow and ſecret Digeſtion; whereby the Spirit, the Water, the Acid, and the Oil become more intimately united, and the compound Liquor leſs pungent.

Theſe Obſervations ſeem to clear up the whole Buſineſs, and render it practicable to better advantage; ſo that Diſtillers need not be obliged to pour their *Nitre*, as they call it, into the Spirit, only a few days before they ſend it away; for fear the Sophiſtication ſhould be diſcovered e'er the Goods are conſumed. No certain Rule can be laid down for the quantity in which this Acid ſhould be employ'd, becauſe different Spirits require different Proportions; let it only be noted, that too large a Doſe is not only diſagreeable, but renders the Impoſition eaſily diſcoverable. And whoever endeavours to cover a foul Taſte, by uſing a large Proportion of it, will, upon appealing to good Judges, find himſelf deceived: its proper Uſe being only to give an agreeable Vinoſity; not unlike to

that

that naturally found in all fine and thin subtile Spirits, drawn from fermented Liquors or Wines.

When the Spirit has been well rectified, 'tis usual to find it incapable of affording the common Bead or *Bubble-Proof*; especially before it has received its proper Dose of colouring: by means whereof, they can, at the same time, give this *Proof-Spirit* any degree of a yellow, from a light lemmon, or straw-colour, to a deep brown, according to the fancy of the Customer. This *Art of Colouring* was first introduced, from observing that all *Brandies*, which by long lying in the Cask, had acquired a mellow Softness and Ripeness, appear'd of a yellow Cast. Whence it was supposed, that part of the particular Excellence of *French Brandies* depended upon this colour; which was therefore studiously endeavoured to be artificially communicated to the rectified Spirits, intended to resemble them. *Coloured.*

For this purpose many things were tried; of which the principal and most famous at present are *Logwood*, *Saffron*, *Japan Earth*, *Treacle*, *burnt Sugar*, and *Oak*. The three former however have but little to recommend them; tho' they are not without their advantages, when properly applied; but the *Treacle*, the *burnt Sugar*, and the *Oak* are very good things for the purpose.

Treacle gives a fine colour, not much unlike the natural one of foreign Brandies; and being necessarily used in a pretty large quantity, as its colour is but dilute, it not only mends the *Bubble* or *Bead-Proof*, impair'd by Rectification; but also gives a Fulness in the mouth: both which Properties in Spirits are found very agreeable to the Vulgar; the chief retail Consumers of these coarse Goods.

Burnt Sugar, that is, *Sugar* diſſolved in a little Water, and ſcorched over the Fire, till it turns black, goes much farther in tinging than *Treacle*; and gives no Sweetneſs, but rather an agreeable Bitterneſs; and thus recommends itſelf to the nicer Palates, that are not for a luſcious Spirit: And to ſay the truth, Sugar thus treated tinges to perfection; with all imaginable Cheapneſs and Expedition.

But of all the Ingredients uſed to give a Colour, nothing is ſo natural as *Oak*; this being indeed the very thing to which the Colour of the *foreign Brandies* is owing; *viz.* the Colour they unavoidably acquire by long lying, and diſſolving the reſinous parts of the Caſk. And this Ingredient it is that particularly fits them to ſuſtain ſome trials, which other Spirits wanting, are unable to ſtand. *Common Spirit* poured upon Oak-ſhavings, and digeſted in a moderate Heat, eaſily fetches out this reſinous Matter; which however goes nothing near ſo far in tinging as *burnt Sugar*. So that a large quantity of Shavings being neceſſary to colour a ſmall parcel of Brandy, 'tis proper at all times to have an *eſſential Extract* of *Oak* ready at hand; that may be uſed occaſionally. But however feaſible and eaſy ſuch a Preparation may appear, the Succeſs will not anſwer without ſome Caution. Every Diſtiller may burn his own *Sugar*; but every one cannot prepare the *liquid eſſential Extract* of *Oak*. The Foundation of the thing lies here; that 'tis Brandy, not Water, or Alcohol alone, which is colour'd by the Caſk: So that he who would not miſcarry, muſt uſe two Menſtruums, or *Alcohol* and *Water*; each whereof, with a ſlight Digeſtion, will extract a ſeparate Part; both which, after due Exhalation,

nalation, muſt be added together, and intimately mix'd with a proper Liquor, ſo as to keep the two parts from ſeparating; as they otherwiſe wou'd do into a groſſer, terreſtrial, and a lighter, unctuous or balſamic Part. To prevent which the more effectually, a proper ſaccharine Intermedium might alſo be uſed. But the great Deſideratum in the Buſineſs of *Malt-Spirit*, is not a Method of giving a fine Vinoſity, and a natural Colour; but a Method of permanently and effectually cleanſing it: which we have above attempted.

Alcolized. The moſt commodious State for Malt-Spirit to be preſerved in, we have already obſerved to be that of *Alcohol*. And how it comes, that this Practice is not more general, let the Dealers and Merchants conſider: for as the Caſe now ſtands, to import or export a Piece of entire Spirit, they really import or export along with it a Piece of fulſome Water, that might be much better ſupplied out of every River. But when a well rectified Malt-Spirit is brought into *Alcohol*, 'tis then in a pure State, at all times fit for the Uſes of a *Spirit:* which cannot be ſaid of Proof-Spirit, though of double the Bulk of Alcohol; becauſe the Water in the Proof-Spirit unfits it to burn or feed a Lamp, diſſolve Roſins, make Varniſh, and many other particular Tinctures, Solutions and Mixtures: whilſt Alcohol is as readily mixed into Punch, or made into other cordial Liquors, as *Brandy*; and that with a greater degree of Certainty, in point of Strength as well as Purity.

Lower'd. There being no cheaper Spirit uſually made than that of Malt, no great Attempts are on foot to imitate or adulterate it: though 'tis ſaid, that in *Poland*, *Denmark*, *Norway*, *Sweden*, *Guinea*, &c.

&c. a Corn-Spirit is, thro' Uſe and Cuſtom, preferr'd by the *Ruſticks* and *Savages* to *French Brandy*. The principal Sophiſtication whereto 'tis liable, is the Admixture of Water; and it ſeems generally allow'd in a Retail way, to daſh an eighth thereof with *Proof-Spirit:* And if any have the Addreſs of doing this, yet make the Spirit retain its Proof; they may very eaſily impoſe upon thoſe who have nothing but the *Bubble-Proof* to truſt to. Such an additional quantity of Water, makes the Spirit taſte ſofter and cooler; for which reaſon many prefer it to the ſtronger, which is hotter: but unleſs the Spirit ſo ſerved, be tolerably clean, or its Proof otherwiſe preſerved; this additional Water ſets looſe the eſſential Oil; which will now leave a nauſeous Farewel in the mouth. If rectified Spirits muſt needs be purchaſed in the ordinary way of *Bead-Proof*; that which goes off in pretty large Bubbles ſhou'd be choſe; provided it otherwiſe appear clean, thin, and light; taſtes ſoft, uniform; and is not high-flavour'd, alkaline, acrid, or fiery, but ſoon quits the Tongue.

Uſed in Mixture. The fair Uſes of *unrectified*, *rectified*, and *double Malt-Spirit*, are things known and familiar; but the clandeſtine Uſes, which are various, ſkulk in few hands. A principal one of this latter kind, is to mix it with dearer or foreign Spirits: but ſo coarſely is the *Malt-Spirit* commonly prepared and rectified, that a nice Palate will readily diſtinguiſh a tenth part of it mix'd in *French Brandy*, and much ſooner in *Arrac*. However, ſome do venture upon a third, yet hope to eſcape undiſcovered; and in effect they frequently do; from a previous knowledge of the Taſte of their Cuſtomers. A certain Mark of ſo groſs an Impoſition is the urinous Scent and Taſte;

'aſte; which on account of the fix'd Salt, com-
ıonly predominates in ſuch adulterated Brandy:
ıd which is no way natural to the genuine.
ınd indeed, all *Brandies* are to be ſuſpected, that
ave not an uniform taſte, and grateful odour;
ɔr I never yet cou'd find any Spirit rectified
ı *London*, but what had ſome particular, pre-
ominant, compound Flavour, given it only to
ɔver and conceal that of the Malt. But one
f the beſt, and moſt infallible ways of diſco-
ering any conſiderable Adulteration with a foul
pirit, is to burn away all that is inflammable;
ıd carefully examine the remaining Phlegm,
oth by the Eye, the Noſe, and the Tongue:
ɔr in this caſe, a ſmall proportion of Oil may
ıanifect itſelf, and eaſily betray its Origin.

But theſe ways will not ſerve to catch an Artiſt;
ıd ſhould the Diſtillers, as by proper Applica-
on they certainly may, once arrive at perfec-
on in the Buſineſs of Rectification, a much
ırger Mixture than they now make, might eſcape
nperceived. And when they are advanced thus
ır, 'tis but another Step, and they may give
s as good *Brandy* from Malt, as that of *Bour-
eaux*, *Rochelle*, or *Cognac*.

History of Melasses Spirit.

What regards the original Production of a
pirit from *Treacle*, has already been conſider'd,
ı general, under the Articles of *Brewing*, *Fer-
ıentation*, &c. We have only here to add,
hat unleſs ſome particular Improvements be
ıade in the Subject; or ſome particular En-
heireſis uſed in the Treatment; the Spirit will
ıot prove ſo vinous as that of Malt, but more
ıat, or leſs pungent and acid; though otherwiſe
ıuch cleaner taſted; as its eſſential Oil is of
leſs nauſeous Flavour: whence, if good freſh

Melaſſes Spirit improved in the firſt Diſtillation.

Wine-

Wine-Lees, abounding in Tartar, be duly fermented in the Solution, made thin for the purpoſe; the Spirit acquires a conſiderable Vinoſity and Tenuity, approaching to that of *French Brandy*.

By Rectification. This Spirit ought likewiſe to be artfully rectified, with the Cautions before given; but alkaline Salts do not ſuit it: ſo that if any Salts are uſed, they ſhould rather be neutral than alkaline; ſuch as *Sandiver*, *common decrepitated Salt*, *Sal Enixum Paracelſi*, &c. though nothing ſo conſiderable is to be expected from theſe neutral Salts, as from a careful Rectification *per ſe*, *in Balneo Mariæ*: by which Operation alone, repeated once or twice with freſh Water, this Spirit may be very well cleanſed, and fitted for the fineſt Uſes.

By Mixture. When brought to the Form of a *Proof-Spirit*, if it have not naturally enough Vinoſity, a good *Spiritus Nitri dulcis* ſuits it extremely: and if the Spirit be clean work'd, it may by this Addition alone be made to paſs on ordinary Judgments for *French* Brandy.

How coloured. The Methods of colouring it are altogether the ſame with the colouring Malt-Spirit*; but *burnt Sugar*, or rather the *eſſential Extract of Oak*, ſeems moſt homogeneous and natural to it.

Adulterated. This Spirit is frequently, and indeed ſometimes ſhamefully adulterated with that of Malt; and 'tis extremely difficult to buy it without a Daſh thereof: or if they aſſure you 'tis not mix'd with Malt-Spirit, they commonly have this Salvo, that Malt was originally uſed in the Fermentation; and ſo the Spirit itſelf was produced in the ſtate of Mixture.

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* See Pag. 119.

Great Britain ſeems the principal ſeat of this Commodity: it was formerly prepar'd in great plenty in *France*, eſpecially up the River *Loire*; but 'tis now forbid, under a ſevere penalty. In *Holland* likewiſe they have it not; on account of the high Duty laid upon the importation of *Treacle*, in favour of their own Sugar-Bakers. *Where made.*

We meet with very little of this Spirit any where in the form of *Alcohol*; tho' when reduced thereto, in a proper manner, 'tis little inferior to the real *Alcohol of Wine:* and ſhould be the thing in general uſe with our Compounders, Chemiſts, and Apothecaries. *Its Uſes.*

Its principal uſes are to mix with *Rum*, *Arrac*, and *French Brandy*; for, if well prepared, it cannot, in a tolerable proportion, be diſtinguiſhed in them. 'Tis alſo of itſelf a pleaſant Dram, and ſerves very notably to make Punch, and the finer compound or cordial Waters. And there are thoſe, who for *Cherry-Brandy*, and the like Drams, by Infuſion, *&c.* prefer it to a true *French* Spirit: ſo that in moſt nice Caſes it ſupplies the Defect of a clean Malt-Spirit; which cannot be commonly procured. Thus *Citron-water*, *Cinnamon-water*, &c. are uſually made with it in *England*; in which Compoſitions, our ordinary rectified Malt-Spirit would taſte very diſagreeable, and ſpoil the whole.

There is another particular Uſe of this Spirit, which none of thoſe that have any high flavour, not *French* Brandy or Arrac, anſwer ſo well: And tho' the thing may ſeem but a trifle, both Pleaſure and Profit have attended the Experiment. 'Tis a Method of making a kind of *extemporaneous Wine*, without Fermentation. The Secret is, to ſlice good ſound Lemmons, and infuſe them, rind and all, for but two or three days, in fine *Melaſſes Spirit*; then to ſtrain out the Liquor,

Liquor, filtre it, and having made a very thin Syrup of the pureſt Sugar, diſſolved in Spring-water, mix them well; and if the Proportions are hit, (which is not difficult to do) it makes a moſt grateful vinous Liquor, not inferior to ſome foreign Wines.

Its Yield. A hundred weight of good rich *Treacle*, may, according as 'tis managed, produce from four to ſeven Gallons of *Alcohol*.

Uſes of the Still-bottoms. The *Still-Bottoms* of Melaſſes are ſucceſsfully uſed to ſcald and recover muſty Caſks; to cleanſe and brighten Braſs-Wire, and ruſty Copper-Ware; and may be applied to many purpoſes where waſhing and ſcouring with *Argol* is proper. Mr. *Boyle's acid Spirit of Wine*, or a Spirit very like it, is alſo hence procurable; ſo likewiſe is a matter analogous to *Becher's Media Subſtantia Vini*. And probably this Liquor may be ſerviceable in dying; for it gives a durable yellow ſtain to the hands, and other animal ſubſtances. The uſe above-mention'd of *Malt-waſh*, holds equally of this; *viz.* that a quantity of it may be advantageouſly added to a new parcel of *Treacle*, deſign'd for fermentation. And whether the *Vinegar-Maker* can find no uſe for it, I leave him to conſider.

History of Sugar-Spirit.

Sugar-Spirit, what, and how prepared. By *Sugar-Spirit* is here underſtood, the Spirit prepared from the Waſhings, Scummings, Droſs, and Waſte of a *Sugar-Baker's* Refining-houſe.

Theſe droſſy, or refuſe parts of *Sugar*, are fermented with Water, in the uſual manner; then diſtil'd into a Spirit, and rectified *per ſe* to vulgar proof. When the Operation is well perform'd, and no foul, or fetid foreign matter has got among the Waſh; this Spirit appears tolerably clean, eſpecially in *England*; but in *Holland*, where

where they alſo prepare it, 'tis uſually very nau- *Its Rectification, and Uſes.*
eous and diſagreeable; tho' capable, by an eaſy Rectification, little known abroad, but familiar with us at home, of being brought into a clean wholeſome Spirit; fit to mix with foreign *Brandies*, and even *Arracs*, in a large proportion, without being much ſubject to diſcovery. But as the *Dutch* leave this Spirit ſo coarſe, they can uſe it for little elſe beſides mixing with *Rum*; and even there 'tis diſcoverable, if ever ſo little overdoſed.

When this *Spirit* is prudently brought into *Alcohol*, it ſeems ſuperior to that of *Treacle*: which affords a very uſeful Hint; the proſecution whereof belongs to another place.

No farther notice need be taken of this Spirit at preſent; becauſe, in other particulars, it coincides with *Melaſſes*, *Malt-Spirit*, and *Rum*; to which we refer.

History of Wine-Spirit.

By *Wine-Spirit* is generally underſtood a *Spirit* produced in *England*, from *Wines* that grew abroad. *Wine-Spirit, what, and how produced.*

The way of producing it, is by common Diſtillation; with no more Rectification, than will bring it to a *Bubble-proof*.

The Yield of Wines is different, according to their Nature; but commonly plays betwixt an eighth and a fourth of Proof-Spirit: that is, they will yield from a ſixteenth to an eighth of their own quantity in Alcohol.

The Wines that are a little prick'd, prove never the worſe for this purpoſe; as giving, in that caſe, a greater Vinoſity to the Produce: which Vinoſity is a very valuable property in a Wine-Spirit; whoſe principal uſe is to mix with another that is tartarized; or a Malt-Spirit,

render'd alkaline by the common Method of Rectification.

Its difference from Brandy. All the *Wine-Spirits* made in *England*, even thoſe from *French* Wines, appearing to differ greatly from the common *French Brandies*, has impreſs'd a ſtrong notion in our people, that there is ſome concealed Art practiſed in *France*, with relation to their Brandies: but this ſuſpicion has no real foundation, as we ſhall manifeſt, when we come to treat of *French Brandies* in particular. In the mean time, let it be obſerv'd, that, by our uſual way of diſtilling *Sicilian Wines*, or *Spaniſh Wines*, we do not produce *Spaniſh* or *Sicilian Brandies*. The true reaſon is, becauſe the Wines exported from abroad, are of a very different nature from the Wines they diſtil for Brandy upon the ſpot; the latter being ſo poor, and thin, as not to ſtand even a few months, or keep from turning eager upon any conſiderable Voyage. But if we had in *England* thoſe poor thin Wines they diſtil for Brandy near *Bourdeaux*, *Cognac*, or up the *Loire*, no queſtion but the *Wine-Spirits* produced from them, would be generally allowed *French-Brandies*, in every reſpect. And in fact, from the thin, prick'd, and damaged *French Wines* receiv'd in *Scotland*, they do, by bare Diſtillation, produce Brandies ſo nearly approaching to thoſe of *France*, as to be allowed for ſuch. *Wine-Spirits* and *Brandies* therefore are the ſame thing; with this difference, that *Wine-Spirit* is the Spirit of a rich Wine, and *Brandy* the Spirit of a poor one: or, at moſt, they differ only as a *Cyder-Spirit* does from a *Crab-Spirit*.

Its Uſes. This *Wine-Spirit* is not eaſy to be bought pure, and unmix'd, at the Diſtillers, nor under a price almoſt equal to that of *French Brandy*. So that if ever it be required, out of the Trade,

it

it might be as well to use *Brandy* in its stead: which will always serve the purpose; unless a high flavour, or a copious essential oil be expected. For, contrary to the nature of other *Spirits*, this is coveted for its oil; as being chiefly intended to cover, conceal, or disguise a fouler Spirit than itself.

Sometimes, however, this *Spirit* is prepared in the way of good husbandry at home, when a parcel of wine happens to be spoil'd; or any quantity of Lees remain at the bottom of a Cask. In which cases the high flavour being not usually required, the Spirit should be drawn off with great gentleness, either *in Balneo Mariæ*, or otherwise; and may afterwards, if there is occasion, be rectified *per se*, or with fresh water, to the desired degree of purity.

Raisin Spirit like it.

Nearly of kin to this *Wine-Spirit*, is that prepared from *Raisins*, fermented only with water: for thus they yield a Spirit hardly distinguishable from some kinds of *Wine-Spirit*; there being as many kinds of *Wine-Spirit*, as there are of Grapes. And the nearer will be the resemblance, the coarser the operation is perform'd; that is, after the usual manner of the Distillers, throwing up as much essential oil as will rise with a galloping heat. And thus in defect of their favourite *Wine-Spirit*, they may easily have one that will cover as much as that. And in the business of covering, 'tis surprizing to what a length this kind of Spirit will go; insomuch that ten Gallons shall sometimes give a determining flavour to a whole piece of ordinary *Malt-Goods:* whence proceeds the great value which is set upon this *Wine-Spirit*, by the Distillers and ordinary *Rectifiers*; whose imperfections it is a good cloak to conceal. We cannot therefore desire this Spirit to be brought to the form

of *Alcohol*; for that would take off from its intended Virtue and Uſe: as, on the contrary, thoſe who employ it only as a Cover, might either keep it in the form of Low-wine, or at leaſt ſkim off the flavouring oil, before the Spirit is rectified to *Proof*. In other reſpects, this Spirit is the ſame as a real *Brandy* *. *Cyder-Spirit* is alſo of the like general nature; and obtain'd in the very ſame method. But as its particular flavour is not ſo deſirable, it may, by care, be render'd very pure, and almoſt inſipid, upon rectification; and in this ſtate, it might advantageouſly be uſed in mixing with other Spirits, or imitating the fineſt Brandies of *France*.

Uſes of the Still-bottoms.

The *Still-bottoms* of Wines may be brought to afford Mr. *Boyle*'s *acid Spirit of Wine*, *Becher*'s *media Subſtantia vini*, a parcel of Tartar to great perfection; and at laſt the Remainder may be turned into genuine *Salt of Tartar*. This Liquor might otherwiſe be ſerviceable in the making of Vinegar and white Lead.

History of Brandies.

Brandies, what.

Brandies, in the ſtrict ſenſe of the word, are nothing more than *Proof Spirits*, obtained by ſimple Diſtillation from real *Wines*, or the fermented Juice of Grapes.

In the general ſenſe, they include all kinds of ſpirits conſidered in a State of *Proof*; or as conſiſting of an equal weight of Water and Alcohol.

The French.

The Brandies of *France* being in the higheſt repute, we ſhall confine ourſelves principally to the conſideration of theſe.

The *French Brandies* moſt generally eſteemed are produced up the *Loire*, or near *Cognac*, *Nants*, and *Rochelle*. Next to theſe, are the *Bourdeaux*, or *entre*

* See Pag. 131.

entre deux Meres Brandies; those of *Languedoc*, and the Islands of *St. Martin*, *Oleron*, &c.

According to the different Species and Growth of the Grapes, the Brandies always differ; whence there are various kinds of *French Spirits*, having particular flavours; by which the *Conoisseurs* readily distinguish one sort from another: though the vulgar call them all by the name of *French Brandy* indiscriminately. But an ordinary judgment may easily distinguish *Languedoc* Brandy from that of the Isles; or *Bourdeaux* from *Cognac*. Nor would there be so great a similarity between the several species of *French* Brandies as there is, but that only the weakest and lowest-flavour'd Wines are distill'd for their Spirit; or such as prove absolutely unfit for any other use. But, when, out of curiosity or good husbandry, they distil the bottoms, or refuse parcels of the grosser-bodied and fuller-tasted Wines; the *Brandy* got from them, is what we in *England* emphatically call a *Wine Spirit* *. *Their difference.*

Every kind of Grape therefore, as it affords a Wine, so does it also a Brandy of its own peculiar flavour: which is an observation that should be well attended to when any parcel of *French Brandy* is proposed to be imitated; for 'tis ridiculous to expect *Cognac* Brandy should be perfectly resembled with a Quintessence made from *Bourdeaux Grapes*; though the Spirit, or subject matter of the operation, were previously rendered ever so pure or tasteless.

A large quantity of Brandies is made in *France* during the time of the Vintage; for all those poor Grapes that prove unfit for Wine, are usually first gathered, pressed, and their juice fermented, and directly distill'd. This rids their hands of their *Whence the large quantities of Brandy in France.*

* See pag. 127. &c.

poor Wines at once; and leaves their Casks empty for the reception of better. 'Tis a Rule with them to diſtil no *Wines* that will fetch any manner of price as *Wines*; for in this ſtate the profits upon them is vaſtly greater than when reduced to Brandies. This large ſtock of ſmall Wines, wherewith they are almoſt over-run in *France*, ſhews the reaſon of their making ſuch vaſt quantities of Brandy, more than other Countries, which lie warmer and better for Grapes.

But this is not the only Fund of their Brandies; for all the Wine that pricks, or turns eager upon their hands, is alſo condemn'd to the Still; and, in ſhort, all that they can neither export nor conſume at home: which amounts to a large quantity; ſince much of the Wine laid in for their family proviſion, is ſo poor as not to keep the ſpending.

How made. Their general method of diſtilling *Brandies* in *France* needs no formal deſcription; as not differing from that vulgarly practiſed among ourſelves in working from Waſh or Wines: nor are they one jot more cleanly or exact in the operation. They only obſerve more particularly, to throw a little of the natural *Lee* into the Still, along with the Wine; as finding this gives their Spirit the flavour, for which it is generally admired abroad; though not at all by themſelves at home: who have a moſt contemptible opinion of Brandy in general; but eſpecially the high-flavour'd kinds. So, that as the diſtillation of this commodity is uſually left to the meaneſt and moſt ſervile hands amongſt them; the Spirit itſelf is very little uſed by any other ſort of people throughout the kingdom.

Their notion of Proof ſquares with ours to a tittle, and they ſtand upon it to a *Punctilio*; as if the

the whole excellence of the Brandy lay there. And in this form of ſtrong bubble-proof all their fine Spirits are conſtantly found.

But they have one particular expedient for ſuch Brandies as prove foul, ſeedy, or retain the taſte of certain weeds apt to grow among the Vines; *viz.* to draw them over again, with a deſign to cleanſe them of that adventitious flavour. In which operation they leave out the *Faints*, or rather change the Receiver as ſoon as ever the ſtream comes proof; then mixing together all that run off before, they call it by the name of *Trois-cinque*; that is, Brandy conſiſting of five parts Alcohol, and three of Phlegm.

Higher than this the *Bruleurs*, or common Diſtillers, in *France* ſeldom bring their Brandies; that refined nation having the addreſs to perſuade the foreign Merchant that the phlegm of *French* Brandy is a natural part, as eſſential to it as the Body to the Soul. The truth is, if people were ſo diſpoſed, they might eaſily reduce *French Brandies*, or the Brandies of any other Nations, to half their uſual bulk, without impairing their virtues: For if the eſſential oil of the wine be the thing required, this is much better preſerved in Alcohol than in *Proof Spirit.* But whether the charge of bringing Brandies into *Alcohol*, would exceed that of a double freight, and double ſtowage, is the Merchant's buſineſs to conſider; or whether it be not proportionably as advantageous to import *Low-wines* as *Brandies*; which, with reſpect to *Alcohol*, are nothing but a ſtronger *Low-wine.*

They uſe no manner of Art to colour their Brandies, nor to give them any additional flavour; the thing they principally value themſelves upon, both in Wines and Brandies, being to

make them *perfectly natural*; ſo that all the colour of their Brandies is acquired from the Caſk, and the length of time they uſually lie therein; which is ſometimes twelve or eighteen months, and often two or three years: during which, 'tis no wonder if they acquire a yellow or browniſh caſt. Their lying thus long, as it were in a ſtate of ſlow digeſtion, wonderfully takes off from that hot, acrid, and foul taſte, peculiar to all *Spirits* or *Brandies* newly diſtill'd; and gives them a coolneſs and a ſoftneſs not eaſily to be introduced by art, without great care being had in the firſt operation. But theſe fine and grateful Brandies, as they prove after having lain thus long, were at firſt hot, acrid, foul and fiery. This fine colour, and an agreeable ſoftneſs or coolneſs in the mouth, going along with *French* Brandies of a good natural flavour, are the things that principally recommend them to the judicious purchaſer.

Ways of examining the goodneſs of Brandies.

And upon theſe properties are founded ſeveral methods of trying their goodneſs, or diſcovering whether they are debaſed or adulterated by the admixture of coarſer Spirits. But there is little danger of any ſuch practice in *France*, as they have no cheaper Spirits to debaſe or adulterate their *Brandies* withal; eſpecially ſince the prohibition of *Melaſſes Spirit* in that Country. And the ſame reaſon, in good meaſure, holds in favour of the *Dutch*; who, tho' generally ſuſpected as great Adulterators, yet in this caſe ſeem but little qualified for it; as having no *Treacle Spirit*, nor a good *Spirit of Sugar*, current among them. And as for their common *Malt-Spirit*, they ſeem to have no hopes of rectifying it; as being ſo intolerably fetid and nauſeous, that almoſt a ſingle Gallon would taſte thro' a whole Piece

of

of Brandy. All therefore that the *Dutch* seem fitted to do in this case, is to mix Brandies with *Wine-Spirits*, or the Spirit drawn from *Wine Lees*, which they have in very great plenty. But even this cannot be very gainful, considering how cheap the Brandies are in *Holland*; for paying no duty, they come almost as cheap there as in *France* itself. The temptation to adulterate *French Brandies* is much greater in *England*, where the Duties upon them are high; tho' they are also very much adulterated up and down the *Continent*, and all considerable trading Towns and Sea-Ports. In *England*, as has been above observed, they use all kinds of Spirits to mix with them; *Malt*, *Melasses*, *Cyder*, *Sugar-Spirit*, &c. and often do it so dextrously, or so sparingly, as vulgarly to pass undiscovered. The same arts are likewise practised in many other Countries; but certain Brokers, Factors, and Under-Merchants, who deal largely in Brandies, are said to have a particular Liquor, which being added to a Glass of any suspected Brandy, will shew by the colour it makes therewith, whether, and in what proportion the whole parcel is mix'd with a *Corn-Spirit*. But such proof is erroneous, and not to be trusted. The fact is this. If a few drops of a *certain vitriolic Solution* be let fall into a Glass of old *French Brandy*, it will, if the vitriolic Solution were rightly prepared, turn the Brandy of a fine purple, or deep violet colour: by the strength or diluteness of which colour, they judge the *Brandy* to be either pure, or mix'd with a Malt Spirit proportionably. The foundation of the thing lies here. Old *French* Brandy, by having long lain in an oaken Cask, thus really becomes a dilute *Tincture of Oak*; which upon the addition of the vitriolic Solution, necessarily

turns of a blue colour; after the manner that *Ink* is made of a Tincture of Galls and Vitriol. But if the *Brandy* be perfectly pale, or very lately distill'd, it will not thus change its Colour, upon the addition of the Solution; tho' the Brandy were totally *French*. And in the same manner a light Tincture of Oak, extracted with Malt-Spirit, or any other Spirit; will, upon affusion of the same Solution, exhibit the same appearance. Hence this kind of proof is nothing more than a way of determining how rich a Tincture of Oak any common Spirit or Brandy is. *Calcin'd Vitriol of Iron*, lightly infused in a certain dilute, or *aqueous mineral acid*, gives this *Solution* to great perfection; being, when well made, of a fine yellow colour, and capable of giving, for a season, the finest blue to a spirituous Tincture of Oak. And here, it may not be amiss to mention, that the Experiments I formerly made of this kind, led me at the first sight of Dr. *Eaton*'s *Styptic*, to conjecture the manner of its preparation; which, upon a second attempt, I hit to great exactness. I should not mention so small a matter, if the discovery of that famed Styptic had not been somewhat unsuccessfully attempted by others; so far, I mean, as concerns the appearance and Phænomena, tho' not, perhaps, the virtues of it. The whole secret is this. To a parcel of old *French Brandy* add a very minute proportion of *calcin'd green Vitriol*; and thus there will presently be made a dilute Ink; which very slowly deposites a black or dusky cloud, that afterwards rests at the bottom of the Glass, and causes the liquor to exhibit all the phænomena, and answer the ends of Dr. *Eaton*'s *Styptic*.

To proceed, 'tis manifest that *French Brandies* naturally receive their colour from the Cask. The discovery of which particular, might probably

bly be the reaſon why high-colour'd Brandies have of late years ſunk in the eſteem of many, ſo as to occaſion pale ones to be much order'd; and for a while, nothing would go down but pale Brandies. Hence, both in *France* and *Holland*, they fell to work upon rediſtilling their old Brandies, to make them of a water whiteneſs. And to ſuch a length this humour run, and the difference in price between pale and brown Brandies grew ſo conſiderable, that much profit was made in *Holland*, barely by the rediſtillation of Brandies, to render them colourleſs. This alſo made very well for *France*; who had much rather diſpoſe of her new *colourleſs Brandies*, for an advanced price, than for a lower, after having kept them in a waſting ſtate, to colour them, many months in the Caſk: which colour, where not artificially introduced, is a ſure ſign of age, that is, excellence on the ſide of Brandy.

The vulgar method of examining Brandies by the *Bead-proof*, may be of good ſervice, in procuring ſuch as will beſt ſerve to mix with, and conceal an ordinary Spirit; as this proof, when ſtrong, ſhews they contain a good deal of the eſſential oil of the grape, which gives an agreeable flavour. But when intended for other curious or chemical uſes, as much labour is often employ'd to get out this fine-taſted eſſential oil in *France*, as the more curious chemiſts employ to get the fetid oil out of Malt Spirit in *England*: and indeed there are many operations where the nidorous odour of either Spirit would be very unſuitable; nor is it often proper to uſe a menſtruum to act upon one body, whilſt it is already ſaturated with another. But no judgment can by this kind of proof be formed of Brandies, as to their mix'd or adulterated ſtate.

The

The ſureſt way for this purpoſe, is, to acquire the habit of judging from uſe and practice. The taſte and ſmell, are, by proper Methods, ſo far improveable in this particular, as not to be eaſily impoſed upon. Care indeed muſt be had, not to taſte Brandies in too high a ſtate; for this ſcorches the mouth, and confounds the judgment. Nor ſhould many ſorts be taſted ſoon after one another: for thus a mixture of taſtes will be made; the taſte of the preceding being not yet gone off the tongue.

How to be imitated, and cleanſed. The beſt Method is to dilute *Brandies* well with Water, in order to their being ſmelt, and taſted; or rather, as was mention'd above, to burn away all their inflammable Spirit, and afterwards examine the Phlegm.

From this Hiſtory of *French Brandies*, compared with the foregoing doctrine of ſimple Diſtillation, and Rectification; it will appear, that many of our *Engliſh* Spirits are convertible into *Brandies*, that ſhall hardly be diſtinguiſhed from the foreign, in any reſpect; provided the Operation be neatly perform'd. And, in particular, how far a *Cyder-Spirit*, and a *Crab-Spirit* may, even from the firſt extraction, be made to reſemble the fine, and thin Brandies of *France* we would recommend to the practice of thoſe Diſtillers, who have any ſkill, and curioſity this way.

To the ſame curious perſons we would alſo recommend the Diſcovery of that *Deſideratum*, in the buſineſs of rectifying *French Brandies*, which the Diſtillers in *France* and *Holland* ſcarce know how to attempt; tho' it would be a profitable buſineſs in either Country. By this Rectification is meant, the *Method of clearing Brandies from a certain ſeedy Taſte*, with which they are frequently impregnated; and, upon which account, they cannot find purchaſers, but upon diſadvantageous

terms. Thus sometimes a Cask of *French* Brandy shall resemble *Aniseed*, or *Caraway* Water, rather than *Brandy*; so that the Proprietor, to get it off, is reduced to the necessity of mixing it among other Brandies; in such small proportions, as may render it undiscoverable: whereas, could he but clear it of this flavour, he might readily be re-imbursed, with a handsome profit.

The foundation for this kind of *Rectification*, is so fully laid in several parts of the present *Essay*, that our *English Distillers*, 'tis hoped, may, from thence, be enabled to effect the thing.

'Tis a mistake to imagine, that all the Brandies made in *France* are so good, and fine, as we usually taste them upon our Keys at *London*. No; there are many hundreds of pieces made every year, almost as disagreeable, and nauseous, as our *Malt-Spirit*. But the case is, they send the *best Brandies*, as they do the *best Wines*, to *England*; where they get the best prices for them. But in *Holland*, the Mart for Goods of all sorts, you shall sometimes not be able to pick a good piece of *French* Brandy out of fifty: the general run of them being either feedy, oily, musty, or otherwise infected with some unnatural and disagreeable flavour. And these are the sorts, which, in *France*, they despair of curing by re-distillation, or bringing towards the state of Alcohol, or to what they call *three fifths*.

These cases require a better Method of Rectification, than our common one, by fix'd Alkalies: but if due care, and skill were employ'd from the first *gathering* of the Grapes, to the making up of the Brandies; not only such inconveniences might be prevented, but the Brandies of *France* might, in general, be render'd much finer.

Some prefer *Rhenish Brandy*, to that of *France*; and particularly in *Holland*, it sells for double the price.

price. 'Tis indeed a very fine *Spirit*; but the *Engliſh* know little of it farther, than that a daſh thereof ſerves to fill up a Caſk of *French*.

The *Spaniſh* Brandies are much coarſer than the *French*; tho' ſometimes made to paſs for them in *Holland*, and other places of great Traffic.

The *Still-Bottoms* of *French* Brandy are uſeful to all the purpoſes above-mentioned of the Still-Bottoms of *Wine-Spirit* *.

History of Rum.

Rum, what. *Rum* is a Spirit procured from the fermented ſcummings, waſte, and refuſe matters of a primary *Sugar-Houſe*; that immediately works the Sugar from the Cane.

Rum therefore differs from a *Sugar-Spirit*, as containing more of the natural flavour, or eſſential oil of the Sugar-Cane; a deal of the raw juice, and parts of the *Cane* itſelf, being often fermented in the Liquor, or Solution, whereof the *Rum* is prepared.

The unctuous flavour of *Rum*, is often ſuppoſed to proceed from the large quantity of fat uſed in boiling the Sugar: which fat indeed, if coarſe, will commonly give a diſagreeable, nidorous, or oily flavour to a Spirit; as I have found by experience: But *Rum* has its ſpecific and natural flavour from the *Cane*.

How made. When a ſufficient ſtock of theſe refuſe Materials is procured, they are fermented in the common method; tho' always ſlowly at the beginning of the ſeaſon of making *Rum* in the *Iſlands*, for want of *Yeaſt*, or other *fermenting Matter*, to ſet the Liquor at work. But, by degrees, they procure a ſufficient quantity of the *Ferment*, which ſpontaneouſly riſes as a head in the operation; and

* See pag. 127, &c.

and thus they come in a little time to ferment and produce their *Rum* with great expedition.

When the *Waſh* is fully fermented, or to a due degree of Acidity; the Diſtillation is carried on in the common way, and the Spirit made up Proof: tho' ſometimes advanced nearer to *Alcohol*, or the ſtate of double Proof; in which caſe they call it *double diſtill'd Rum.*

It may be otherwiſe rectified to advantage; as *Rectified, &c.* 'tis commonly firſt drawn, with a full doſe of high-flavour'd oil in it, which requires to lie, or digeſt for a long time in the Spirit, before the whole becomes ſoft, and fit for uſe: whereas, were it to be well rectified, it would grow mellow much ſooner, and have a much leſs potent flavour, which ſometimes renders it diſagreeable.

The beſt ſtate to keep it in, both for Exportation and otherwiſe, is, doubtleſs, that of *Alcohol*; unleſs when the groſs oil is required in it, for the ſake of mixing and covering. And by duly throwing out its Oil, it may be brought nearly to the flavour of a fine *Sugar-Spirit*, or *Arrac*: as a very ſmall proportion of it, uſed in its natural ſtate, to a fine taſteleſs Spirit, will give it a flavour bordering very near upon that admired in *Arrac*.

This *Spirit* is uſually very much adulterated in *England*, with one or other of the cheaper ſorts; even a rectified Malt-Spirit, if uſed in moderation, much leſs a Melaſſes, or Sugar-Spirit, being not eaſily diſtinguiſhable therein.

The ways of trying its goodneſs, are the ſame *How aſſay'd.* with thoſe already mentioned, for the examination of other Spirits. In this, and moſt other reſpects, it ought to be conſidered as a *Brandy* of a particular ſpecies: So that what is delivered in the foregoing Section of *Brandies*, will be alſo appli-

applicable to *Rums*. For tho' the *Sugar-Cane* differs from the *Vine*; yet the ſweet ſaccharine ſubſtance, whereto both the Juice of Grapes, and the Juice of the Sugar-Cane are, by the ſame Art, reducible, fits them to afford Wines, and Brandies, that ſhall not be readily found to differ. Which is a pregnant Hint, that may be farther proſecuted in due time.

History of Arracs.

Arrac what. *Arracs*, properly ſo called, are Spirits produced from the fermented Juice of certain Trees, growing in the *Eaſt-Indies*.

Various contradictory accounts have been handed about, as to the real ſubject that gives origin to this fine ſpirituous Liquor: the vulgar ſuppoſing it to be *Rice*, others the Juice of the *Eaſtern* Sugar-Cane; others a mixture of this and the Juice of the *Toddy-Tree:* and others again take it for an artificial Preparation of the Fleſh of Animals, and more coſtly Ingredients.

But, beyond diſpute, the finer *Arracs* are made of the Juice of the *Cocoa-Tree*, or the *Palm-Tree:* tho' other trees alſo may afford Juices fit for the ſame purpoſe, or the making of *Arrac* particular: which is a general and familiar name in the *Eaſt* for all kinds of *Brandies*; as the word Spirit is with us.

How made. The Proceſs of making *Arrac*, as I received it from more than one curious perſon, who had ſeen the whole work, is as follows.

The manner of collecting the vegetable Juice for it in the *Eaſt*, differs from our common way of tapping Trees in *England*. It ſeems the Operator, being provided of a ſufficient ſtock of ſmall Earthen Pots, with Bellies, and Necks, like our ordinary Bird-Bottles; he faſtens a parcel of them

them to his Girdle, or otherwiſe commodiouſly about him; and thus equipp'd, ſwarms directly up the tall trunk of the *Cocoa-Tree:* when coming at the Boughs, he with a knife cuts off certain little Buds, or Buttons, and immediately applies a Bottle to the wound. And having thus applied, and dextrouſly ſupported his whole number of Bottles, as ſo many Receivers, for the Liquor to diſtil into, he deſcends. This is uſually done in the *Evening*; the Tree bleeding more freely in the night. Next Morning the Operator takes off his Receivers, and empties them into a proper Receptacle; where, of itſelf, the Liquor ſpontaneouſly ferments. When the fermentation is over, the weak Waſh, now grown a little tart or acid, is put into the Still, and drawn down to a *Low-Wine:* which is ſo very dilute and poor a Liquor, as ſoon to corrupt and ſpoil by keeping. For which reaſon, to make it ſtronger, they rectify it in another Still, to that very weak kind of *Proof-Spirit* we commonly find it; which, notwithſtanding its being Proof, ſometimes holds but a ſixth, and ſometimes but an eighth of Alcohol: all the reſt being a poor Phlegm, or acidulated Water, valuable only for having been brought from *Goa*, or *Batavia*.

Whence its Proof.

How this Spirit ſhould come to appear Bubble-Proof, and yet be really ſo far below what we commonly mean by Proof, might appear ſtrange, if we had not already inquired into the nature of this kind of *Proof*; and ſhewn it, owing to a certain tenacity of the parts of the Liquor, or to the particular property of the Oil held diſſolved in the Spirit. To this we may add, that the finer and more ſubtile any Oil is, the leſs it refuſes to mix with an aqueous *Menſtruum*; inſomuch, that we ſee the eſſential Oil of ſome vegetables,

getables, at leaſt a certain portion thereof, is ſo fine, and ſubtile, as to mix, without turning milky, even in pure Water itſelf: which is the caſe in many diſtill'd Simple Waters. Hence 'tis no wonder, that ſo ſubtile an Oil, as muſt naturally be contain'd in ſo thin and dilute a vegetable Juice as that which affords *Arrac*, ſhould diſpoſe it to mix with a Water animated by a ſixth or eighth part of perfect *Alcohol*.

Sometimes there come into *England*, and very commonly into *Holland*, *Arracs* of the common *Brandy-Proof*; and ſometimes above it: the frugality of the *Dutch* having taught them to ſpare ſome of the freight of ſo uſeleſs a part, as the Phlegm of Arrac is. But why they do not go ſtill farther, and bring it over in the form of *Alcohol*, is their buſineſs to conſider.

Its different ſorts. Beſides the common ſorts of *Goa* and *Batavia Arracs*, there are two others leſs generally known; *viz.* the *bitter* and the *black*. The *bitter Arrac* is ſuppoſed to have been impregnated with ſome rich *Bezoar*; as that of the *Porcupine*, *Cercopithecus*, &c. taken out of the Gall-Bladders of ſuch Creatures. Theſe ſtones will indeed communicate a bitterneſs, and are ſometimes uſed in the *Eaſt*, to give that flavour to Punch: but others ſuppoſe the bitterneſs of *Arrac* not owing to any thing adventitious, but entirely to the nature of the *Juice*, that afforded the Spirit; as ſuppoſe the *Cachou-Tree*, or that which yields the bitter Juice, abuſively called *Terra Japonica*.

The black *Arrac* is a very coarſe Spirit, and uſually drawn higher than the finer ſorts; being not drank like them, but employ'd for coarſe and ordinary purpoſes. And of kin to this black ſort, ſeems to be the *Turkiſh Arrac*, or *Rackee*, as 'tis called.

Arrac,

Arrac, as it comes from abroad, is often apt to grow foul, and black, especially if the *Leager* or *Cask* be any way decay'd; or the Liquor comes to touch any Nails, rusty Iron, or the like; which it presently dissolves, and thence, upon account of the Oak, turns inky. To whiten and clarify such foul *Arrac*, 'tis usual to put a large quantity of new, or skimm'd Milk, into the Cask; and work it about therein, as the Vintners do, in order to whiten their brown Wines. And when the bottoms are large, they commit them to a Conical Filter, of Flannel, whence the Liquor comes away fine. *How clarified.*

This Art of purifying Arracs with Milk, were tolerable, if they did not, at the same time, lower them with Water also; which is sometimes done, to a shameful degree: tho' the weakness of some genuine *Arracs* greatly contributes to countenance such an abuse. This, however, seems the principal debasement practised upon *Arracs*, among reputable Dealers; who are scarce ever furnish'd with another Spirit, tasteless enough to mix with *Arrac*, so as not to be discover'd by the chief Consummers of so dear a Commodity. And in *Holland*, 'tis usually sold so cheap, as not to be worth adulterating; tho' they had a proper Spirit for the purpose. *Adulterated.*

The extraordinary Price which *Arrac* bears in *England*, has caused many attempts among the Distillers to imitate it; but generally without success: as they have commonly hoped to do it, for cheapness, with their own fulsome rectified *Malt-Spirit*. *Imitated.*

There are indeed some certain ways of doing it to perfection; but whoever would succeed, must either know the method of making a tasteless Spirit; the Art of collecting and working some sweet, tho' otherwise tasteless Juices of Ve-

getables; or elſe a certain Method of treating a peculiar, dry, pulverable Body, that is readily ſoluble in Water. This laſt Method is attended with the leaſt difficulty, and greateſt profit. But, however it may go with this particular; 'tis ſtrange methinks we ſhould no where meet with *Engliſh Arracs:* ſince we are furniſhed with ſo many Trees, capable of ſupplying them, as well as the *Eaſt*; particularly the *Birch*, the *Sycamore*, and the like.

SECT. VI.

Of the Reduction of Spirits *to their* greateſt Simplicity; *and turning one* Simple Spirit *into another.*

All Spirits reducible to perfect Alcohol.

HAVING ſeen, in the preceding Sections, how all ſimple Spirits are originally produced, rectified, and fitted for the common purpoſes of life; we come at length to conſider, how they may be fitted for ſome uncommon, or more curious uſes.

It has been ſhewn, that *ſimple Spirits* conſiſt of four different parts; *viz. Water*, *Oil*, *Phlegm*, and *Alcohol:* the laſt of which is the eſſential part, or what denominates, and really conſtitutes the whole a Spirit. In reducing *Spirits* therefore to their utmoſt degree of ſimplicity, 'tis evident, that the three ſuperfluous parts are to be got rid of, and the *Alcohol* left alone. By which means we ſhall procure a Liquor *ſui generis*; or of many particular qualities, not to be found in any other Fluid. Among others, it has theſe remarkable

pro-

properties. (1.) When abſolutely purified, 'tis an *uniform* and *homogeneous Liquor*; capable of no farther Separation, without loſs or deſtruction to ſome of its homogeneous parts. (2.) 'Tis *totally inflammable*, or burns away in a Veſſel floating on cold Water; without affording any Soot, or leaving the leaſt Moiſture behind it. (3.) It has no ſpecific or diſtinguiſhable Taſte, Odour, or Flavour, any more than pure Water; except what is owing to its Nature as *Alcohol*, or perfectly pure Spirit. (4.) 'Tis an *unctuous*, yet *criſpy Fluid*; being not only totally inflammable, but running veiny upon Diſtillation; whilſt the Drops of it, falling into the Receiver, roll upon the Surface of the other Liquor, like *Peas* upon a Table, before they unite. (5.) It appears to be the eſſential Oil of the Concrete, broke fine, and intimately and ſtrongly mixed with an aqueous Fluid, which is aſſimilated or changed in its nature by the Operation. (6.) And, laſtly, it ſeems to be an univerſal kind of Fluid; or producible with the ſame properties from every vegetable Subject. But thus to produce it, requires care and exactneſs in the Operation.

This ſhews us the Foundation of a Method, for reducing all ſimple Spirits to a perfect Similarity or Sameneſs; to which when they are once brought, 'tis no difficult matter to impregnate them with eſſential *Oils*; and thus turn *Malt-Spirit* into *French Brandy*; or if you pleaſe, *French Brandy* into *Malt-Spirit*; *Arrac* into *Rum*, and *Rum* into *Arrac*, *&c.* *And thence eaſily to any kinds of Brandies, &c.*

The more practicable Methods of reducing *Alcohol* to this degree of Purity, have been touch'd upon above; but no very facile and cheap Method of doing it to the utmoſt perfection, is known at preſent. Thoſe who have any Curioſity this way, may try the thing by long Di- *The Methods of making a pure Alcohol.*

geſtion; or repeated Diſtillation from Water into Water; where the eſſential Oil will at once be left upon two Surfaces, and the Acid be imbibed. The ſhorter ways are thoſe by Rectification upon neutral, abſorbent Salts and Earths, as Sugar, Chalk, *&c.* And, laſtly, by the uſe of *fix'd Alkalies*; which indeed greatly keep down both *Phlegm* and *Oil*: inſomuch that this laſt Method ſeems the ſhorteſt, if the Art were known of utterly aboliſhing the alkaline Flavour, which the Alcohol acquires in the Operation; and which, for the preſent purpoſe, is not ſuitable, as abſolutely deſtroying all Vinoſity; that univerſally conſiſts in a fine volatile pungent Acidity: tho' this Vinoſity may be recovered, after having been thus deſtroy'd; as we have ſhewn above *.

The difficulties, however, uſually met with in procuring a perfect *Alcohol*, either with or without fix'd Alkalies, are eſteemed ſo great, that our Diſtillers ſcarce think it worth their while to attempt the thing, in any manner. They are all of them for the ſhort, the facile, and the cheap ways of working; and laugh at the ſlow chemical Methods by Sand-heats, Water-baths, and Glaſſes. But how contemptibly ſoever they may judge of this matter, there are thoſe who can work *Spirits* to as much profit in this ſlow chemical way, as they in their haſty one. And till the Diſtillers can let go their hurry and fondneſs for diſpatch, they ought not to expect any great ſucceſs in the buſineſs of *Rectification*, and clean working.

Hints for procuring a taſteleſs Spirit.

There is another Method of procuring a *Taſteleſs Spirit*, almoſt at the firſt Operation; which, complying with the Temper of the Diſtillers, would fit them admirably, if they could make it

* See Pag. 117, *&c.*

it come cheap enough. There is in *England* an immenſe quantity of a cheap vegetable Subſtance, eaſily procurable, and eaſily fermentable into a *Waſh*, that yields, by common Diſtillation, a Spirit almoſt taſteleſs; which may, with great eaſe, be made the perfect *Alcohol* we ſpeak of. But for the common purpoſes of Diſtillers, it need not be drawn ſo high; as having, in the form of common Proof-Spirit, ſuch a degree of true vinoſity, yet neutrality in Taſte and Odour, as renders it fit to mix in an equal, or a much greater proportion, with the fineſt foreign Brandies or Arracs. That the Diſtillers in their re-ſearches after all gainful Improvements in their Art, have hitherto miſſed, or over-look'd this *vegetable Subject*, is ſurprizing; becauſe it can only be conceal'd from them by lying too much expoſed. The only difficulty with them will be, when they have found the Subject, to make it yield Spirit enough; which they may do by a tolerable knowledge in the Nature and Buſineſs of *Fermentation*. Such a Spirit as this ſeems to be the grand *Deſideratum* in the Art of Diſtillation: and is capable of performing all that can be expected from a Spirit; not only in the vulgar way of Diſtillers, but alſo in the ways of Chemiſtry, Pharmacy and Medicine. Such a Spirit is much more valuable and uſeful than any other poſſeſs'd of a ſtrong Flavour. Whence all the finer Cordials, and the compound Waters of the Apothecary, ſhould be made with it: ſo likewiſe ſhould all the curious chemical Preparations that require an untartariz'd *ſpirituous Menſtruum*. Several fine Waters, Eſſences and Tinctures, might alſo be extemporaneouſly prepared with it; by the admixture of the eſſential Oils of Vegetables, *&c.* And thus *French Brandy*, and other foreign Spi-

And turning it into Brandies of all kinds.

rits, might be readily imitated to perfection, if the eſſential Oils of their reſpective Wines were at hand. Another particular uſe of it would be, to raiſe fine thin Wines to any degree of ſtrength, without communicating the leaſt ill flavour; or any thing like a Brandy taſte.

This vegetable Subject has ſtill a farther advantage; for being flavourleſs of itſelf, it alters not the Scent and Taſte of any Ingredient that ſhall be fermented with it: And beſides, is admirably fitted to ferment along with Ingredients. Whence it affords a moſt excellent opportunity of introducing any number of new *ſpirituous Liquors*, of whatever Taſte, Odour and Virtue the Operator pleaſes. And this might give riſe to a finer, pleaſanter, and more efficacious *Set of Brandies*, compound Spirits and Waters, than the World is hitherto acquainted with: the ſtrength and flavour whereof ſhall be entirely at the direction of the Artiſt, and made ſuitable to every Palate.

Again, by checking this Operation in the middle, or any other ſuitable time, a kind of *natural Quinteſſences* may thus be very commodiouſly obtained, that ſhall far excel the artificial; and readily unite with fair Water, ſo as to form an extemporaneous Cordial, of any virtue required. And thus, for inſtance, the natural Quinteſſence of *Cinnamon*, *Nutmeg*, and all the *aromatic Vegetables*, either alone, or in compoſition, might be commodiouſly procured, and render'd portable, and fit for the Pocket; as a highly concentrated Cordial: which may at any time be let down with Water, to a proper degree of ſtrength. And this Hint, as not incapable of many uſeful Improvements, is more particularly recommended to the Conſideration of Phyſicians and Apothecaries.

SECT.

SECT. VII.

Of COMPOUND DISTILLATION, *with particular regard to the* Apothecary.

BY *Compound Diſtillation*, is meant that wherein the addition of certain Ingredients gives the Spirit ſome new Properties, Virtues and Uſes; different from thoſe of a *ſimple Spirit*. Thus the *Cordial Waters* of the *Diſtillers*, and the *Compound Waters* of the *Apothecary*, are Productions of this Operation. *Compound Diſtillation, what.*

The *Apothecaries* have long been ſubject to the ridicule of *Diſtillers*, on account of their inelegant way of making compound Waters; and at preſent ſeem to yield the Diſtillers maſters of the Art, without venturing farther to diſpute the point. But as *Apothecaries* are all expected to be chemical Operators, I don't ſee how they can ſubmit to be out-done in a chemical Branch of their Buſineſs; eſpecially, how they can acknowledge the Diſtillers to make better *compound Waters* than themſelves; yet conſtantly ſupply their Patients with thoſe of their own making.

The Diſtillers uſually think themſelves ſo perfect in this Art, as to need no farther Inſtruction; but they will not, 'tis hoped, be unwilling that a little aſſiſtance ſhould be given the *Apothecary*, in a point that concerns the Health of his Patients.

In all *Compound Diſtillation*, 'tis a principal *Rule*, that the Spirit employ'd be well rectified, *Rules and Cautions belonging to it.*

cleanſed, and render'd nearly inſipid; eſpecially if a *Malt-Spirit* be choſe: otherwiſe the Oil of the *Spirit* will prevent its being well impregnated with the virtues of the Ingredients, and alſo be apt to taſte through them all. And for this reaſon, as well as others, the Spirit ſhould be brought into the form of *Alcohol*. At leaſt, if a clean proof-leſs *Malt-Spirit* cannot be procured; let a fine *Melaſſes Spirit*, which tho' Proof, ſhews thin and attenuated, be uſed without any farther addition of Water in the Still. An additional quantity of Water only takes up room to bad purpoſe, and not only prolongs, but prejudices the Operation. And when *Alcohol* is employ'd, let it only be mix'd with an equal quantity of fair Water.

In the next place, due *regard* muſt be had to the buſineſs of *Digeſtion*; without which the virtues of ſome Ingredients will not riſe in Diſtillation. Thus, without good *maceration*, the ponderous *Oil of the Cinnamon*, is not very ready to riſe with the *Spirit*: whence the virtue of it ſometimes remains in the Still; and requires to be fetched out by cohobation. The Apothecaries, to avoid this trouble, or for other reaſons, are uſually content to have their *ſtrong Cinnamon Water* poor, that their *ſmall Cinnamon Water* may be rich. But this is perverting the Deſign of the Phyſician; who expects both to be made in perfection, and *ſecundum artem*.

When the Ingredients, according to their reſpective natures, have ſtood a due time in *Digeſtion*, the Spirit is to be drawn from them in the manner that beſt tends to bring over the virtues, whereon the character and expectation of the Water are founded. So if the Ingredients naturally abound in a heavy, viſcous Oil; the Operation ſhould be performed with a briſker

Fire,

Fire, than when the Oil is thin, light, and ethereal. Thus ſtrong Cinnamon-water, after ſufficient digeſtion to looſen the Oil, might be drawn over ſmarter than *Citron-water*, the *Spirit of Mint*, or the like; where the eſſential Oil aſcends much eaſier along with the Spirit.

The capital Thing of the whole reſts here, that a *due proportion of the finer eſſential Oil of the Ingredients be received into, and embodied with the Spirit*; whilſt the groſſer, leſs ſubtile, and leſs agreeable Oil is kept out. To effect this fully, requires, (1.) That the operation be well regulated from the firſt; (2.) That the Receiver be changed in due time; and, (3.) That the Spirit be prudently made up. When no regard is had to theſe ſeveral particulars, as it rarely ſeems to be among the Apothecaries; the conſequence is the production of a milky, thick, turbid Liquor, that taſtes more like what the Diſtillers call *Faints* than a *Cordial Water*; and indeed, ſeems more fitted to give ſickneſs, than to cure it. At leaſt, before it can be uſed, it muſt either ſtand a long time to fine of itſelf, if ever it will fine; or have its groſs, unctuous, and terreſtrial Parts precipitated by Art. On the contrary, when theſe *Rules* are prudently obſerved, the water proves, without farther trouble, clean-taſted, clear, briſk, pleaſant and refreſhing; ſuppoſing it intended for a common Cordial, and not for Phyſic.

What ſeems to have led the Diſtillers into this clean way of compounding, is their particular eſteem and fondneſs for the *Bubble-Proof*; a thing little underſtood by *Apothecaries*, and leſs regarded in their productions. The *Diſtillers*, in the making of compound waters, find, if they ſuffer their *Faints* to run among the high Spirit; this procedure kills their *Proof* before its time. Hence

they

they are inſtructed to leave them out, and make up with fair *Water*; reſerving their Faints for other uſes, to which, as containing a copious Oil, they are better adapted: ſo that, by a little management, they may be turned into *Waters* themſelves, or made to give out their eſſential oil. In which manner, and by continuing to run the Still longer than the advantage from the Spirit requires; a large quantity of *Oil* may frequently be procured. And this piece of knowledge among the *Diſtillers*, or their Servants, has ſent many parcels of *Oil of Aniſeed*, *Oil of Juniper*, *Oil of Caraway*, *Oil of Cloves*, &c. to the Druggiſt, the Chemiſt, and the Apothecary, at ſuch an under-price, as ought to ſhew them the trick; if they could not otherwiſe diſtinguiſh between a perfect eſſential Oil, and one that has by Spirit been robb'd of its more ſubtile and ethereal part. And this may ſerve to ſhew the nature of that extemporaneous method of making ſome compound and Cordial *Waters* with the *eſſential Oils* of Aromatics, and certain Plants. The common practice is to rub theſe Oils into a kind of *Elæoſaccharum* with Sugar; and thus diſſolve it in a *Proof Spirit*. And if the eſſential Oil be freſh and genuine, the Spirit clean and thin, and the operation dextrouſly performed; better waters may be made in this manner than are vulgarly found, either at the *Diſtillers* or *Apothecaries*: the chief fault being, that they contain too little of the fine ethereal Oil, and too much of the groſſer unctuous matter of the Ingredient.

The fine light Oil, of which this groſſer is robbed by a careful Diſtillation, is the very thing that gives the flavour, virtue, and ſpecific difference of the compound Spirit: and this is generally found to come over with the Spirit, while the fire is kept moderate, or ſo as to cauſe only a ſimmering,

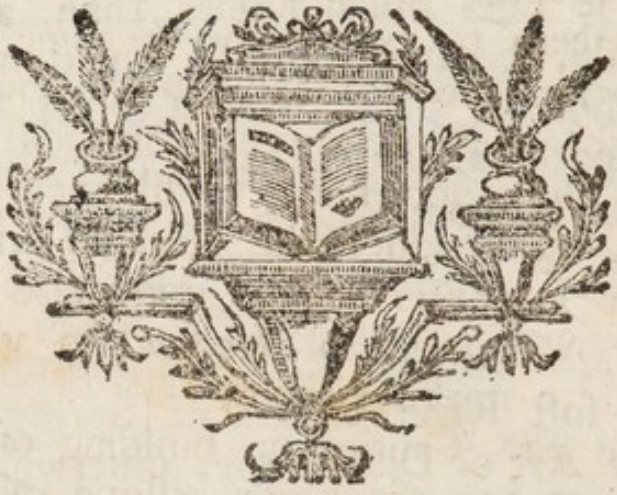
mering, and not a boiling, in the Liquor of the Still. But when once the fire is raiſed, as it uſually is, when the Still works ſlow; part of the groſſer Oil alſo comes over, and thus impregnates the Spirit. In general, it may be a *Rule* to change the Receiver, as ſoon as ever the Stream appears *Proof:* tho' there are ſome caſes, as particularly in *Cinnamon*, where a little of the Faints ought to be mix'd in among the Water. But this is univerſal, that ſo much of the Faints ſhou'd in no caſe be uſed, as to bring a cloudineſs or milkineſs upon the Water, uſually kept in the ſtate of full Proof: This ſtate being ſuppoſed to mellow and ripen it ſooner; as indeed it does much ſooner than a lower ſtate wou'd, becauſe the Oil cou'd not then remain diſſolved. But moſt Cordial Waters, for the Apothecaries uſe, had perhaps better be preſerved in the condition of a *three fifth* of Brandy, that is, as they come from the Still unmade up.

The *Water* employ'd for making up, ſhou'd either be ſoft River-Water, or Spring-Water, ſoften'd by Art or Diſtillation; otherwiſe 'tis apt to turn the Spirit thick, and precipitate a Sediment; eſpecially if made below Proof: or if the Spirit partake of an alkaline nature, from the manner of its rectification. But when this happens, or there is a neceſſity for making Goods below Proof, they may be fined in a day or two, either with a ſmall proportion of Alum, the white of Eggs, or with Jelly of Iſing-glaſs, beat up to a Froth, and applied in the ſame manner as in the fining of Wines.

All *Compound Waters* ſhould likewiſe be a little edulcorated with the fineſt Sugar; as this ſerves to unite the eſſential Oil of the Ingredients more intimately with the Spirit: and at the

the ſame time makes the Water taſte ſofter and pleaſanter in the mouth.

And if theſe particulars be well obſerved, the *Apothecary* may doubtleſs make as good Cordial Waters as the *Diſtiller*, without the aſſiſtance of the *Balneum Mariæ:* which however is a lawful Engine, in reſerve for the Apothecary, if he can no otherwiſe get the advantage over his Adverſary.



SUP-

SUPPLEMENT.

Of the Structure of a Still-House.

BY ſome particular Contrivances in the *Structure of a Still-houſe*, the Work may be ſhorten'd, and render'd more agreeable as well as advantageous. In this particular the *Dutch* Diſtillers ſeem to exceed the *Engliſh*, who are neither ſo neat nor ſo ready in the buſineſs as they might be; but appear commonly embaraſs'd in Sluſh and Dirt, whilſt they continue at work. To reduce this affair to an elegant Simplicity in *England*, we might do well to have the *Still-houſes* of *Holland* in view, and endeavour to improve them.

1. The firſt Caution in building of a Still-houſe is, to lay the Floor a-ſlope, where the wet work is to be perform'd; and to have it well flagg'd with broad Stones, ſo that the Sluſh may readily run off, and be diſcharg'd by the Vents or Drains on the ſides.

2. The Stills ſhou'd be placed abreaſt, along that ſide of the Still-houſe, to which the Floor has its current. The Stills in *Holland*, for their largeſt *Malt-works*, are never of that monſtrous ſize we commonly find them about *London*; but much more manageable and handy; as ſeldom containing above ſix or eight Hogſheads: and with ſuch Stills a ſingle Hand will perform much more buſineſs than in one of thirty or forty times the ſize.

3. Fronting the Stills, and adjoining to the back-Wall, ſhou'd be a Stage raiſed for the *Fermenting Backs*; which being placed at a proper height, may empty themſelves, by means of a Cock and a Canal into the Stills; which are thus charged without farther trouble.

4. Near this Set of Fermenting Backs, ſhou'd ſtand a Pump or two, that may readily ſupply them with Water; by means of a Trunk or Canal leading to each Back.

5. Under the Pavement, adjoining to the Stills, ſhou'd be a kind of Cellar, wherein to lodge the Receivers; each whereof is to be furniſh'd with its Pump, to raiſe the Low-Wines into the Still for Rectification. And thro' this Cellar the refuſe Waſh or Still-Bottoms, ſhou'd be diſcharged; by means of a Hoſe, or other Contrivance.

Theſe are ſome of the principal Matters to be regarded in erecting of a Malt Still-houſe; or any other deſign'd for the original Production of Spirits. And by a due regard had to them, *Malt-Spirit* may be made with little more trouble than Melaſſes. For by this means the buſineſs of *Brewing*, and *Cooling the Waſh*, which requires ſo much time and pains in the *Engliſh* manner, is entirely ſaved; Fermentation carried on to better advantage; and the Yield of the Spirit increaſed, according to the Proceſs already conſidered, under the *Sections* of *Brewing* and *Fermenting*.

AN ESSAY

Towards a

PRACTICABLE METHOD

OF

CONCENTRATING WINES,

And other

FERMENTED LIQUORS;

So as to reduce their *Bulk*, render them more *Unalterable* and *Perfect*, more *Durable* and fit for *Service*, *Carriage*, and *Exportation*.

ADVERTISEMENT.

THE following Eſſay *opens a new Way of working in* Chemiſtry; *and ſhews how to analyſe certain Bodies by* Cold. *Chemiſtry ſhould not wholly confine itſelf to the Fire; when there are ſeveral other Agents and Inſtruments in Nature, no leſs efficacious than that, in producing Chemical Effects; and principally* Cold; *which muſt be allow'd the left hand of Chemiſtry, if* Heat *be the right.*

But beſides theſe two; Air, Water, particular Motions, and particular Bodies have an inſtrumental efficacy in producing great Changes, both artificial and natural; and unleſs Chemiſtry *make uſe of theſe, as well as the others, it muſt ſtill continue very lame, and imperfect. Many things of this kind are hinted to the world by that noble chemical Philoſopher Dr.* Stahl, *who has given the whole Art a new Caſt, and ſhewn it a much more ſerviceable thing in Philoſophy, in Arts, and the buſineſs of common life, than is generally conceived. To him we are obliged for the following* Eſſay; *which contains an account of a curious, and, in all probability, a very profitable Experiment. The Matter of Fact was indeed known before; but not experimentally deduced, confirm'd, and explain'd.* Glauber *ſpeaks much of a certain Secret to the like purpoſe; but in ſuch Terms, as if he either underſtood not himſelf, or intended not to be underſtood by others: and indeed he trumpets upon it in ſuch a tumid manner, as ill becomes a Chemical Philoſopher; who ſhould never loſe ſight of Nature, nor ſtray beyond the limits of Experience. Mr.* Boyle *touches the matter ſoberly and diſcreetly, in his* Natural Hiſtory of Cold; *but ſeems unacquainted with its excellence, and numerous uſes. What may be farther wanting to render it practicable, in the larger way of buſineſs, the Merchant and Mechanic may conſider of; but the diſcovery of its farther Chemical and Philoſophical Uſes, is earneſtly recommended to the* Britiſh *Philoſophers.*

AN ESSAY TOWARDS A PRACTICABLE METHOD *of Concentrating* WINES, *and other fermented* LIQUORS, *&c.* *

SECT. I.

FUNDAMENTAL OBSERVATIONS *upon the Real, or Chemical Nature of* WINE; *and all* FERMENTED LIQUORS.

1. WINES, and fermented Liquors, both before and after Fermentation, conſiſt not of ſimilar, but heterogeneous parts; joined together in one, certain *Nature and texture of the original matter of Wines.*

* This Subject having been curiouſly proſecuted by Dr. *Stahl*, in a Work of his but little read in *England*, we chuſe to give the Subſtance of what he delivers upon it; and add our own Obſervations, Experiments, and Illuſtrations occaſionally, in the way of Notes; as judging it much better for the public, to ſpread what is already well done, by ſuch excellent hands, than to write entirely from the narrow confines of our own Experience. And this Method we propoſe to obſerve for the future, where we find any Chemical Subject uſefully

tain determinate order. Thus, the action and eſſence of *Fermentation* being a ſeparation and deſtruction of the former connexion of the ſubject; and tranſpoſing its parts anew: there muſt of neceſſity have been a kind of firm or durable texture, in the ſubject ſo disjoin'd, ſeparated, and new ranged *.

2. For example, *Grapes*, being laid upon dry ſtraw, in a cold place, will, for ſome time after they are ſeparated from the Vine, preſerve that texture which gives them their ſaline, unctuous, and ſlimy ſweetneſs; which the juice alſo retains after preſſing, and becomes a clear tranſparent Muſt: without ſeparating it ſelf into heterogeneous parts, but continuing uniformly and evenly mixed; ſo as to preſerve the different matters it conſiſts of intimately collected among themſelves. And in this firmly connected ſtate, it may be kept for many months; if a cask be perfectly filled therewith, and ſet in a cold place, as we evidently ſee in *Stum*.

Nature of Wines themſelves.

3. *Wine* in the preciſe Chemical, or Philoſophical Notion thereof, is a ſaline, clammy, oleaginous matter, diluted with a large proportion of

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proſecuted by foreigners, or Authors but little known or read in our own Country.

The Paper from whence this *Extract* is taken, occurs *among the Doctor's other* SCHEDIASMATA, *under the following Title.* Menſis October, commendans Concentrationem, ſive Dephlegmationem Vini, aliorumque Fermentatorum, & Salinorum Liquorum, ſalvis univerſis eorum viribus. *Opuſculum Chymico-Phyſico-Medicum.* Halæ Magdeburgicæ, 1715.

* This *Eſſay* proceeds in the aphoriſtical manner; wades pretty deep in natural Philoſophy; and carries a ſteady Eye upon the texture, connexion, or arrangement of the particles of Bodies; whereon their nature and properties depend. We muſt therefore beg of the Reader to conſider the matter in this light; and to expect rather Science than Ornament.

of water; whereby 'tis ſet at a diſtance from it ſelf, or expanded; whilſt the ſaline parts are ſaturated with, and interſperſed among the ſubtile earthy ones, that make the ſlimineſs; and thus they together imbibe, detain, entangle, and hold the groſſer oily parts: beſides which, there are other oily parts vaſtly more ſubtile, that by means of the highly attenuated ſaline portion adhering to them, remain as much connected with the water as the reſt; and theſe are what we call the ſpirituous parts. But the connexion of them all together, is ſo ſtrong and durable, that they move, for a long time, as one body, without ſeparating, if carefully preſerved *.

4. But if the *ſpirituous part* be once drawn away, and ſeparated from the *Wine*, by diſtillation; tho' it were again immediately poured back, or reſtored to the remaining maſs from whence it came, and ever ſo finely ſhook in again therewith; the whole by no means recovers its former taſte, odour, and durability; but turns to a confuſed, turbid mixture of a different, nauſeous taſte, unnatural ſmell; and approaches near to a ſtate of vappidity †. *Wine, how affected by taking away its Spirit.*

* An acquaintance with the true Nature, Hiſtory and Effects of *vinous Fermentation*, will fully explain and juſtify theſe poſitions. The Author himſelf, Dr. *Stahl*, has given us a very laborious and exact piece upon this Subject; which we hereafter propoſe to illuſtrate in the ſame manner as the preſent.

† This holds true in the general: but if a new Fermentation, or even a Fret, be naturally or artificially raiſed, after they are put together again; the Spirit may be thus reinſtated, and the Wine render'd perfect; as I have ſeen. The experiment however is uſually attended with ſome difficulty and uncertainty; tho' capable of being render'd ſucceſsful by a particular Encheireſis, or the uſe of a proper intermedium.

How by a new addition of Spirit.

5. Again, if an inflammable Spirit, diſtill'd from the ſame, or any other kind of Wine, be put to a parcel of Wine that was too ſaline, or not ſufficiently ſpirituous; the bare addition, or tumultuary admixture thereof, very far from giving the fine and intimate ſoftneſs of a good wine, will rather manifeſt its own burning acrimony, and nidorous flavour, to the ſmell and taſte; and alſo add a nauſeous bitterneſs to the former tartneſs and auſterity *.

How affected by Heat.

6. So likewiſe any conſiderable heat, or even a degree of ſimmering or tepidity, will by its inteſtine and ſubtile agitation, that barely diſturbs the exceeding fine ſpirituous parts, which are very ſuſceptible of the motion of heat, or diſjoins them from the reſt, occaſion an alteration of its taſte, tranſparency and durability; as much as if the Spirit had really been drawn off, and poured back again †.

How render'd durable.

7. On the other hand, *Wine* kept in a cool vault, and well ſecured from the external air, will preſerve its texture entire in all the conſtituent parts, and ſufficiently ſtrong for numerous years: as appears not only from old wines, but other foreign fermented liquors; particu-

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* This likewiſe holds true, if no proper caution and encheireſis be uſed; but if a fine Spirit be artificially prepared and introduced, it will after a time be intimately mix'd with the other parts of Wine, and remain abſolutely undiſcoverable to the taſte and ſmell, unleſs by the excellence and ſtrength it gives.

† This is a common accident, and a diſeaſe in Wines kept too hot; and not eaſy to cure, when of long continuance: otherwiſe it may be remedied by introducing a ſmall artificial Fermentation, that new ranges the parts of the Wine, or rather recovers their former texture. But the thing here intended, is the actual expoſing of Wine to the Fire or hot Sun; which preſently diſpoſes it to turn eager: and making the Wine once boiling hot, is one of the quickeſt ways of expediting the Proceſs for *Vinegar*.

particularly thoſe of *China*, prepared from a decoction of *Rice*; which being well cloſed down, and buried deep under ground, continue for a long ſeries of years, rich, ſtrong, and generous, as the *Hiſtories* of that Country univerſally aſſure us.

8. The like is alſo to be underſtood of *Vinegar*, after it has thrown off the ſuper-abundant earthy parts, and many of the oily ones, that preſided whilſt it continued Wine; whence the ſaline ones now get the aſcendant, and as it were ſubdue and preſide over the ſpirituous: for good and perfect Vinegar being well ſtopt down, will continue pure, and unaltered, for a great length of time. *Vinegar.*

9. But if it be left open, ſo that its fine vapour exhales, or its more ſubtile part be drawn off from it; and again poured back: in either caſe, it loſes its uniform conſiſtence, and particularly its durability, and now directly hurries into vappidity and corruption.

10. If either by fraud or accident, a larger proportion of Water comes to be mix'd with Wine, than is abſolutely proper for its conſiſtence, and no way neceſſary or eſſential; this ſuperfluous Water does not only deprave the taſte, and ſpoil the excellence of the Wine; but alſo renders it leſs durable: for humidity in general, and much more a ſuperfluous aqueous humidity, is the primary and reſtleſs inſtrument of all the changes by fermentation *. *Water mix'd with Wine.*

* That *Water* is the principal Inſtrument of Fermentation, will be fully ſhewn and explain'd hereafter, in the chemical Doctrine and practical Experiments of Fermentation; which we reſerve for the Introduction to our *Natural and Experimental Hiſtory of Wines*. In the mean time, it appears, in ſome meaſure, from what is deliver'd below, at the beginning of Sect. V.

11. It may therefore doubtleſs be uſeful, and ſometimes very convenient, to take away this *ſuperfluous Water* from the other part, which ſtrictly and properly conſtitutes the *Wine*. But for the method wherein this may commodiouſly be done, we will firſt examine thoſe propoſed by others, for the purpoſe; ſhew their difficulties and inſufficiences; and afterwards propoſe a perfect and eaſy way of effecting the thing.

SECT. II.

Of the METOHD *of Condenſing* WINES *by* HEAT, *or* EVAPORATION.

Superfluous Water in Wine.

1. WHOEVER conſiders it, will find, that all fermented liquors labour with an over-proportion of Water; and that if a very conſiderable quantity thereof were taken away, they would become not only richer, but more durable; provided ſo much humidity were ſtill retain'd, as is juſt neceſſary to preſerve the vinous conſiſtence, keep the ſaline part fluid, and the ſlimy and the unctuous parts mix'd in and expanded along with the reſt.

Effects of the Spirit and Water being ſeparated from Wine.

2. But as an actual and truly ſaline matter abounds in *Wine*, and *Vinegar*, and that of an acid auſtere or tartarious kind; when the ſpirituous part is drawn away, the Wine becomes ſurpriſingly more auſtere: and when a large quantity of the watry part is ſeparated, this ſuperabundant ſaline tartarious matter coagulates into a cryſtalline form, and falls to the bottom, or ſtrikes to the ſides of the Cask. For the ſubtile oily matter, which makes the ſpirituous part in

Wine,

Wine, blunts and takes off from a tartarious acidity; in the ſame manner as the addition of rectified ſpirit of wine blunts, ſheaths and dulcifies the corroſive acid ſpirits of *Nitre*, *Salt*, and *Vitriol*.

4. But this *tartarious Salt* abounding alſo with an over-proportion of a groſs unctuous matter, cannot be diſſolved or diluted without a very large proportion of water; which being taken away, it preſently concretes into dry ſolid cryſtals: as is the known caſe of *Cremor Tartar*. And hence proceeds the effect before obſerved; *viz.* that the acidity and roughneſs of the Wine manifeſt themſelves the more, when the Wine is deprived of its ſpirit. And this is an experiment familiar in the kitchen; when Wine is burnt or uſed in ſauce: for boiling, always gives it a much greater degree of auſterity.

5. And when this Water is, even by diſtillation, plentifully drawn off from Wine, not of a terreſtrial and chalky, but of a tartarious nature; a beautiful Tartar will be found to cryſtallize among the remaining maſs, in a conſiderable proportion.

6. But altho' this ſuperfluous Water, that dilutes the Wine, and greatly weakens its taſte, might be very advantageouſly ſpared from the Wine, which wou'd then become much more rich and noble; and at the ſame time more ſmooth and ſoft, thro' the loſs of ſome part of its Tartar; yet this end cannot be ſecured by diſtillation, becauſe of the damage it does to the remaining maſs, and deſtroying thoſe properties thereof which ought to be preſerved. *Whether ſeparable by exhalation.*

7. For firſt, the ſpirituous part is the life of the wine and all fermented liquors; and not only keeps them together, embalms the whole, and renders it durable, or not ſubject to corruption; but alſo in great meaſure gives them that aro-

matic, refreſhing, and reſtorative virtue and effect they have upon the human body.

8. Nor is this all; but the intimate and extremely ſubtile union of this ſpirituous part with the reſt, is perfectly the ſole and entire cauſe of both the former effects: ſo that it by no means ſuffices to have the ſpirit barely preſent among the other parts, for then it might be drawn off and return'd back again, without damage to the wine; but the eſſential union is here diſſolved by taking it away, and can never be reſtored by a ſimple re-affuſion. 'Tis therefore deſtructive of the end propos'd, thus to break and diſſolve the texture of the Wine, as this entirely ſubverts and corrupts its nature.

9. And this inevitably proves the caſe, whenever *Wine* is evaporated or diſtill'd: which conſtantly requires a degree of heat ſufficient to convert water into vapour; whence the ſpirituous part being much more volatile than the aqueous, flys off together with, or even before it; and thus leaves the Wine diſſolv'd in its texture, and without its ſoul. Upon which, the remaining ſaline, ſlimy, unctuous maſs is ſo diſturbed, as no longer to remain connected, but immediately turns thick and turbid; and afterwards runs impetuouſly into a kind of corruption, attended with vappidity, ropineſs and ſinew. All which circumſtances abundantly ſhew the method of exhalation to be abſolutely unfit for *condenſing Wines*; as it ſo many ways deſtroys the whole vinous texture and compages.

SECT.

SECT. III.

Of the METHOD *of Condenſing* WINES *by* PERCOLATION.

1. THAT *Wine*, ſtrictly and properly ſo call'd *, is of a groſſer and thicker body than Water; or that the eſſential and truly conſtituent parts of Wine, may be conſider'd as ſeparate and diſtinct from a ſuperfluous and copious aquoſity, appears both *à Priori* and *à Poſteriori*. *The denſity or groſſneſs of a vinous body.*

2. For firſt, 'tis rational to conceive that a matter conſiſting of a collection of ſaline, ſlimy †, and unctuous parts, brought into one maſs, ſhould have a groſſer conſiſtence than pure and ſimple Water.

3. And next, this groſſneſs of the proper and eſſential particles of Wine manifeſts itſelf to the eye, (1.) In thoſe diſeaſes of Wines, wherein they become viſcous and ropy: when they not only loſe their tranſparency, but may be drawn out and extended like a mucus; and do not, upon pouring out, then fall in drops, but run down in long ropy ſtrings. (2.) It appear again to the eye in *Vinegar* grown mothery, mucilaginous, and tough, ſo as ſometimes to afford

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* That is, Wine freed from its ſuperfluous and prejudicial Water.

† This ſlimy or mucilaginous part of Wine, ought particularly to be remarked; as a real conſtituent and often a predominant part, manifeſt in all the ſtates, but eſpecially thoſe termed the præternatural ſtates of Wine; and both before as well as after Fermentation.

a denſe skin, like leather; which cannot well be ſuppoſed to proceed from the Water, but from the more proper and eſſential parts of the Wine it was made of.

4. But becauſe theſe *Inſpiſſations* may poſſibly be attributed to ſome preternatural diſorder of the Wine, we may add, that our *Method of concentration* exhibits this groſſneſs of parts to the eye; whilſt the Wine remains in a perfect ſtate, free from its ſuperfluous aquoſity: for here it appears much denſer, and deeper in colour, leſs fluid, leſs thin, leſs tranſparent, and in every reſpect of a thicker and higher conſiſtence.

5. Laſtly, this is ſtill more evident in *Malt-liquors*, which being concentrated in our manner, taſte full and thick, almoſt like Oil in the mouth, and pour out like that, or a thin Syrup; being at the ſame time alſo heighten'd, or concentrated in colour.

Lays the Foundation of a Separation.

6. From the preceding phænomena, it ſhou'd ſeem natural, that theſe different parts of Wine, which vary ſo much in conſiſtence and tenuity of matter, might be ſeparated from each other by a commodious *Percolation*; ſo that the aqueous parts which appear the fineſt, ſhou'd run thro' the pores of a proper ſtrainer, and leave the groſſer behind.

The inconvenience of the Method by Percolation.

7. But the practice hereof is clogged with great difficulties. For *firſt*, thoſe thin liquors which have a manifeſt and copious ſaltneſs, as Wine has, are either ſo attenuated; and their groſs part, however thick in compariſon of Water, is yet ſo ſubitle and penetrating in it ſelf, as at the ſame time to paſs the pores of any ordinary ſtrainer: at leaſt ſuch liquors will, along with their aqueous, tranſmit the fineſt and moſt delicate of all their parts, and leave the more ſluggiſh,

giſh, the truly groſſer, or thoſe moſt tending to ropineſs, behind *.

8. It muſt alſo be obſerv'd, that moſt kinds of *Wine*, beſide their genuine, ſubſtantial and rich, eſſential part, have conſtantly join'd with them ſome foreign ſuperfluous and prevailing gummy or mucilaginous matter; which the more it inviſcates the nobler part, the thicker and groſſer that actually becomes; whilſt the other finer portion, which is not clogg'd with ſuch a load, remains more penetrating and active. And hence alſo the difficulty of condenſing Wines by percolation is increaſed; as this ſubtle ſpirituous part paſſes the ſtrainer along with the Water †.

9. A *contrary* difficulty attends the uſe of a cloſe ſtrainer; ariſing from the groſs mucilaginous particles, either accidentally interſpers'd in *Wine*, or cleaving to this and other fermented liquors, but eſpecially malt drinks: for theſe viſcous, tenacious, and clammy particles, preſently clog and block up the pores of the ſtrainer; and by that means hinder the thinner and more watry particles from getting away. And the natural tenacity or clammineſs of liquors prepar'd from malt, honey, and the like, communicates, in the manner of a mucilage, ſuch a ropineſs, even to the ſuperfluous water; and diffuſes and expands it ſelf ſo much therein, that the water it ſelf is thereby thicken'd and rendered much leſs apt to flow.

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* This is the common caſe of all fermented liquors, tho' ever ſo fine and bright: and opens the way for explaining their nature and compoſition; the changes whereto they are ſubject; their diſeaſes and their remedies.

† Whence the remaining Wine is depauperated and render'd vappid, inſtead of being meliorated. Theſe two laſt obſervations will appear perfectly juſt, to thoſe who have made any experiments, in this way, upon Wines.

10. A *third* difficulty attends this Method by *Percolation*, viz. that although it were poſſible to make the ſeparation; yet the work would proceed ſo ſlow, that the more ſubtile, not ſo ſtrictly inflammable, as fine, brisk, volatile, and ſpirituous parts, which give the pungent taſte and odour, might in the mean time exhale, and leave the remaining Wine flat and vappid: or if this inconvenience cou'd be prevented, yet in ſo tedious an operation, ſome prejudicial fermentative alteration wou'd, in all probability, happen.

The Difficulty of finding a proper ſtrainer.

11. And after all, there wou'd ſtill remain a *queſtion* as to the matter to be uſed for the ſtrainer; which they who have never made any experiment this way, might little dream of. For as the common *filters* or *ſtrainers* are generally made of paper, linen, or ſome kind of cloth; all theſe readily communicate and impreſs a foreign diſagreeable taſte to the liquor, eſpecially to Wine, if intended for condenſation in this manner. And it may ſeem ſurprizing, that even a momentaneous paſſage of *condenſed Wine* thro' the cleaneſt linen, will give it a remarkable and very diſagreeable *taſte of the Rag*, that ſhall continue for many months, and cannot eaſily be got off again *. This happens in a much greater degree

* This is alſo a very great difficulty in the *Preſſing of Wine-Lees*; which contain a very large proportion of Wine; that may readily be forced from them by the *Tail-Preſs*. But our people generally uſing Canvas Bags for that purpoſe, all *Preſs'd-Wines* may be diſtinguiſh'd by this *taſte of the Rag*; unleſs great care be uſed. To prevent the inconvenience, as much as poſſible, their way is to ſoak the Bags, for a long time, and even to boil them in ſeveral parcels of Wine; which thus takes out the diſagreeable flavour, and leaves the Bags more pure. Yet after all their endeavour, the Canvas ſtill gives ſome little ſmatch to the Wine. So that it were better perhaps to have a particular kind of *Hair-cloth*, &c. wove for the purpoſe.

degree to *condens'd Wine*, after the ſame manner as the higheſt rectified ſpirit, or alcohol of Wine, will in many caſes perform a ſolution immenſely quicker, and more powerful than ſuch a phlegmy ſpirit, tho' mix'd but with a tenth proportion of Water: for ſo our *concentrated*, or, as we may call it, *rectify'd Wine*, being freed from its ſuperfluous phlegm, has a more powerful, more immediate, and more intimate effect upon the parts of the cloth, and other bodies, by means of the concentration of its ſpirituous and ſaline parts, than when its efficacy is weakened by being diluted with Water †.

12. This Method however by *Percolation*, tho' no way ſufficient to free the *Wine* of all its ſuperfluous Water, may yet be of ſome ſmall ſervice, if apply'd with due regard to the difference there is between fermented liquors, eſpecially in point of conſiſtence. And therefore ſome faint or imperfect imitation of *our Method* may be had by means of thick paper filters, or other common ſtrainers. And in this view, that common tavern trick, with a piece of liſt, when dextrouſly perform'd, might be of ſome ſervice: for if a long and thick woollen ſtring be firſt ſoaked in Water, and then one end of it plunged into Wine, whilſt the other end hangs a great way down, without the glaſs; it will, in an imperfect manner, draw away the Water from the Wine. But all theſe and the like attempts are trifling and uſeleſs, in compariſon of our eaſy, expeditious and perfect manner of effecting the thing: to which we next proceed. *The Uſe of Percolation.*

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† This affords a noble and very improveable Hint of the power of *concentrated or rectified Wine*, uſed as a Menſtruum: and we cou'd wiſh for an opportunity of making ſome certain experiments to this purpoſe. But more of this below. *See* Sect. V. *ſub finem.*

SECT. IV.

The METHOD *of Condenſing* WINES, *and other* SALINE SPIRITUOUS LIQUORS, *by* COLD.

Tranſition. 1. HAVING above ſhewn what effect the Motion of Heat and the Action of Fire have upon all, but eſpecially the finer parts of fermented Liquors, and more directly upon thoſe of Wine; and how much they contribute to diſſolve the intimate union of vinous Fluids, and change their whole nature, which conſiſts in that union and connexion: we paſs on to the conſideration of *Cold*; which being oppoſite to *Heat*, may be ſuppoſed to have different effects, or at leaſt ſuch as better ſuit the preſent purpoſe.

Foundation of the whole Invention. 2. If any kind of *Wine*, but rather ſuch as has never been adulterated, be in a conſiderable quantity, as that of a Gallon or more, expoſed to a ſufficient degree of Cold, in froſty weather, or in any place where the Ice continues all the year, and ſo be brought to freeze; the ſuperfluous Water contain'd in the Wine, will be turn'd to Ice, and leave the proper and truly eſſential part unfrozen; unleſs the degree of Cold ſhould be very intenſe, or the Wine but weak and poor *.

3.

* This Fact was ſufficiently known to the *Hollanders*, who winter'd in *Nova Zembla*; and has been imperfectly mention'd by ſeveral, in particular by Mr. *Boyle*, and other chemical Philoſophers. And from the hint of Mr. *Boyle*, I made, during our laſt great Froſt in *England*, a variety of Experiments, with different kinds of Wine, Vinegar, Urine,

3. When the Froſt is moderate, the experiment has no difficulty, becauſe, in that caſe, not above a third or fourth part of the ſuperfluous Water will be froze in a whole Night: But if the Cold be very intenſe, the beſt way is, at the end of a few hours, when a tolerable quantity of Ice is form'd, to pour out the remaining Liquor, and expoſe it to freeze afreſh by itſelf. And this for two reaſons; (1.) Becauſe when the quantity of Ice grows large, more of the *concentrated Wine* will be apt to hang and lodge in it. And, (2.) Becauſe it wou'd otherwiſe require a longer time to drain away from the Ice *. *The Accuracy requir'd in the Experiment.*

4. If the veſſel that thus by degrees receives the ſeveral parcels of *condenſed Wine*, be ſuffer'd to ſtand in the cold freezing place, where the operation is perform'd; the quantity lying thin in pouring out, or otherwiſe, will be very apt to freeze anew: and if it be ſet in a warm place, ſome of this aqueous part thaws again, and ſo weakens the reſt. The *condenſed Wine* therefore ſhould be emptied in ſome place of a moderate temper, as to cold and heat; where neither the Ice may diſſolve, nor the vinous ſubſtance, mix'd among

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Urine, *&c.* and found the reſult exactly correſpondent with what is hereafter deliver'd of this new method. And if the Author had any advantage in point of the natural ſtrength of the Cold in *Germany* over that of *England*, we have ſupplied this defect by *artificial Congelation*.

* The making of the Experiment will render this extremely clear and intelligible: for without breaking the Ice, the unfrozen part will, barely by inclining the veſſel, find its own way, and drain clear from the watery part, which is now in the form of Ice. So that if the draining be perfect, the Ice of the deepeſt red *Bourdeaux* Claret, will become nearly as pale as Water; and reſolve, by warmth, into an almoſt colourleſs Phlegm. Which is no ſmall curioſity attending this Experiment; and at the ſame time affords a Criterion of its exact performance.

among it, be congeal'd. But the beſt expedient of all, is to perform the operation with a large quantity of Wine, as that of ſeveral Gallons; where the utmoſt exactneſs, or prevention of all waſte, need not be ſo much regarded *.

5. By this method there firſt freezes about one third of the whole Liquor, and is properly the more purely aqueous part thereof; inſomuch that when all the vinous fluid is poured off, to be again expoſed to a farther concentration, the Ice remaining behind, upon this firſt emptying, being ſet to thaw gently in a warm place, diſſolves into a perfectly aqueous Fluid; retaining only a light ſcent, but extremely little of the taſte and colour of the *Wine* †.

Tartar ſeparated by the Condenſation.

6. If the *Wine*, now once concentrated, ſhou'd, by longer continuance in the freezing cold, be again congeal'd to the utmoſt, (unleſs the cold were very ſevere indeed) and then again be drained from its Ice; there ſoon after falls to the bottom of the glaſs it was poured into, a groſs, white, and ſhining Powder or Tartar ‡; and even the icy part remaining behind, depoſites a little more of this Powder, after thawing: and again, the ſame vinous concentrated matter does the ſame, upon ſtanding a few days or hours; but the more of it as the *Wine* was auſtere, or genuine, neat,

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* The nicety and accuracy of the Experiment has a great dependance upon the due obſervation of this Caution.

† Tho' always more or leſs, as the Operation was ſlow or ſudden, imperfectly or perfectly perform'd. Thus when a freezing Mixture of Snow, or Ice and Salt, is made uſe of for this purpoſe, its operation may prove ſo quick, that part of the true vinous ſubſtance ſhall be catched and entangled in the Ice, before it has time to ſeparate and run into the centre, where the freezing virtue does not reach. But in this caſe the Remedy is exact and cautious Draining; and the Prevention a due management of the freezing mixture.

‡ See below, Sect. iv. ¶. 11.

neat, and unadulterated with Sugar, Brandy or the like *.

This *Ice* of the ſecond operation differs in no reſpect from that of the firſt; provided the vinous matter be perfectly drained away from it, before the *Ice* is ſet to melt; whereby it runs into the very ſame kind of fine Phlegm: excepting only, when the Wine was leſs ſpirituous, that it taſtes a little more ſaline than the Water ſeparated by the firſt operation †. *Nature of the Ice of the Wine.*

8. The part which has eſcaped being froze, in both operations, is a real *concentrated Wine*; as appears by its colour, conſiſtence, taſte and ſmell: for it now has all thoſe properties in a greater degree, and a much narrower ſpace, than when ſo largely diluted with a ſuperfluous Water: and therefore becomes a much nobler and richer Wine, than without ſuch a contrivance cou'd poſſibly be procured. For, as by this means two third parts of Phlegm are taken away, in the better ſort of Wine; or three-fourths in the weaker; what remains muſt needs become highly rich and ſaturate ‡. *Nature of the uncongealed part.*

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* No wonder at this ſeparation of the Tartar in the Water, and the concentrated vinous matter; when the nature of Tartar requires a large proportion of Water to diſſolve and keep it fluid. And perhaps from this Property might be derived a method of trying whether *Wines* are adulterated with Brandy, Syrups, Sugar or the like, by an unskilful hand: But if the proper art and addreſs be uſed, ſuch a diſcovery is abſolutely impoſſible.

† This ſhews the perfection of the operation; as it loſes not its efficacy upon repetition, but brings away mere Water at laſt as well as at firſt; without conſiderably robbing the Wine of any more valuable and genuine part.

‡ Trial and Experience alone can ſhew what a degree of melioration this condenſation gives to Wines; by comparing them with a parcel of the ſame, that has not been condenſed. Tho' this proof admits of ſome kind of fallacy; for the Senſes

Imperfection of the Experiment.

9. This operation, tho' it be perfect in Wine, does not ſucceed altogether ſo well in rich *Malt-liquors*. Thus, for example, having by ſeveral condenſations reduced a full gallon of ſtrong Malt-liquor to the quantity of a pint and half; the Ice ſeparated from it in the firſt concentrations, reſolved into a liquor ſomewhat of the colour and taſte of Small-beer; and that obtain'd at the laſt, might have almoſt paſt for Small-beer, tho' a flaſhy, watry taſte, manifeſtly predominated in it. But the part that remain'd uncongealed was extremely rich; and for conſiſtence and taſte far exceeded the famous double *Brunſwick* Mum. In point of ſtrength or ſpirituoſity, it ſeem'd perfectly aromatic, and nobly flavour'd; a thing not found in common Malt-liquors. And for conſiſtence, it reſembled a dilute Syrup, and with a pleaſing ſoftneſs ſheathed the acrimony of the ſpirit, and concealed the bitterneſs of the Hop; which before was very conſiderable*.

10.

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here do not exactly judge of a ſmall improvement. A true method ſeems to be that of reducing the condenſed Wine back again to its former ſtate; but to do this with accuracy and advantage, is a ſecret that will be touch'd upon hereafter. In the mean time, let the Water frozen out of the Wine be examin'd as to its degree of Vinoſity; for the difference muſt needs be in the concentrated Wine.

* A faithful obſerver, and recorder of Philoſophical Experiments, ever follows Nature cloſe; and barely tranſcribes, or, as it were, exactly copies the Phænomena he obſerves: Accordingly the inſufficiency of this *Experiment of Condenſation* is here juſtly deſcribed, and its imperfections ſhewn, without palliating, or making the thing better than it really is: thus avoiding an Error that has ſtrangely prevailed among natural, and eſpecially chemical Philoſophers, who are very apt to write in a romantic hyperbolical ſtrain, and give imaginary excellencies to things, inſtead of keeping cloſe to that rigorous truth and accuracy which natural and artificial Philoſophy abſolutely requires. The defect, however, of the preſent Experiment, is ſupply'd, or greatly leſſen'd, by what immediately follows.

10. The mucilaginous nature predominant in all *Malt-liquors*, here occaſions a greater inaccuracy; as not ſuffering the condenſed part to get clear, and run from the Ice: but as this liquor is cheaper than Wine, the loſs is leſs conſiderable; and not only ſo, but if the operation were to be perform'd in large, the thaw'd liquor might commodiouſly be employ'd in a freſh brewing; ſo as with a ſlight Encheireſis to prevent all manner of loſs. And thus likewiſe the Phlegm of Wine, ſeparated in the operation, may, by a proper *Ferment*, be converted into good Vinegar; with a great deal of eaſe and moderate profit *. *How remedied.*

11. What a large quantity of Water abounds in *Vinegar*, is well known to thoſe who are skill'd in *Chemiſtry*; ſo that a great parcel of Vinegar will ſaturate but a ſmall one of alkaline Salt: and again, a deal of *Vinegar* is required to diſſolve a little quantity of Metal. A pint of the ſtrongeſt *Vinegar* will ſcarce diſſolve above two drams of Iron; or ſaturate more than the like quantity of good Salt of Tartar: but our method of condenſation effectually remedies this inconvenience, and ſo far deprives the *Vinegar* of its ſuperfluous Water, and ſo far collects its acetous penetrating ſharpneſs, as to render it extremely powerful: thus throwing out five or ſix parts of uſeleſs Phlegm, that taſtes ſcarce perceptibly acid; and at the ſame time retaining *The Experiment tranſfer'd to Vinegar.*

* Every one verſed this way, will eaſily perceive the truth, the juſtneſs, and practicability of what is here ſaid. The Encheireſis mention'd, need be no more than to add the poor aqueous malt-liquor, not before the boiling, if any boiling be uſed, but in the *Tun*, as it is called; provided the brewing were rich enough to allow of it. And for making *Vinegar* of the depauperated phlegmy Wine, tho' it contains, even when the Operation is perform'd by a common hand, but very few vinous parts; Wine-Lees, Raiſins, Sugar, or the like, is all the *Ferment* that need be employ'd.

the ſtrength and virtue of the whole, in the part remaining uncongeal'd*.

This *condenſed Vinegar* likewiſe towards the end of the operation, or in the laſt congelations, lets fall a white ſhining Powder or Tartar, in the manner above mention'd, as well as Wine †.

12. Again, the thicker the *Vinegar* is, the leſs fit it proves for diſtillation; as not only thus contracting an Empyreuma, but coming over oleaginous: inſomuch that the pureſt white Salt of Tartar, being ſaturated with clear diſtill'd Vinegar, and afterwards ignited, turns black, and yields a ſmell like that of crude Tartar in calcining. And, on the other hand, the more 'tis diluted immediately before diſtillation, the leſs danger there is of burning. So likewiſe if the thick remaining Maſs, when the thinner is diſtill'd from it, be again diluted with Water; it may, by a ſecond diſtillation, be brought to afford a quantity of an acetous ſubſtance; tho' this latter be not comparable to the former extremely volatile part: which *Vigani* juſtly ſuſpects is a thing known but to few ‡. And even when the *Vinegar* is diſtil'd with great labour, difficulty and care, it ſtill has this effect in a higher degree; and contains an immenſe quantity of Phlegm, in proportion to its acid Salt.

13. Here alſo our *Method of Condenſation* affords an aſſured remedy; firſt of all ſeparating the more aqueous part; and in the next place, that which is ſomewhat acetous; tho' not comparable to what remains behind **.

14.

* This Experiment I have alſo found to anſwer fully upon trial.

† See above, ¶. 6.

‡ See *Vigani Medull. Chym.* pag. 13.

** So that, by this means, a moſt concentrated and ſubtily ſpirituous diſtill'd Vinegar, may commodiouſly be procured; viz.

14. How diſagreable and nauſeous 'tis to prepare the *Rob* of Urine, in the common way, for *Phoſphorus* and other purpoſes, is known not only to the operator, but perceiv'd by the whole neighbourhood where 'tis done: and here again our new *Method* affords a ready and commodious remedy; and largely throws off the aqueous part, leaving the unctuous and ſaline ones behind, untouch'd by the cold, unleſs it be very intenſe *. *To Urine.*

15. Laſtly, this *Method* is applicable to the making of *Salt* from Sea-water, or poor Salt-ſprings; as readily ſeparating the ſweet water, and leaving a ſtronger *Brine* for the Coction: ſo as to require little more than commodious Receptacles for containing a large quantity of theſe waters in the freezing ſeaſons, in cold countries; which countries are generally fit for this deſign, have numerous occaſions for the Salt, and are commonly well ſupply'd with wood for boiling the Salt down from the Brine †. *And to the making of* Salt.

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viz. by freezing the whole parcel of diſtill'd Phlegm, and diſtill'd Vinegar together; a thing of great moment to the curious in the *Chemia ſublimior*, and thoſe who underſtand *Hollandus*. And when the Vinegar is froze without diſtillation, by this means you have a noble *Rob*, or rich concentrated Vinegar, freed from its debilitating and uſeleſs watry part.

* There is little danger that the natural Cold of our climate, even in the ſevereſt winter, will prove too ſtrong for this or the other condenſations: it generally proves too weak; but may be quicken'd by a prudent uſe of the common freezing mixtures, made with Ice, or Snow and Salt, *&c.* But to ſuit the artificial degree of *Cold* in theſe caſes, requires, at leaſt, as much dexterity, as to ſuit the degrees of Fire in the ſeveral chemical operations.

† Here is a noble Hint for Merchants, and thoſe concern'd in the *Fiſheries*, &c. The Foundation of the thing is juſt and natural, and the Experiment is certain and well verified: But to reduce ſolid Experiments to profitable Works, ſomething more is required than a Purſe.

SECT. V.

The Advantages of the Method of CONDENSING WINES *by* COLD.

Excellence of the method in Wines.

1. 'TIS certain, that the beſt and nobleſt *Wines*, if expoſed for ſeveral days to the warm open air of the ſummer, out of a vault or other proper Receptacle, will inevitably corrupt and ſpoil; throwing a mouldy or mucilaginous matter to their ſurface, and acquiring a degree of ſtench or vappidity, or at beſt turning to *Vinegar*: On the contrary, the *Wine* condenſed in our manner, ſuffers none of theſe changes, upon being ſo expoſed; but remains, for a long time, not only uncorrupted, but even unaltered, as we have experienced, for ſeveral years †. And as this difference is owing to nothing more than freeing the *Wine* of its ſuperfluous Water; it may hence be fairly preſumed, that *Water* alone is the principal or immediate Inſtrument of all the fermentative Motions and Changes of vinous Liquors *. 2. We

† The Fact itſelf is indubitable; for the real vinous part receives no manner of damage, but the greateſt improvement, by the congealing Cold; tho' the Water, upon thawing from the Ice, is prejudiced or ſomewhat corrupted, according to the nature of all frozen bodies; unleſs thawed with great caution, or ſome particular *Encheireſes*, mention'd by Mr. *Boyle* in his *Hiſtory of Cold*.

* This Propoſition, that *Water* is the primary and moſt effective Inſtrument in *Fermentation*, is finely deduced and demonſtrated by the Author, in an expreſs Treatiſe of *Vinous Fermentation*; where the whole Doctrine of this abſtruſe matter is delivered in the moſt ſcientifical manner; and that difficult point fully clear'd and ſettled, in the way of a rigid and pure philoſophical Inquiry. A work well deſerving to be better known in the chemical and philoſophical world. See the Note upon ¶. 10. Sect. 1.

2. We condenſed, in our method, a Gallon and half of a poor, weak, auſtere, and acid Wine, to about a quart, in the winter of the year 1696; and put it into a glaſs bottle, whereof a third part remained empty, and ſtopt it only with a hard wreath of paper: and thus it ſtood, for the ſpace of two years, in my bed-chamber; where, during the ſummer, when the weather was fair, the windows were open all day-long, and where alſo, in the winter, other aqueous Liquors uſually froze. During this time, it was often open'd, and ſome of it pour'd out, both to taſte, and otherwiſe to uſe; and yet in all this time it neither grew mouldy nor ſour, nor ſuffer'd any ſeparation of parts; only depoſited a ſmall quantity of Tartar, but retain'd its original conſiſtence and taſte entire: excepting ſome ſmall change in both for the better †.

3. In the ſame manner we concentrated a ſomewhat better kind of *Wine*, to a little more than a fourth part; but the bulk of this did not keep ſo well as the former, as having many more taſters than that auſtere and diſagreeable ſort. When it was by degrees taſted away to half a pint, I put the remainder into a glaſs, and tied it over with a piece of bladder; then ſet it in the ſame place, near the former: but cou'd not prevent its being ſipt away by degrees, till only about three ounces were left. This ſmall quantity ſtood all the ſummer, barely cover'd with a looſe bladder; without alteration, or growing in the leaſt mouldy or acid; and long after retain'd its moſt grateful taſte and quick ſmell: only the latter was ſomewhat weaken'd thro' the bottle's remaining untied down. And that under this inconve-

† Several Experiments I made to the ſame purpoſe, fully confirm the truth of this.

nience it ſhou'd continue ſo perfect and entire, is really ſurprizing *.

4. I had, in the winter of the year before, condenſed a very ſmall quantity of the ſame ſort of wine, to half an ounce, and put into an ounce vial; which remain'd, lightly tied down, all the next year, in my ordinary ſtove-room; where it kept, without corrupting, till after the end of the winter; when, by the unequal, and ſometimes violent heating of the room, it became vappid and mouldy †.

In Vinegar. 5. A parcel of *Vinegar* concentrated after the ſame manner, in the winter 1694, and by that means brought to a corroſive degree of ſharpneſs, which rendered it unfit for the table, ſtood in the ſame room with the *concentrated Wines*, for three whole ſummers and winters, without any manner of tendency to corruption, or the ſmalleſt ſign either of mouldineſs or ropineſs ‡.

In Urine. 6. But *Urine*, concentrated in this manner, varies very remarkably, according as it was taken freſh, or half putrefied: that taken freſh, remains tolerably clear, of a dull yellow colour, and almoſt without ſmell; but that which was taken half putrefied, and of a colour betwixt brown and red,

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* This ſhews the excellence of the method, in rendring liquors more durable and unalterable by any change of weather; which ſo greatly affects the common unconcentrated *Wines*.

† Let it be here again obſerved, that no romantic or extravagant commendations of the method are attempted, but its failures and imperfections every where noted; ſo as juſtly to copy Nature, and deſcribe the effects, without flouriſh, vanity, or exaggeration. But the cauſe of this failure is evident, and nothing leſs cou'd be expected from the negligent manner in which the Wine was deſignedly kept.

‡ The uſes and advantages of thus condenſing Vinegar, were touch'd upon above, under *Sect.* iv. ¶. 13. *Note*; and may be as great to the Vinegar-merchant, as the concentration of Wines to the Vintner, *&c.*

red, acquired a dusky colour, by the concentration, like that of dark-colour'd Beer; and preſently turn'd abominably fetid, if ſet in a warm place: But that taken unputrefied, remained ſo for a very long time. I kept a pint of it for two ſummers and two winters, without any remarkable change; it ſcarce ſmelling at all diſagreeable or like Urine *.

7. Theſe examples and experiments ſufficiently ſhew, that Liquors thus concentrated, may, for a long time, be kept in a ſtate of perfection, with little care †. But there are ſome particular changes of Wines and Vinegars, thus concentrated, that happen in proceſs of time. *Conſequences of the Experiment.*

8. And firſt, *Wines*, upon being thus concentrated, ſeem to acquire a more auſtere taſte than they had originally; and no wonder, as the condenſation brings their ſaline and rough matter into a third or fourth of its original compaſs; ſo that this is no new addition or increaſe of the rough taſte, but perhaps ſome degree of mitigation thereof, in regard of the cloſeneſs whereto this rough matter is brought; which of itſelf ought rather to multiply the effect in a greater proportion.

9. The change may be conceived owing to this, that all *Wines* are obſerved to grow mild and ſoft by long lying; which effect is greatly promoted in them by a ſucceſſive ſeparation of their Tartar, and a gentle evaporation of ſome part of their water; occaſioning that neceſſity we find of frequently filling up the casks in the ſummer months: But in our concentrated *Wine*, tho'

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* Some uſes of this *Rob* of Urine have alſo been mention'd above. See *Sect.* iv. ¶. 14. Beſides which, it has many more in Chemiſtry.

† Doubtleſs as perfect, as long, and with as little trouble as can be expected, or need any way be wiſh'd for.

tho' ſome Tartar be ſucceſſively ſeparated, yet there is found no concurrent evaporation; for the concentrated *Wine* grows ſoft and mellow in a well-ſtop'd glaſs, where no ſenſible diminution of the quantity is perceived. But the effect proceeds principally from a cloſer combination of the groſſer with the ſpirituous part; which now wanting water, ſucceſſively throws off the groſſer Tartar from the reſt of the mixture *.

10. But beſides this, there ſeems another remarkable change incident to our *concentrated Wine*, not only in the taſte, but more abundantly in the ſmell; for although that very auſtere Wine above mention'd had a much milder taſte the third year than the ſecond, yet its ſpecifick odour perfectly reſembled that of *Sack* or *Canary*: ſo as to be miſtaken for it, from the ſmell alone, by good judges, who were well acquainted with the original flavour of the Wine from whence it was *concentrated* †.

11. Nor is this change of odour peculiar to *Wine* alone; but *concentrated Vinegar* participates ſomewhat of it: and was obſerved for ſome time to loſe it in great meaſure upon being left long ſtopt only with paper; and the bottle often poured out of ‖.

12. And, therefore, as 'tis plain that Wines, and all other fermented liquors, become much more

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* This matter is farther illuſtrated from what was ſaid under *Sect.* IV. ¶. 6. and the *Note* thereon.

† This is a high degree of melioration, to give a poor thin *German* Wine, the high flavour and richneſs of *Canary*.

‖ Somewhat of this kind I alſo obſerved in a particular compound red *Vinegar*, made with Poppy-Flowers, *&c.* and condenſed by freezing; but I have not obſerved that the fact holds in any reſpect of Vinegar thus condenſed after it is once diſtilled: which happens very well for chemical uſes. And thus *Wines* and *Vinegars* meliorate and gain a mellowneſs and richneſs from this operation, whilſt they retain their true vinous parts; and again, when theſe are ſeparated, the reſt becomes more durable and unalterable by repeated congelations.

more durable by concentration, and yet this durability is here confirm'd and proved from ſmall and inconſiderable quantities, wherein they always keep the worſt; it is obvious that if the operation were perform'd in large, a great bulk of the liquor thus concentrated, wou'd be ſtill immenſely leſs ſubject to alteration, from the air and heat; which are the two great incentives to fermentative motions: and that if ſuch ſmall parcels ſuffer'd no change for the worſe, much leſs would the larger *.

13. But as theſe *concentrated liquors*, by reaſon of their conſiderable proportion of ſaline and fine ſpirituous parts, have a leſs tendency to diſſolution and corruption; ſo, on the contrary, the aqueous part ſeparated from them, has a very ſtrong tendency thereto: for as it takes from the Wine, and carries off with it a little of the mucilaginous and unctuous part, and yet is almoſt wholly a mere moveable, fluid Water, that is the moſt active inſtrument of fermentative motion, it cannot but preſently fall into corruption †.

14.

* This reaſoning is not only juſt, but actually confirm'd by experience: and I have my ſelf long kept conſiderable quantities of concentrated Wines, without the leaſt alteration for the worſe, or any tendency thereto; even tho' no care were taken of the containing Veſſel; tho' it were not half filled, and often left unſtopp'd or the like. Nor is a high degree of concentration required to ſecure this end; tho' the higher it be carried, or the nearer to a rich ſyrupy conſiſtence the Wine is brought, doubtleſs the leſs ſubject to change or decay. And this rich, ſyrupy, or rather more viſcous or ſlimy, than truly ſyrupy conſiſtence, is the exact height, whereto condenſed Wines ſhould be brought, to receive their utmoſt perfection: As any thing under this, leaves ſome ſuperfluous or prejudicial aquoſity; and any thing over, a degree of ſolidity, unſuitable to the true and eſſential nature of a *vinous ſubſtance*.

† When the Wine is ſeparated by congelation into two parts, the one aqueous, and the other truly vinous, 'tis pleaſing to obſerve

Uſes of the Experiment.

14. This buſineſs of *Congelation* is not only applicable to immediate profit, but alſo paves the way to certain matters of curioſity; and ſhews one particular, which tho' not new, but antiently common and familiar, has yet grown ſtrangely into diſuſe, thro' the indolence of mankind.

15. As to the point of *immediate uſe*, it needs no explanation; for he muſt be very dull indeed, who does not immediately perceive that *Wines*, *&c.* by this Method may be reduced to any degree of vinoſity, ſtrength or perfection. Thus, for example, if a *Wine* of a moderate ſtrength have a third part of its Water taken away, in the form of ice, by congelation; the remaining part will thereby be doubled in ſtrength and goodneſs: for if in the better ſorts of Wines we allow, as we may, one third part to be good or truly vinous, and two third parts to be Water; then that one third good part is divided among the two aqueous parts: whence, if one of the two aqueous parts be taken away, that ſame third part before divided between the two Waters, now remains collected or condenſed, in a double proportion, along with but one of them †.

16.

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obſerve how ſoon the aqueous part corrupts, even tho' kept with the utmoſt care; whilſt the other remains ſound and unalter'd, for the longeſt time. I have ſeen this watry part in two or three days grow mouldy, fetid and nauſeous; unfit for all manner of curious uſes: inſomuch that if intended for Vinegar, or to be employ'd in a new brewing, it ſhould either be preſerved by art, and a particular encheireſis, or elſe be uſed directly.

† Every one muſt needs ſee the great benefit and advantage of this Experiment, reduced to a work in *Wine-Countries*; ſo as to have *concentrated Wines* ſent into foreign parts, inſtead of Wine and Water, or Wines loaded, and in a fair way of being ſpoiled by three or four times their own quantity of ſuperfluous

16. But if this *Condenſation* be carried up to the utmoſt, and practiſed in a large quantity, with a ſomewhat intenſe cold, it may perhaps reduce good Wines to a ſixth: and this ſmall quantity might commodiouſly be uſed as a quinteſſence to meliorate, improve, and even ſpecificate ſmaller and low-flavour'd Wines *. For which purpoſe, it is perfectly well ſuited: whereas *Glauber*'s method, with the quinteſſence or *eſſential Oil of Wine*, tho' prepar'd ever ſo curiouſly, from the moſt fragrant Wine, is no way proper to anſwer this end; but retains a nidorous and nauſeous flavour, different from a true vinous nature †.

17.

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fluous phlegm. But the buſineſs is how to freeze Wines in hot Wine-Countries: with regard to which, we only hint that in moſt Wine-Countries there are hills and mountains cover'd with ſnow all the year round. And wherever there is ſnow, no natural Philoſopher can, at this time of day, be at a loſs to freeze. So that the greater difficulty is, how to reduce the *concentrated Wines* again, without damage and loſs, or bring them back to their firſt ſize, and render them fit for the companionable Glaſs, and not leave them only fit to be uſed in the way of high cordial or ſweet-meat. For the bare addition of Water is not the perfect way: but a perfect way there is; and will be a little farther touched upon at the cloſe of this Section. In the mean time, if Merchants have not the addreſs to find their account in this diſcovery, I hope at leaſt Philoſophers, Phyſicians and Chemiſts may.

* I have by the uſe of a proper *freezing mixture* condenſed Wines in *England* ſtill farther than the degree here mention'd; and find no reaſon to think it impracticable in very large quantities: but then a curious hand, or a curious method ſhou'd be employ'd about it. And thus indeed a noble rich Eſſence, or Rob may be procured, capable of working almoſt miracles, as to the turning of Water into Wine, *&c.*

† A fine quinteſſence, however, is obtainable ſomewhat in *Glauber*'s manner, that mends poor Wines extremely, and gives a genuine or truly vinous flavour to ſuch as are taſteleſs; as I have found by experience. But for improving all the truly vinous parts of Wines, the imitating of *Champaign*, *Burgundy*, &c. in *England*, &c. nothing that I know of is comparable to this *Rob*, or perfectly *concentrated Wine*. And doubtleſs,

17. Many high Commendations have been beſtow'd upon the *Spirit of Wine of the Ancients*; and great things have been ſaid of the *Philoſophical Spirit of Wine*: And among other extraordinary Properties, it is celebrated for diſſolving Gold. *Paracelſus* mentions this famous Subſtance again and again; ſometimes covertly, ſometimes more openly; but moſt particularly and expreſsly in the ſixth Book *de Archidoxis*; and becauſe the original is *German*, and little read, we ſhall ſubjoin the whole paſſage, as containing ſomewhat extraordinary.

18. The Paſſage is this. "Obſerve, therefore, "that the *Spirit of the Wine*, ought to be pre- "ſerved along with the vinous *Subſtance of the* "*Wine*, and not with the *Phlegm:* for Wine "contains two Subſtances; the one *Vinous*, the "other *Phlegmy*. The vinous Subſtance is that, "wherein the Spirit of the Wine lies, and from "which it ſhould not be ſeparated; but the "phlegmy ſubſtance is a feculent recrementi- "tious part, or ſweet water, that ought to be "ſeparated from the true ſubſtance, as a Metal "from its ore, earth or droſs. Put therefore "a quantity of the oldeſt and beſt Wine, per- "fect both in colour and taſte, into a glaſs; "whereof it may fill a third part: ſeal the neck "*Hermetically*, and ſet it to digeſt in warm "Horſe-dung, for four months, without ſuffer- "ing it to cool. After this expoſe it, for a "month, to the cold of a ſevere froſty Winter, "that it may freeze; by which means the Spirit "of the Wine, together with its groſſer vinous "ſubſtance, will be driven into the middle of "the parcel, and ſeparated from the Phlegm; "which

doubtleſs, by means thereof, Men may have a Remedy for improving a bad Vintage, or mending the poor Wines of unſeaſonable *Years*, or unfavourable *Places* for Vines.

" which Phlegm is now to be thrown away:
" but what remains unfrozen, is the *Spirit of the*
" *Wine with its true Subſtance.* Put this into a Pe-
" lican, and let it ſtand to digeſt a while in mo-
" derately warm Sand; then take it out: and
" thus you will have the *Magiſtery of Wine* we
" ſpeak of *."

19. In other Places he mentions it under the name of *Concentrated Wine*, *Eſſence of Wine*, *Vinum Eſſatum*, *Alcohol*, *&c.* and frequently aſſerts, that *Spirit of Wine* is not an *inflammable liquor:* and with good reaſon declares it ſhould not be ſeparated from the vinous Subſtance; with many expreſſions to the like purpoſe. We are not, however, from hence highly conceited of this magiſtery; but know ſo much of it, as to judge it worthy the attention of Philoſophers, no leſs than that thing of like kind, the *Eſſence* or *Ens primum of Baulm*; which a certain modern author rejected upon the authority of *Paracelſus*; but credited upon the atteſtation of *le Febure*, who vouched to the ſucceſs of the thing. But this ſubſcribing to Teſtimony, rather than to Experience, is what ſuits extremely ill with Chemiſtry †. 20.

* It is not without apprehenſion that we inſert the two laſt Paragraphs from our Author; as being well aware of the ſlur it may poſſibly bring upon the whole Performance, in the judgment even of ſome very eminent Philoſophers, on account of the air it carries of the ſublimer Chemiſtry, and the attempts of thoſe vulgarly called the Adept. But we leave the thing to ſtand or fall by *Experiment*; which is the only *Criterion* to be allowed in *Chemiſtry*. We have no View of turning Mens Heads to vain Purſuits; but would gladly be inſtrumental in leading them on to moderate Things, of univerſal Uſe and Benefit. We therefore interpoſe not in the preſent Point; deſiring to gain a fair hearing in the lower matters we have to offer: which by degrees may pave the way to the higher; if there ſhall be any thing ſolid and uſeful found in them.

† The Author here appears to mean Mr. *Boyle*, who is as ſeverely charged by others, for giving too much credit to *Paracelſus:*

20. Moſt of the ancient *Chemical Philoſophers* profeſs they uſed *their Spirit of* Wine for diſſolving Gold; but it is certain, that our common Spirit of Wine has no ſuch effect: and if we may judge from *Rolfinck*, the Emperor *Rudolphus* employ'd this *Concentrated Wine* of *Paracelſus* for that purpoſe †. What *Vigani* ſays, as to the uſe of this Preparation, may be ſeen in his *Medulla Chymiæ*. But the philoſophical uſes of the Philoſophical Wine, are not to our preſent purpoſe: Tho' we cannot help recommending a ſtrict examination of theſe matters; and particularly what *Paracelſus* delivers upon the Subject.

21. To conclude, as to the direct and immediate uſe of our Method of Condenſation; he who has the *Secret*, by means of a *little*, *dry*, *powdry Body*, of turning Water into Wine; will not, perhaps, eaſily divulge the capital uſe he may make of this Experiment ‖.

Paracelſus: but the truth is, in things of this kind, he proceeded with great caution; and we do not find he had here any experimental knowledge of his own, to ſpeak from; otherwiſe he valued Teſtimony in matters of Philoſophy, but as a hint for farther Inquiry. What we have ourſelves ſeen of this Preparation, belongs not to the preſent Subject; and indeed requires to be better examin'd, before we can ſpeak to the purpoſe about it.

† See Rolfinck's *Chymia in Artis formam redact.* p. 184.

‖ Here is ſomewhat covertly, but candidly and philoſophically intimated the thing we mentioned above in our Note upon ¶. 15. of this *Sect.* The myſtery lies in the words *little*, *dry*, and *powdry*: and a chemical Philoſopher cannot well miſs of the Interpretation. The *Body* is common, and *England* abounds with it. 'Tis totally and tranſparently ſoluble in Water, fermentable, perfectly white, and ſweet as *Sugar*. But the Author goes not ſo far: and tho' we ſhou'd not have hit upon his meaning, we aſſert, from our own knowledge, the Fact here plainly delivered.

F I N I S.