The compound Corpuscles of the fermentable Subject being affected by the perpetual Motion of the Particles of the aqueous Fluid, a proper Degree of Motion is necessary, or that the Particles move with a proper Degree of Velocity, which principally depends on external Heat: Aconsiderable Degree of Cold, indeed, will not absolutely prevent Fermentation, though it will greatly retard it; and a boiling Heat will prevent it still more. A tepid, or middle Degree of Heat between Freezing or Boiling, is therefore the most proper for promoting and quickening the Operation.

The Admission of Air, also, though not of absolute Necessity, yet greatly promotes and quickens the Action, as being a capital Instrument in putting in a proper Degree of Motion the oily Particles of the Subject: But whilst the Air thus contributes to hasten the Effect, it causes at the same time by its Activity some remarkable Alterations in the oily Particles; for it not only moves, but absolutely dissolves and displaces them from their original Connexions; and thus carries them off with itself from the whole Mass. And, therefore, though the Consideration of the Air does not so properly belong to Fermentation in the general, yet it does in particular; as having an accidental Power to
of Distillation.

to alter every Species of this Operation: Consequently its Agency ought to be well understood, either to procure Alterations at pleasure in the fermenting Malt, or to prevent and correct impending Dangers.

The oily Particles thus separated and dissolved by the Air, are also elastic, though they probably derive that Property from their Intercourse with the Air itself, and their being rendered extremely minute.

Wherefore, therefore, an aqueous Fluid is added to a fermentable Subject exposed to a temperate Heat, a fermentative Struggle immediately arises, the saline Part of the compound Particles being dissolved by the continual intestine Motion of the Water, and carried up and down with it in all Directions, amidst an infinite Number of other Particles, as well fermentable, as aqueous ones; whence, by this Collision and Attrition, the saline Particles are dissolved, and separated from their Connexion with the oily and earthy. And as the oily Particles are the most subtle and elastic, they would, by this means, be thrown up to the Surface of the Liquor, and carried off by the Air, were they not closely connected with the earthy ones, whose Gravity prevents their Evaporation, and, by coming in contact with others of the same kind, form Aggregations,
Aggregations, and sink down, with the oily Particles, to the Bottom. But before these can form a Bulk too large to be supported by the Water, many of the oily Particles are, by their frequent Collisions with the aqueous Fluid, separated from the earthy ones; and, by Degrees, more strongly connected again with the saline ones; whilst, on the other hand, the same saline Particles imbibe some of the earthy ones, which being left single, upon their Separation from the oily Particles, floated about separately in the Fluid.

And hence proceed the several different Consequences of Fermentation; viz. 1. From the Separation of the saline Particles of the fermentable Subject proceeds the tart, saline, or acid Taste of the Liquor; which is more sensible at first, before the Liquor is duly composed and settled, or the due Arrangement and Connection of the saline Particles with those of the oily and earthy Kinds, completed: After which the Liquor proves milder, softer, or less pungent. 2. From the oily Particles being set at liberty, proceeds the strong Smell of the Liquor, and the Head or shining Skin upon the Surface. 3. The earthy Particles collecting together in Clusters, cause the Fluid to appear turbid, and afterwards a visible earthy, or clay-like Matter to be precipitated: And some
of Distillation.

Some of the earthy Parts, in their Motion, arriving at the Head, or oily Skin on the Surface, cause it to thicken; and afterwards taking it down along with it, thus constitute the Lees which abound in Oil. From this new Struggle or Collision, which is productive both of Solution, and a new Connection in the saline and earthy Corpuscles, proceeds the Ebulition in Fermentation. And, lastly, by the same repeated Coalition of the oily with the aqueous and saline Particles, the inflammable Spirit is produced.

Having thus laid down a concise Theory of Fermentation, we shall now proceed to the Practice.

The Wash being brought to a tepid, or lukewarm State in the Backs, a proper Quantity of a good-conditioned Ferment is added; but if the Ferment be solid, it should be previously broke into small Pieces, and gently thinned either with the Hand, Whisp, &c. in a little of the tepid Liquor. A complete and uniform Solution, however, should not be attempted, because that would greatly weaken the Power of the Ferment, or destroy its future Efficacy. The whole intended Quantity, therefore, being thus loosely mixed with a moderate Parcel of the Liquor, and kept in a tepid State, either by
by setting it near the Fire, or otherwise, and free from the too rude Commerce of the external Air; more of the insensibly warm Liquor ought to be added, at proper Intervals, till, at length, the whole Quantity is properly set to working together. And, thus, by dividing the Business into Parts, it may much more speedily and effectually be performed, than by attempting it all at once.

The whole Quantity of Liquor being thus set to work, secured in a proper Degree of Warmth, and defended from a too free Intercourse of the external Air, Nature itself, as it were, finishes the Process, and renders the Liquor fit for the Still.

By Ferments, we mean any Substance, which, being added to any rightly disposed fermentable Liquor, will cause it to ferment much sooner and faster than it would of itself; and, consequently, render the Operation shorter; in contradiction to those abusively called so, which only correct some Fault in the Liquor; or give it some Flavour. Hence we see, that the principal Use of Ferments is to save Time, and make Dispatch in Business; whilst they only occasionally, and, as it were, by Accident, give a Flavour, and increase the Quantity of Spirit. And, accordingly, any fermentable Liquor,
of Distillation.

Liquor, may, without the Addition of any Ferment, by a proper Management of Heat alone, be brought to ferment, and even more perfectly, though much slower, than with their Assistance.

These Ferments are, in general, the Flowers and Fæces of all fermentable Liquors, generated and thrown to the Surface, or deposited at the Bottom, either during the Act of Fermentation, or after the Operation is finished.

Two of these are procurable in large Quantities, and at a small Expence; we mean, Beer-Yeast and Wine-Lees; a prudent and artificial Management, or Use of which, might render the Business of Distillation much more facile, certain and advantageous.

It has been esteemed very difficult, and a great Discouragement, in the Business of Distillation, to procure a sufficient Stock of these Materials, and preserve them at all times ready for use. The whole Secret consists in dexterously freeing the Matter from its superfluous Moisture; because in its fluid State, it is subject to a farther Fermentation, which is productive of Corruption; in which State it becomes intolerably fætid and cadaverous.
The Method of exposing it to the Air till it has required a proper Consistence, is subject to great Inconveniencies; and so peculiar and careful a Management necessary, that it rarely succeeds.

The best Way, therefore, is to press it very slowly and gradually, in a thick, close, and strong Canvas Bag, after the manner of Wine Lees, by the Tail press, till it becomes a kind of Cake; which, though soft, will easily snap, or break dry and brittle between the Fingers. Being reduced to that Consistence, and closely packed up in a tight Cask, it will remain a long Time uncorrupted, preserve its Fragrancy, and consequently, fit to be used for fermenting the finest Liquor.

The same Method is also practicable, and to the same Advantage, in the Flowers or Yeast of Wine; which may be thus commodiously imported from abroad: Or, if these cannot be procured, others of equal Efficacy may be procured from fresh Wine Lees, by barely mixing and stirring them into a proper warm Liquor; whence the lighter, or more volatile and active Parts of the Lees, will be thrown to the Surface; and may easily be taken off, and preserved; by the above-mentioned Method, in any desired
desired Quantity. And hence, by a very easy Process, an inexhaustible Supply of the most useful Ferments may be readily and successively procured, so as to prevent for the future all Occasion of Complaint for want of them, in the Distiller's Business.

Experience has demonstrated, that all Ferments abound much more in essential Oil, than the Liquor which produced them; and consequently they retain, in a very high Degree, the Smell and Flavour of the Subject. It is therefore requisite, before the Ferment is applied, to consider what Flavour is intended to be introduced, or what Species of Ferment is most proper for the Liquor.

The Alteration thus caused by Ferments is so considerable, as to render any neutral fermentable Liquor, of the same Flavour with that which yielded the Ferment. This Observation is of much greater Moment than will presently be conceived; for a new Scene is hereby opened, both in the Business of Distillation, and others depending upon Fermentation. It must, however, be observed, that its Benefit does not extend to Malt, treated in the common Method; nor to any other Subject but what affords a Spirit tolerably pure and tasteless: For, otherwise, instead of producing a simple, pure,
pure, and uniform Flavour, it causes a compound, mixed, and unnatural one. How far the fine Stillers may profit by it, well deserves his Attention; and whether our native Cyder Spirit, Crab Spirit, &c. which have very little Flavour of their own, may not, by this Artifice, be brought nearly, if not entirely, into the State of some foreign Brandies, so highly esteemed, is recommended to Experience.

It is common with Distillers, in order to increase the Quantity of Spirit, give it a particular Flavour, or improve its Vinosity, to add several things to the Liquor, during the Time it is in a State of Fermentation; and these Additions may properly be reduced to Salts, Acids, Aromatics, and Oils.

All rich vegetable Juices, as Treacle, Honey, &c. which either want a natural Acid, have been deprived of it, or contain it in too small a Quantity, will be greatly improved by adding, at the Beginning of the Operation, a small Quantity of the vegetable or fine mineral Acids; as Oil of Sulphur, Glauber's Spirit of Salt, Juice of Lemons, or an aqueous Solution of Tartar. These Additions will either give, or greatly improve the vinous Acidity of the Subject, but not increase the Quantity of the Spirit, that
that Intention being performed by Aromatics and Oils.

All pungent Aromatics have a surprising Quality of increasing the Quantity of the Spirit, as well as in altering, or improving the Flavour; but their Use requires that the Fermentation should be performed in close Vessels. And if a large Quantity be intended to be added, Care must be taken not to do it all at once, lest the Oiliness of the Ingredients should check the Operation. But if the Flavour be the principal Intention, they should not be added till the Operation is nearly finished. After the same Manner a very considerable Quantity of any essential vegetable Oil may be converted into a surprisingly large Quantity of inflammable Spirit; but great Caution is here also necessary not to drop it too fast, or add too large a Quantity at a time, which would damp the Fermentation; it being the surest Method of checking, or totally stopping this Operation, at any Point of Time required. The best Method, therefore, of adding the Oil, so as to avoid all Inconveniencies, is to rub the Oil in a Mortar with Sugar, which the Chemists call making an Oleofasccharum, by which Means the Tenacity of the Oil will be destroyed, and the whole readily mix with the Liquor, and immediately ferment with it. The Distiller would do well
to consider these Observations attentively, as he may thence form an advantageous Method of increasing the Quantity of Spirits, and at the same Time greatly improve their Quality and Flavour.

But in order to put these Observations in practice, particular Regard must be had to the containing Vessel in which the Fermentation is performed, the Exclusion of the Air, and the Degree of the external Heat or Cold.

With regard to the containing Vessel; its Purity, and the Provision for rendering it occasionally close, are chiefly to be considered. In cleansing it, no Soap, or other unctuous Body should be used, for fear of checking the Fermentation; and, for the same Reason, all strong alkaline Lixiviums should be avoided. Lime-water, or a turbid Solution of quick Lime may be employed for this Purpose, without producing any ill Effect; it will also be of great Service in destroying a prevailing acetous Salt, which is apt to generate in the Vessels when the warm Air has free Access to them; and tends to pervert the Order of Fermentation, and, instead of a Wine or Wash, produce a Vinegar. Special Care must also be had, that no Remains of Yeast, or cadaverous Remains of former fermented Matters, hang about
of Distillation.

about the Vessels, which would infect whatever should be afterwards put into them; and cannot, without the utmost Difficulty, be perfectly cured and sweetened.

The occasional Closeness of the Vessels may in the large way, be provided for by Covers properly adapted; and, in the small way, by Valves, placed in light Casks. These Valves will occasionally give the necessary Vent to preserve the Vessel, during the Height of the Fermentation; the Vessel otherwise remaining perfectly close, and impervious to the Air.

It is a Mistake of a very prejudicial Nature, in the Business of Fermentation, to suppose, that there is an absolute Necessity for a free Admission of the external Air. The express contrary is the Truth, and very great Advantages will be found by practicing according to this Supposition. A constant Influx of the external Air, if it does not carry off some Part of the Spirit already generated, yet certainly catches up and dissipates the fine, subtile, or oleaginous and saline Particles, whereof the Spirit is made, and thus considerably lessens the Quantity. By a close Fermentation this Inconvenience is avoided; all Air, except that included in the Vessel, being excluded. The whole Secret consists in leaving a moderate Space for
the Air at the Top of the Vessel, unpossessed by the Liquor. When the Liquor is once fairly at work to bung it down close, and thus suffer it to finish the Fermentation, without opening or giving it any more Vent than that afforded it by a proper Valve placed in the Cask; which, however is not of absolute Necessity, when the empty Space, or rather that possessed by the Air, is about one tenth of the Gage; the artificial Air, generated in the Operation being then seldom sufficient to open a strong Valve, or at most not to endanger the Cask.

This Method may be practised to good Advantage by those whose Business is not very large; but it requires too much Time to be used by the large Dealers, who are in a manner forced to admit the free Air, and thus sustain a considerable Loss in their Quantity of Spirit, that the Fermentation may be finished in the small Time allowed for that Purpose. It may, however, be said, that the silent, slow, and almost imperceptible vinous Fermentation, is universally the most perfect and advantageous.

During the whole Course of this Operation, the Vessel should be kept from all external Cold, or considerable Heat, in an equal, uniform, and moderate Temperature. In the Winter, a Stove Room, such as is common
of Distillation.

mon in Germany, would be very convenient for this Purpose; the Vessel being placed at a proper Distance from the Stove: But at other Seasons no particular Apparatus is necessary with us in England, if the Place allotted for the Business be but well defended from the Summer's Heat, and the ill Effects of cold bleak northern Winds.

The Operation is known to be perfected when the hissing, or small bubbling Noise can be no longer heard, upon applying the Ear to the Vessel; and also by the Liquor itself appearing clear to Eye, and having a pungent Sharpness on the Tongue. And that it may fully obtain these Properties, and be well fitted to yield a pure and perfectly vinous Spirit by Distillation, it should be suffered to stand at rest in a somewhat cooler Place, if practicable, than that in which it was fermented; till it has thoroughly deposited and cleansed itself of the gross Lee, and become perfectly transparent, vinous and fragrant; in which State it should be committed to the Still, and the Spirit obtained will not only exceed that obtained in the common Way in Quantity, but also in Fragrance, Pungency, and Vinosity.

CHAP.
HAVING in the two preceding Chapters laid down the best Methods of Brewing and Fermentation, we shall now proceed to the Method of Distillation.

And in order to lead our Readers methodically through the Path which lies before them, we shall begin with explaining the Principles of Distillation; or, the Method of extracting the Spirituous Parts of Bodies.

To extract the Spirits is to cause such an Action by Heat, as to cause them to ascend in Vapour from the Bodies which detain them.

If this Heat be natural to Bodies, so that the Separation be made without any adventitious Means, it is called Fermentation, which we have already explained.

If it be produced by Fire, or other heating Power; in which the Alembic is placed, it is called Digestion, or Distillation: Digestion, if the Heat only prepares the Materials for the Distillation of their Spirits; and Distillation, where the Action is of sufficient
of Distillation.

sufficient Efficacy to cause them to ascend in Vapour, and distil.

This Heat is that which puts the insensible Parts of a Body, whatever it be, into Motion, divides them, and causes a Passage for the Spirits inclosed herein, by disengaging them from the Phlegm and the earthy Particles by which they are inclosed.

Distillation considered in this Light, is not unworthy the Attention and Countenance of the Learned. This Art is of infinite Extent; whatever the whole Earth produces, Flowers, Fruits, Seeds, Spices, aromatic and vulnerable Plants, odoriferous Drugs, &c. are its Objects, and come under its Cognizance; but we generally confine it to Liquids of Taste and Smell; and to the simple and spirituous Waters of aromatic and vulnerable Plants. With regard to its Utility, we shall omit saying any thing here, as we shall give sufficient Proofs of it in the Sequel.

CHAP. IV.

Of particular Distillation.

Distillation is generally divided into three Kinds; the first is called Distillation per ascensum, which is when the Fire, or other
other Heat, applied to the Alembic, containing the Materials, causes the Spirits to ascend. This is the most common, and indeed almost the only kind used by Distillers.

The second is called Distillation per descensum; which is, when the Fire being placed upon the Vessel precipitates, or causes the Spirit to descend. This Kind is hardly ever used by Distillers, but to obtain the Essence or Oil of Cloves.

The third is termed Distillation per latus, or oblique Distillation; but this being used only by the Chemists we shall say nothing farther of it here.

With regard to the different Methods of Distillation, occasioned by the different Vessels, or Materials made use of to excite Heat, improperly called Distillation; they are of various Kinds, and shall be explained as they occur in the Work.

There are various Kinds of Distillation, some of which arise from the different Constructions of Alembics; such are the Distillation by the common Alembic, with a Refrigeratory, the Glass Alembic, the serpentine Alembic, and the Retort: Others are produced from the Heat surrounding the
of Distillation.

the Alembic; such as the Distillation in Balneum Mariae, the Vapor, the Sand, the Dung, and the Lime Baths.

These different Methods of Distilling, we shall explain in enumerating the Operations in which they are most proper; and proceed to treat of the different Forms of Alembics and their Constructions.

C H A P. V.

Of Alembics, and their different Constructions.

The Alembic is a Vessel usually of Copper tined, which serves for, and is essential to all Operations in the Distillery.

There are several Sorts of Alembics, all different, either with regard to Matter or Form. As, the common Alembic with a Refrigeratory, the earthen and the glass Alembic, the Balneum Mariae, and the Vapor-Bath Alembic.

Every one of these being of a different Construction, are also used in different Operations.

The
The common Alembic consists principally of two Parts, the lower Part called the Body, and the upper termed the Head.

The Body consists of two Pieces, the lower called the Cucurbit, and the upper the Crown. The Cucurbit, or lower Part of the Body, is a kind of Receptacle proportioned to the Size of the Alembic, in which the Bodies to be distilled are placed.

The Crown, or upper Part of the Body, is also another Part of the Alembic; and is that Part of the Body to which the Head is immediately luted. But an Idea of these several Alembics will be much better attained from the following Figures, which represent them much stronger to the Imagination than is possible to be done by Words.

Fig. 1. Is a common Alembic, as it appears before it is placed in a Furnace, where a is the Bottom, b the Crown, c the Head.

Fig. 2. Is the Body without the Head; a the Rim or Top of the Crown, where the Head is luted.
Fig. 3. The Head; a the Rim where it is to be luted to the Body; b the Nose, or End which is luted into the Worm.

Fig. 4. The Worm, as it appears when out of the Tub in which it is fixed when in use; a the End into which the Still Head is inserted, b that which conveys the Liquor into the Receiver.

Fig. 5. Two Stills at work in one Refrigeratory; a, b the two Still Heads, c, d the Bodies inclosed in the Brick-Work, e, e the two Fire-Places; f, f the two Ash-Holes; g a Common Receiver; b a Spout Receiver, called by Chemists a Separating-Glass, used in the Distillation of Herbs, in order to extract their essential Oil; i a Crane for drawing the Water out of the Refrigeratory.

Fig. 6. A small Still with a Refrigeratory; a the Body, b the Head, c the Refrigeratory filled with Water, d the Receiver, luted to the Bec of the Alembic.

Fig. 7: A Glass Alembic to be used as a Balsamum Mariæ; a the Body, b the Head, c the Bec, which is to be luted to the Receiver, d a Trivet on which it is standing in the Water.
Fig. 8. A proper Receiver for the Glass Alembic, called by Chemists a Bolt-Head, or Matrafs.

Fig. 9. The Glass Alembic placed in a Copper Vessel; a the Copper Vessel filled with Water, b the Body of the Glass Alembic, c the Head, d the Receiver luted at e to the Bec of the Alembic.

Fig. 10. A cold Still for distilling simple Waters; a the Head, b the Bec, or Nose, c the Receiver, d the Plate on which Herbs are laid.

Fig. 11. A Vessel for Digestion, called by Chemists a Pelican or circulatory Vessel; a the Body, b the Head, c, c two Tubes, luted at d, d, by which the Liquor returns from the Head into the Body; e a Furnace on which it is placed, f the Fire-place, g the Ash-hole.

Fig. 12. Another Receiver, used when it is necessary to lute it to the End of the Worm, in order to prevent the most volatile Parts from being evaporated, and lost.
CHAP. VI.

Of the Accidents that too often happen in performing the Processes of Distillation.

Among the Accidents which frequently happen in Distilling, the least of all is for the Operation to miscarry and the Ingredients to be lost.

And this being a Subject of the greatest Importance we shall treat it with all possible Accuracy.

All Accidents are occasioned by Fire, their primary Cause; by want of Attention they get too much Head, and Fear often suffers them to become irremediable.

The first Accident which may happen by the Fire, is when a Distiller, by too great a Heat, causes the Ingredients to be burnt at the Bottom of the Still; by this Means his Liquor is spoiled by an empereumatic Taste, and the Tin is melted off from the Alembic. An Empereuma resembles the Smell of burnt Tobacco, and is produced in Liquors by too great a Degree of Heat. To illustrate this, distil any Fruit, Flowers, or any Aromatic whatever; but especially

D something
something whose Smell is very volatile, draw off only the best, unlute the Alembic, and what remains in the Still, will be found to have a very disagreeable Smell; whence it follows, that if a little more had been drawn off, it would have spoiled what was before obtained.

If the Fire be too violent, the extraordinary Ebullition of the Contents causes them to ascend into the Head; and, if a Glass Alembic, they fall ignited into the Recipient; the Heat breaks it, the Spirits are dissipated, and often take Fire from the Heat of the Furnace.

If the Fire be too strong, the Bottom of the Still becomes red hot, the Materials inflamed, and consequently the Fire reaches the Recipient.

When an earthen Alembic is used, the closest Attention is requisite to keep the Fire from burning the Materials at the Bottom. The Head, which is always of Glass, bursts, and the Spirits are spilt, and often catch fire. And the Remedy becomes the more difficult, as Earth retains the Fire much longer than a common Alembic.

If the Alembic be not firmly fixed, it is soon put out of Order, falls down and unlutes
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lutes itself; thus the Liquor is spilt, and the Vapour sets the Spirits on fire.

If all the Joints be not carefully luted, the Spirits at their first Effort issue through the least Aperture, run into the Fire, which is propagated into the Alembic by the Vapour.

In Distillations where the Phlegm ascends first, its Humidity penetrates the Lute, and loosens it, so that when the Spirituous Vapours ascend, they are exposed to the same Accident.

Lastly, when the Recipient is unluted, especially if near full, without the greatest Circumspection the Spirits will be spilt, and so catch Fire.

Hitherto I have only given a simple Account of what daily happens to Distillers; but the Consequences of these Accidents are infinitely more terrible than the Accidents themselves; for an Artist to lose his Time, his Labour and Goods, is no small Matter; but it follows from what we have premised, that both his Life and Fortune are in danger from these Conflagrations. Instances of the former are too common, as well as those of the latter, relating to the
Danger to which the Operator is exposed: They are evident, and we have seen very lately three Instances sufficient to intimidate the most faneous. The Spirits catch, the Alembic and Recipient fly, and the inflamed Vapour becomes present Death to all who breathe it.

The Rectifiers, who perform the most dangerous Operations of Distillery, are particularly exposed to these terrible Accidents; the Fineness of the Spirit at the same time that it renders it more inflammable, also causes the Fire to spread with the greater Rapidity. And when their Storehouses are once on fire, they are seldom or never saved.

Possibly I may be censured for my Conciseness on this Head; indeed the Importance of it requires the most particular Discussion; but intending to speak of the Methods proper to prevent these Accidents, I shall close this Chapter, with recommending the Subject of it to the Serious Reflection of all concerned in Distillation. And it being hitherto omitted, though of all others it requires the Attention of the Distiller, I shall further observe, that these Operations should never be left to Servants. What can be expected from ignorant Persons? Fear will seize