proceeds till he has fixed his whole Number of Bottles, which serve as Receivers to the Juice distilling from the Wounds. This Operation is generally performed in the Evening, a greater Quantity of Juice flowing from the Tree in the Night than in the Day. The Bottles are next Morning taken off, and the Liquor emptied with a proper Vessel, where it spontaneously ferments. As soon as the Fermentation is completed, the Liquor is thrown into the Still, and drawn down to a low Wine; but so very poor and dilute, that they are obliged to rectify it in another Still, to that weak kind of Proof Spirit, we generally see it; for though it appears Bubble-Proof, it rarely contains more than a sixth, and sometimes only an eighth of Alcohol, all the rest being no more than an acidulated Water, which might be supplied from any common Spring. Why Arrac appears Bubble-Proof, when in reality so far below what we mean by Proof, is not so great a Mystery, as at first Sight it appears to be; for this kind of Proof is entirely owing to a certain Tenacity of the Parts of the Liquor, or to the particular Property of the Oil incorporated in the Spirit; as we shall abundantly shew in a subsequent Chapter.

From this Account of Arrac, it should seem no very difficult Matter to imitate it here.
here. And, perhaps, the whole Difficulty lies in procuring a pure and insipid Spirit; for it is ridiculous to attempt it with our common Malt-Spirit. With regard to the Flavour of the Arrac, it may be effectually imitated by some essential Oils easily procurable.

Hence we see of what prodigious Advantage a pure and insipid Spirit would be of to Distillers, and consequently the great Encouragement there is to attempt the Discovery. Perhaps a Spirit of this kind may be extracted from Sugar properly refined. The Hint is worth prosecuting; and the Writer of this Essay, from repeated Experiments, is abundantly convinced that the Thing is practicable. Had he entirely succeeded, he would readily have communicated the Whole for the Benefit of his Country; but is now obliged to defer, to some future Opportunity, the Result of his Enquiries. In the mean Time, he would recommend the Prosecution of this Hint to those Distillers, who endeavour to improve their Art, and advance it nearer to Perfection.

Since Arrac is a Spirit extracted from the Juice of the Cocoa tree, it might perhaps be worth enquiring how nearly it might be imitated by fermenting and distilling the Juices
Juices of the Birch and Sycamore-trees. We should by this Means obtain an English Arrac; and, perhaps, a Spirit equal in Flavour to that imported from Batavia.

When the Cask, in which the Arrac is imported happens to be decayed; or the Liquor touches any Nails, or other Iron, it dissolves Part of it, and at the same time extracts the resinous Parts of the Oak, by which means the whole Liquor in the Cask acquires an inky Colour. In order to whiten and clarify Arrac, which has contracted this Colour, a large Quantity of new or skimmed Milk must be put into the Cask, and the whole beat together, as Vintners do to whiten their brown Wines; by this means the inky Colour will be absorbed by the Milk, and fall with it to the Bottom, so that the greatest Part of the Arrac may be drawn off fine; and the Remainder procured in the same Condition by being filtered through a conical Flannel Bag.

CHAP. XXIII.

Of Rectification.

There are several Methods of performing this Operation; though some, and indeed those in general practised by our Distillers, hardly deserve the Name; because...
instead of rectifying, that is freeing the Spirit from its essential Oil and Phlegm, they alter the natural Flavour of the Spirit that comes over in the Operation.

The principal Business of Rectification is to separate the Spirit from the essential Oil of the Ingredient, which is very apt to adhere strongly to the Spirit. And in order to this, Care should be taken in the first Distillation; that is, the Spirit, especially that from Malt, should be drawn by a gentle Fire, by which means great Part of the essential Oil will be kept from mixing with the Spirit; for Experience has abundantly proved, that it is much easier to keep asunder, than to separate them when once mixed.

But as it is almost impossible to draw low Wines without the Spirit being in some Measure impregnated with the essential Oil, it is absolutely necessary to be acquainted with some Methods of separating the Spirit from the Oil, and also of freeing it from its Phlegm. The best Methods of doing this to Perfection, are Re-distillation and Percolation.

In order to rectify low Wines, they should be put into a tall Body or Alembic, and gently distilled in Balneum Mariae; by this means
of Distillation. 91

means a large Proportion, both of the Oil and Phlegm will remain in the Body. But if the Spirit should be found, after this Operation, to contain some of the essential Oil, it must be let down with fair Water, and re-distilled in the same gentle Manner. And thus it may be brought to any Degree of Purity; especially if in the working the Spirit be suffered to fall into a proper Quantity of clear Water, and the Spirit afterwards rectified to the Height proposed. The same Method should be used in freeing Proof-Spirit, or even Alcohol, from this Oil; namely, by letting it down with clean Water to the Strength of low Wines, and re-distilling it in Balneum Mariae. But it must be remembered, that it is much more difficult to cleanse Alcohol, or Proof-Spirit than low Wines, because the Oil is more intimately mixed with the two former than with the latter. This Oil may however be separated from Proof-Spirit, &c. by the Method already proposed, especially if it be previously filtrated through Paper, thick Flannel, Sand, Stone, &c.

But this Method, though it effectively answers the Intention, is generally rejected by our Distillers, because of the Slowness of the Operation; and others substituted in its stead, though instead of freeing the Spirit from the Oil, they only abolish the natural Flavour
Flavour of the Spirit, and make a more intimate Mixture between the Particles of the Spirit, and those of the essential Oil.

It is impossible to enumerate all the Methods practised by Distillers, as almost every one pretends to have a secret Nostrum for this Purpose. The principal Methods in use for rectifying Malt-Spirits, are however reducible to three, namely, by fixed alcaline Salts, by acid Spirits mixed with alcaline Salts, and by saline Bodies, and flavouring Additions.

The Method of rectifying by alcaline Salts is thus performed. To every Piece of Proof-Spirit, add fourteen Pounds of dry Salt of Tartar, fixed Nitre, or calcined Tartar; lute on the Head, and distil, by a gentle Heat, but be very careful to leave out the Faints. By this Method a large Proportion of the foetid Oil will be left in the Still; and what comes over with the Spirit will be greatly attenuated. But this Operation is generally performed in a very different manner; for, instead of distilling the Spirit in a gentle and equable manner, the Still is worked in its full Force; by which means the Oil, which should have remained in the Still, is driven over, and intimately mixed with the Spirit; and, consequently, the whole Operation frustrated, and
of Distillation.

and the Spirit rendered much harder to cleanse than it was before.

But even when the Operation is performed according to the Rules of Art, it is far from being perfect; for it is well known, that Part of the fixed Salts become volatile in the Operation, pass over the Helm, and intimately mixes with the essential Oil still contained in the Spirits: by this means the Oil becomes more perfectly united with the Spirits, and consequently much harder to be separated by repeated Distillations. Nor is this all, for the Still being worked in its full Force, the bitter Oil of the Malt, formed into a kind of liquid Soap in the Still, by means of the alcaline Salt, is brought over the Helm with the Faints, and suffered to mix with the Spirit, whereby it is rendered almost as nauseous and ill-tasted as before the Operation. Besides, if this Operation were performed in its utmost Perfection, it would never answer the Intention; for the alcaline Salt destroys the Vinosity of the Spirit; and consequently deprives it of one of its most valuable Properties. Our Distillers are well acquainted with this Defect in the Operation, and endeavour to supply it by an Addition of Acids. This is what we call the second Method by Alcalies and Acids.
The Operation of rectifying by the Method of fixed Alcalies and Acids is the same as that above described; the Spirit is drawn over from fixed Alcalies as before; but in order to mortify the Alcali in the Spirit, and restore its Vinosity, a proper Quantity of some acid Spirit is added. Various kinds of Acids are used on this Occasion; but principally those of the mineral Kind, because of their Cheapness; as Oil of Vitriol, Spirit of Nitre, Oil of Sulphur, and the like. We would, however, caution a young Distiller from being too busy with these corrosive Acids, the sulphurous Spirit of Vitriol, dulcified Spirit of Nitre, or Mr. Boyle's acid Spirit of Wine well rectified, will much better answer his Purpose.

The third Method of Rectification is that by saline Bodies, and flavouring Ingredients. There is no Difference in the Operation between this and the two foregoing Methods; fixed alcaline Salts, common Salt decrепitated or dried, calcined Vitriol, Sandiver, Alum, &c. is put into the Still with the low Wines, and the Spirit drawn over as before. When the Quantity is drawn off, the flavouring Ingredients are added to give the Spirit the Flavour intended. But as the Spirit is not by this means rendered sufficiently pure, the disagreeable Flavour of the
the Spirit generally overpowers that of the Ingredients, whereby the whole Intention is either destroyed, or a compound Flavour produced, very different from that intended.

Some Distillers, instead of alcaline Salts, use quick Lime in rectifying their Malt Spirit; this Ingredient cleanses and dephlegmates the Spirit considerably; but like that rectified from alcaline Salts, it requires an alcaline Disposition, and also an nidorous Flavour. Acids, therefore, are as necessary to be mixed with those Spirits rectified with quick Lime, as with those rectified with an alcaline Salt. If Chalk, calcined and well purified animal Bones, &c. were used instead of quick Lime, the Spirit would have a much less alcaline or nidorous Flavour; and, consequently, the flavouring Ingredients might be added to it with more Success than can be expected from a Spirit rectified from alcaline Salts.

But, perhaps, if neutral Salts were used instead of the alcaline ones, the Spirit might be rendered pure, without contradicting an alcaline Flavour; soluble Tartar might be used for this Purpose, though the Spirit acquires from hence a little faponaceous Flavour. Dr. Cox has mentioned another Method
thod for this Purpose, namely, to deprive the volatile Salts of their Oil, by rendering them neutral with Spirit of Salt, and afterwards subliming them with Salt of Tartar: The Acid may be varied if the Spirit of Salt should not be found so well adapted to the Purpose as could be wished: But fine dry Sugar seems the best adapted to the Purpose of rectifying these Spirits; as it readily unites with the essentia Oil, detains and fixes it, without imparting any urinous, alcaline, or other nauseous Flavour to the Spirits rectified upon it.

Thus have I considered the principal Methods used by our Distillers in rectifying their Spirits; and shall conclude this Chapter with remarking, that there is no other Way of rectifying to Perfection besides what we first laid down, namely, by gentle Distillation. But then it must be remembered, that the whole Process must be of a Piece: We mean, that the first Distillation from the Wash must be performed in a gentle manner; for otherwise the essentia Oil will be so intimately blended with the Spirit, as not to be easily separated by Re-distillation. Another good Property attending this Method is its Universality; all kinds of Spirits, from whatever Ingredients extracted, require Rectification; and this is adapted to all kinds.
OF Distillation.

CHAP. XXIV.

Of the Flavouring of Spirits.

We have observed in the preceding Chapter, that the common Method of rectifying Spirits from alkaline Salts, destroys their Vinosity, and in its stead introduces an urinous or lixivious Taste. But as it is absolutely necessary to restore, or at least to substitute in its room some Degree of Vinosity, several Methods have been proposed, and a Multitude of Experiments performed, in order to discover this great Desideratum: But none has succeeded equal to the Spirit of Nitre; and accordingly this Spirit, either strong or dulcified, has been used by most Distillers to give an agreeable Vinosity to their Spirits.

Several Difficulties however occur in the Method of using it; the principal of which is, its being apt to quit the Liquor in a short Time, and consequently depriving the Liquor of that Vinosity it was intended to give. In order to remove this Difficulty, and prevent the Vinosity from quitting the Goods, the dulcified Spirit of Nitre, which is much better than the strong Spirit, should be prepared by a previous Digestion continued for some Time with Alcohol; the
longer the Digestion is continued the more intimately will they be blended, and the Compound rendered the milder and softer.

After a proper Digestion, the dulcified Spirit should be mixed with the Brandy, by which Means the Vinosity will be intimately blended with the Goods, and disposed not to fly off for a very considerable Time.

No general Rule can be given for the Quantity of this mineral Acid requisite to be employed, because different Proportions of it are necessary in different Spirits. It should, however, be carefully adverted to, that though a small Quantity of it will undoubtedly give an agreeable Vinosity resembling that naturally found in the fine subtle Spirits drawn from Wines, yet an over large Dose of it will not only cause a disagreeable Flavour, but also render the whole Design abortive, by discovering the Imposition. Those, therefore, who endeavour to cover a foul Taste in Goods by large Doses of dulcified Spirit of Nitre, will find themselves deceived.

But the best, and indeed the only Method of imitating French Brandies to Perfection, is by an essentail Oil of Wine; this being the very thing that gives the French Brandies their Flavour. It must, however,
however, be remembered, that in order to use even this Ingredient to Advantage, a pure, tasteless Spirit must be first procured; for it is ridiculous to expect that this essential Oil should be able to give the agreeable Flavour of French Brandies, to our fullsome Malt Spirit, already loaded with its own nauseous Oil, or strongly impregnated with a lixivious Taste from the alcaline Salts used in Rectification. How a pure insipid Spirit may be obtained has been already considered in some of the preceding Chapters; it only therefore remains to shew the Method of procuring this essential Oil of Wine, which is this:

Take some Cakes of dry Wine Lees, such as are used by our Hatters, dissolve them in six or eight times their Weight of Water, distil the Liquor with a slow Fire, and separate the Oil by the Separating Glass; reserving for the nicest Uses that only which comes over first, the succeeding Oil being coarser and more resinous.

Having procured this fine Oil of Wine, it may be mixed into a Quintessence with pure Alcohol; by which Means it may be preserved a long time fully possessed of all its Flavour and Virtues; but without such Management, it will soon grow resinous and rancid.

H 2 When
When a fine essentia Oil of Wine is thus procured, and also a pure and insipid Spirit, French Brandies may be imitated to Perfection with regard to the Flavour. It must, however, be remembered, and carefully adverted to, that the essentia Oil be drawn from the same sort of Lees, as the Brandy to be imitated was procured from; we mean, in order to imitate Coniac Brandy, it will be necessary to distil the essentia Oil from Coniac Lees; and the same for any other kind of Brandy. For as different Brandies have different Flavours; and as these Flavours are owing entirely to the essentia Oil of the Grape, it would be preposterous to endeavour to imitate the Flavour of Coniac Brandy, with an essentia Oil procured from the Lees of Bourdeaux Wine.

When the Flavour of the Brandy is well imitated by a proper Dose of the essentia Oil, and the Whole reduced into one simple and homogeneous Fluid, other Difficulties are still behind: The Flavour, though the essentia Part, is not however the only one; the Colour, the Proof and the Softness must be also regarded, before a Spirit, that perfectly resembles Brandy, can be procured. With regard to the Proof, it may be easily hit, by using a Spirit rectified
of Distillation. 101
tified above Proof; which, after being inti-
timately mixed with the essential Oil of
Wine, may be let down to a proper Stan-
dard by fair Water. And the Softness may
in a great Measure be obtained by distilling
and rectifying the Spirit with a gentle Fire;
and what is wanting of this Criterion in the
Liquor, when first made, will be supplied
by Time; for it must be remembered, that
it is Time alone that gives this Property to
French Brandies; they being at first, like
our Spirits, acrid, foul, and fiery. But with
regard to the Colour a particular Method is
necessary to imitate it to Perfection: And
how this may be done shall be considered in
the next Chapter.

C H A P. XXV.

Of the Methods of colouring Spirits.

T H E Art of colouring Spirits owes its
Rise to Observations on foreign Bran-
dies. A Piece of French Brandy that has
acquired by Age a great Degree of Softness
and Ripeness is observed, at the same time,
to have acquired a yellowish brown Colour;
and hence our Distillers have endeavoured
to imitate this Colour in such Spirits as are
intended to pass for French Brandy. And
in order to this a great Variety of Experi-
ments has been made on various Substances,
in order to discover a direct and sure Method of imitating this Colour to Perfection. But, in order to do this, it is necessary to know from whence the French Brandies themselves acquire their Colour; for till we have made this Discovery, it will be in vain to attempt an Imitation; because, if we should be able to imitate exactly the Colour, which is indeed no difficult Task, the Spirit will not stand the Test of different Experiments, unless the Colour in both be produced from the same Ingredient.

This being undeniably the Case, let us try if we cannot discover this mighty Secret; the Ingredient from whence the French Brandy acquires its Colour.

We have already observed, that this Colour is only found in such Brandies as have acquired a mellow Ripeness by Age; it is therefore not given it by the Distiller, but has gained it by lying long in the Cask. Consequentially, the Ingredient from whence this Colour is extracted, is no other than the Wood of the Cask, and the Brandy in reality is become a dilute Tincture of Oak.

The common Experiment used to prove the Genuineness of French Brandy proves, that this Opinion is well founded. The Ex-
Experiment is this: They pour into a Glass of Brandy a few Drops of a Solution of calcined Vitriol of Iron in a diluted Spirit of Sulphur, or any other mineral Acid, and the Whole turns of a blue Colour; in the same Manner, as we make Ink of a Tincture of Galls and Vitriol.

Since, therefore, the Colour of French Brandies is acquired from the Oak of the Cask, it is no Difficulty to imitate it to Perfection. A small Quantity of the Extract of Oak, or the Shavings of that Wood properly digested, will furnish us with a Tincture capable of giving the Spirit any Degree of Colour required. But it must be remembered, that as the Tincture is extracted from the Cask by Brandy, that is Alcohol and Water, it is necessary to use both in extracting the Tincture; for each of these Menstruums dissolves different Parts of the Wood. Let, therefore, a sufficient Quantity of Oak Shavings be digested in strong Spirit of Wine; and also at the same Time other Oak Shavings be digested in Water: And when the Liquors have acquired a strong Tincture from the Oak, let both be poured off from the Shavings, into different Vessels, and both placed over a gentle Fire till reduced to the Consistence of Treacle. In this Condition, let the two
Extracts be intimately mixed together, which may be done effectually by adding a small Quantity of Loaf Sugar, in fine Powder, and well rubbing the Whole together. By this Means a liquid essential Extract of Oak will be procured, and always ready to be used as Occasion shall require.

There are other Methods in Use for colouring Brandies; but the best, besides the Extract of Oak above-mentioned, are common Treacle and burnt Sugar.

The Treacle gives the Spirits a fine Colour, nearly resembling that of French Brandy; but as its Colour is but dilute, a large Quantity must be used; this is not however attended with any bad Consequences; for notwithstanding the Spirit is really weakened by this Addition, yet the Bubule Proof, the general Criterion of Spirits, is greatly mended by the Tenacity imparted to the Liquor by the Treacle. The Spirit also acquires from this Mixture a sweetish or luscious Taste, and a Fulness in the Mouth; both which Properties render it very agreeable to the Palates of the common People, who are, in fact, the principle Consumers of these Spirits.
of Distillation.

A much smaller Quantity of burnt Sugar than of Treacle will be sufficient for colouring the same Quantity of Spirits; the Taste is also very different; for, instead of the Sweetness imparted by the Treacle, the Spirit acquires from the burnt Sugar an agreeable Bitterness, and by that Means recommends itself to nicer Palates, which are offended with a luscious Spirit. The burnt Sugar is prepared by dissolving a proper Quantity of Sugar in a little Water, and scorching it over the Fire till it acquires a black Colour.

Either of the above Ingredients, Treacle or burnt Sugar, will nearly imitate the genuine Colour of old French Brandy; but neither of them will succeed, when put to the Test of the vitriolic Solution.

Thus have I traced the Subject of Distillation from its Origin; shewn the Methods commonly made use of by Distillers, and pointed out various Improvements, that might be introduced into this Art with great Advantage; and shall conclude this Part with recommending the several Hints to those Distillers who are desirous of improving their Art, and proceeding on a rational Foundation, it being from such only that
that Improvements are to be expected; for where the Operations are constantly carried on in the same beaten Tract, it is in vain to expect Improvements, unless Chance should be kind enough to throw that in their Way, which a rational Theory would have easily led them to discover.
A Complete System of Distillation.

PART II.

Containing the Method of distilling Simple Waters.

CHAP. I.

THE Instruments chiefly used in the Distillation of Simple Waters, are of two Kinds, commonly called the Hot Still, or Alembic, and the Cold Still; the former is represented in Fig. 5, and the latter in Fig. 10.
The Waters drawn by the cold Still from odoriferous Plants are much more fragrant, and more fully impregnated with their Virtues than those drawn by the hot Still, or Alembic; but the Operation is much more slow and tedious by the former than the latter, so that very few care to comply with it: And, therefore a Method has been invented, to avoid the Tediums of the one, and the Inconveniencies of the other. The Method is this:

A Pewter Body is suspended in the Body of the Alembic, and the Head of the Still fitted to the Pewter Body: Into this Body the Ingredients to be distilled are put, the Alembic filled with Water, the Still Head luted to the Pewter Body, and the Nose luted into the Worm of the Refrigeratory or Worm.

The same Intention will be answered, by putting the Ingredients into a Glass Alembic, and placing it in a Bath Heat, or Balneum Mariae; as we have before directed, Chap. XI.

By either of these Means, the Ingredients have greater Heat given them than in the cold Still; and yet, by the Interposition of the Water, in which the Vessel, containing
containing them is placed, they are not so forcibly acted upon by the Fire, as in the common Way of the hot Still. So that all those Things which require a middle Way between the other; that is, those Simples which are of a Texture between very volatile, and very fixed, are treated very properly by this Method; but neither the very odoriferous Simples, nor those whose Parts are very heavy and fixed, can be treated this Way but to Disadvantage.

One of the greatest Advantages of this Contrivance is, that Waters so drawn come over much cooler than from the hot Still; that is, they have not so much of the Fire in them, as the Distillers term it; so that a hot spicy Water, thus ordered, will taste as cool on the Palate when just drawn, as it would, when drawn by the hot Still, after it had acquired a considerable Age.

CHAP. II.

Of Waters drawn by the cold Still.

The cold Still is much best adapted to draw off the Virtues of Simples, which are valued for their fine Flavour when green, which is subject to be lost in drying. For when we want to extract from Plants a Spirit so light and volatile, as not
to subsist in open Air any longer than while the Plant continues in its Growth, it is certainly the best Method to remove the Plant from its native Soil, into some proper Instrument, where, as it dries, these volatile Parts can be collected and preserved. And such an Instrument is what we call the cold Still, where the drying of the Plant or Flower, is only forwarded by a moderate Warmth, and all that rises is collected and preserved.

As the Method of performing the Operation by the cold Still, is the very same, whatever Plant or Flower is used, the following Instance of procuring a Water from Rosemary, will be abundantly sufficient to instruct the young Practitioner in the manner of conducting the Process in all Cases whatever.

Take Rosemary, fresh gathered, in its Perfection, with the Morning Dew upon it, and lay it lightly and unbruised upon the Plate, or Bottom of the Still. Cover the Plate with its conical Head, and apply a Glass Receiver to the Nose of it. Make a small Fire of Charcoal under the Plate, continuing it as long as any Liquor comes over into the Receiver. When nothing more comes over, take off the Still Head, and remove the Plant, putting fresh in its stead,
of Distillation.

stead, and proceed as before; continue to repeat the Operation successively, till a sufficient Quantity of Water is procured. Let this distilled Water be kept at Rest, in clean Bottles close stopped, for some Days in a cold Place; by this Means it will become limpid, and powerfully impregnated with the Tasteful and Smell of the Plant.

In this Water are contained the Liquor of Dew, consisting of its own proper Parts, which are not without Difficulty separated from the Plant, and cleave to it even in the drying. This Dew, also, by sticking to the Outside, receives the liquid Parts of the Plant, which being elaborated the Day before, and exhaling in the Night; are hereby detained; so that they concretely together into one external Liquid, which is often viscid, as appears in Manna, Honey, &c. This Water also contains the Fluid, which exhales from the Vessels of the Rosemary, and which principally consists of simple Water, as appears upon long standing in an open Vessel, when the Taste and Odour vanishing, leave an insipid Water behind. Another Part of this Water is that subtile, volatile Substance, which give the Plant its peculiar Taste and Odour; for this the Senses discover in it; but what remains after the Process is finished, scarce afford any thing thereof. The fame Water seems also