of Distillation.

Seize them, when the greatest Presence of Mind is requisite.—Let us now proceed to the Methods of preventing, or at least lessening their Effects.

C H A P. VII.

Of the Methods of preventing Accidents.

To have informed the Reader of the Accidents which happen in Distilling, would have been of little Consequence, without shewing, at the same Time, the Methods of preventing them. In order therefore to fortify him against the Terror, which the foregoing Chapter may have excited, we will here point out the Remedies for all the Cases before specified.

To prevent Accidents, two Things especially must be known, and adverted to.

1. The Knowledge of the Fire, which depends on the Fuel, whether Wood or Coal.

2. The Manner of luting so as to prevent the Vapours from escaping through it, and by that Means of setting the whole on fire.

D 2 The
The hardest Wood generally makes the quickest Fire, such as Beech, Oak, Holm, Elm, &c. The white Woods, as the Ash, the Poplar, the Willow, and the Birch, make a milder Fire. This holds good also of the Coal made of these two kinds of Wood; and, consequently, the Nature of the Wood or Coals must determine the Fire, and the Action of this must be proportioned to the Effect intended to be produced by it. That is, the Capacity of the Alembic, the Matters to be distilled, and their Quantity. The same may also be said of Pit Coal, which is generally used in England.

It is evident, that the larger the Alembic, the more Fire is necessary. What has not been digested, also, requires more Fire than that which has been prepared by that Operation. Spices require a stronger Fire than Flowers; a Distillation of Simple Waters more than that of spirituous Liquors.

The surest Way of ascertaining the necessary Degree of Fire, is to regulate it by the Materials, as they are more or less disposed to yield them Spirits, &c. and this is done as follows. The Operator must not leave the Alembic, but attentively listen to what passes within, when the Fire begins to heat it. When the Ebulition
of Distillation.

Distillation becomes too vehement, the Fire must be lessened, either by taking out some of the Fuel, or covering it with Ashes or Sand.

It requires a long Experience in the several Cases, before a Distiller can acquire a competent Knowledge in this important Point. Nor is it possible to determine the Degree of Fire from the Quantity of Fuel; Judgment, assisted by Experience, must supply this Defect.

Every thing being determined with regard to the Degree of Fire, we shall now proceed to explain the Method of luting Alembics.

By the Term luting an Alembic, we mean, the closing the Joints through which the Spirits might transpire.

Lute is a Composition of common Ashes, well sifted, and soaked in Water; Clay, and a kind of Paste made of Meal or Starch are also used for this Purpose; which, as I before observed, is to close all the Joints, &c. in order to confine the Spirits from transpiring.

Good Luting is one of the surest Methods of preventing Accidents. An Alembic, where
where all Transpiration is prevented, having nothing to fear but the too great Fierceness of the Fire; and that may be regulated by the Rules already laid down.

The refrigerating Alembic is mostly used. The Body and the Head are joined to each other; but notwithstanding the greatest Care be taken in luting the Juncture, there will still be some imperceptible Interstice for Transpiration; and the least being of the greatest Consequence, a Piece of strong Paper, should be pasted over the Joint, and the Alembic never left, till the Spirits begin to flow into the Receiver, in order to apply fresh Paper, if the former should contract any Moisture. The Master himself should carefully attend to this, and whatever Precaution may have been previously used, the Eye must be constantly upon it.

The Alembic, when vinous Spirits are distilled, should be luted with Clay, carefully spread round the Junctures, in order to prevent all Transpiration; because the Consequences here are terrible; for when the Fire catches a large Quantity, it is often irremediable. Besides, as this Earth cracks in drying, it must be often moistened, and fresh applied, on the first Appearance of any Occasion for it.
The Retort is also luted with Clay; but as glass Retorts are also used, they are often coated with the same Clay, to prevent their melting by the Intenseness of the Fire.

Lastly, the earthen and glass Alembics are luted with Paper and Paste as above.—Having thus explained the great Consequence of Circumpection with regard to Luting, and the Degree of Fire, we shall now proceed to a third Method of preventing them, and close this Chapter with a short Observation on portable Furnaces; which is, That Alembics being never thoroughly secure on this kind of Furnaces, a Hook should be fastened to the Refrigerant for fixing it to the Wall.

CHAP. VIII.

Of the Remedies for Accidents, when they happen.

Notwithstanding the best of Rules, and the strictest Observation, it is impossible entirely to prevent Accidents, and therefore it is of no less Importance to point out the Remedies on those Occasions.

The most essential, are Courage and Presence of Mind; Fear only increasing the Misfortune.
1. If the Fire be too violent it must be covered, but not so as totally to prevent its Action, as by that Means the Process of the Distillation would be interrupted, and render it more difficult and less perfect.

2. When the Ingredients burn, which you will soon discover by the Smell, the Fire must be immediately put out, in order to prevent the whole Charge of the Still being entirely spoiled, which would otherwise inevitably be the Consequence.

3. If the Spirits should catch fire, the first care is to unlute immediately the Receiver, and stop both the End of the Beak and Mouth of the Receiver with wet Clothes.

The Fire must then be put out, and if the Flame issued through the Luting, the Joints must be closed with a wet Cloth, which, together with Water, should never be wanting in a Distill-house.

4. If the Alembic be of Earth, and the Contents burn at the Bottom, the Fire must immediately be put out, the Alembic removed, and Water thrown upon it, till the Danger is over; and, for farther Security, covered with a wet Cloth.

5. If
5. If after all your Care in closing the Juncatures to prevent Transpiration, you perceive any thing amiss, while the Spirits are ascending, apply Clay, or any other Composition, in order to stop the Aperture, and have always a wet Cloth ready to stifle the Flame, if the Spirits should take fire.

6. If the Heat detaches the Lute, or it becomes moist, immediately apply another, having always ready what is necessary for performing it. Should the Transpiration be so violent, that you cannot immediately apply a fresh Lute, clap a wet Cloth round the Joint, and keep it on firm and tight, till the Spirits have taken their Course. But if notwithstanding all your Efforts the Transpiration should increase, so that you fear a Conflagration, remove the Receiver as soon as possible from the Fire, and afterwards your Alembic, if portable; but if otherwise, put out the Fire immediately.

7. The Charge being worked off, be cautious in luting the Receiver, that nothing be spilt on the Furnace, and carry it to some Distance from it, that the Spirits exhaling may not take fire.

8. Lastly observe, that wherever a Remedy is required, there must be no Candle used;
used; for the spirituous Vapours easily take
fire, and propagate the Flame to the Vessels
from whence they issue.

All that has been hitherto said concerns
only the Management of the Alembic; but
what remains is still more interesting, and
relates to those who work it, that they may
not, by conquering the Accident, destroy
themselves.

On discovering any of the above Acci-
dents, when the Flame has not yet reached
the Spirits, let the Remedies already men-
tioned be applied, either with regard to the
Lute, or the Violence of the Fire.

But if the Flame has reached the Alemb-
ic, the following Precautions are to be
used.

The Operator must not approach the
Alembic without a wet Cloth over his
Mouth and Nostrils, it being immediate
Death to inhale the inflamed Vapour.

In hastening to stop any Accident, be
careful to approach the Side opposite to that
whither the Air impels the Flame; for,
without this Precaution you would be in-
volved in it, and could not, without the ut-
most Difficulty, extricate yourself from it.
If notwithstanding this Precaution, the Eddy of the Air should force the Flame to your Side, quit the Place immediately, and do not return till its Direction be changed, always taking care to have a wet linen Cloth before your Nose and Mouth, and keep yourself on the Side opposite to the Direction of the Flame: And also to have another such Cloth, in order to smother the Flame, and close the Crevise through which the Spirits issue.

Should it be your Misfortune to be covered with inflamed Spirits, wrap yourself in a wet Sheet, which should be always ready for that Purpose. Self-Preservation is of too great Importance that any of these Precautions should be omitted in such Variety of Dangers.

If the Fire has acquired such a Head that it cannot be stopp’d, the Receiver must be broke, and the Alembic, if portable, thrown down; but no Person must be suffered to go near them, especially those who are Strangers to the Business.

In a desperate Case, like that of a large Quantity of rectified Spirit taking Fire, if Time permit, the Communication of the Beak of the Alembic with the Recipient, which is usually a Cask, must be cut off, by closely
closely stopping the Bung; and be sure no Candle come near the Receiver, leaving the rest, as the Danger would be too great to expose ones self to the Flames of a large Charge, and the Distiller's Safety should be principally considered.

I thought it my Duty to give my Reader these Informations, and hope that in the Practice of Distillation, he will find them of great Advantage.

CHAP. IX.

On the Necessity of often cooling the Alembic, as another Means of preventing Accidents.

The Refrigerant is so essential a Part of the Alembic, that for want of it several other Expedients are made use of to perform its Office, for cooling those whose Capacity, Brittleness, or lastly the Construction, will not admit of their having any.

The Refrigerant is usually in proportion to the Capacity of the Alembic, for which the following may serve as a Rule, that the Capacity of the Refrigerant should be to that of the Alembic, as 14 to 8.

The Necessity of cooling the Head of the Alembic is self-evident to all who have the
of Distillation.

the least Knowledge of Distillation, as it condenses the Spirits, cools them, and causes them to flow into the Receiver, which, if of Glass, would otherwise be broken by the Heat; and consequently serves to prevent Conflagrations.

The Alembics of the Balneum Maria, and the Vapour Bath, ought also to have Refrigerants, like the common Alembic, unless they are of Glass.

Those of Earth and Glass are cooled, as we have already observed, with a wet Cloth, which is also used to cool the Head of other kinds of Alembics. But it is not difficult to contrive one which may be placed in a Refrigerant; such as the following.

To a common small Still apply and lute a Worm, or long tin or pewter Tube, forming several Circumvolutions, of the same Circumference with the Body, in order to give it some Elevation, place this Worm in a Refrigerant, proportioned to the Alembic. If the Capacity of this Alembic should make it bear too much on the Neck of the Matras, it may be supported by a Trevit of the same Circumference as the Body itself: The Extremity of the Worm may have a Beak projecting beyond the Side of the Refrigerant, for conveying the Spirits into the Receiver.

This
This Apparatus will be attended with little Expence, will save the Distiller the Trouble of being perpetually cooling the Head of the Alembic, and is such a Safeguard against Accidents, that if the Worm be well luted, nothing need be apprehended but from the Violence of the Fire.

This Method of Practice, therefore, is productive of three valuable Particulars: The first is, that by cooling the Spirits it preserves the Receiver, and obviates the Accidents arising from their Heat. The second is, that the Spirits being kept in a moderate Heat, the Transpiration is less, and consequently the Spirits procured by the Operation have more Taste, Smell and Fragrancy than they would otherwise have had.

Experience demonstrates, that when the Spirits flow hot into the Receiver, however attentive the Distiller may be to lute the Juncatures of the Alembic, there will be a very sensible Evaporation, which even in simple Waters greatly depreciates the Goodness of the Liquor.

Lastly, the third is, that the Cooling of Alembics is what principally contributes to the Perfection of the Operation; because
the Coolness of the Head precipitates the Phlegm, and in the Case of too great a Degree of Fire, and where the Ebullition is too vehement, if after taking away Part of the Fire, or covering it, the Ebullition should continue, the Head may be cooled with a wet Cloth, till the Ebullition is reduced.

As there is a Necessity of cooling the Alembic; so what we have said cannot be too carefully observed. In fine, the Contrast of Cold and Heat, equally concurring, but by Methods directly opposite, to the same Process, and the Perfection of the Distillation, is a Phænomenon, which deserves the Attention of all who study the Operations of Nature.

CHAP. X.

Of the Necessity of putting Water into the Alembic, for several Distillations.

Two principal Advantages attend putting Water into the Alembic. The first is, to prevent the Loss the Distiller would incur without that Precaution, and so prevent any Alteration in the Liquor procured by Distillation. This we shall illustrate by an Example. Suppose a Distiller should attempt to rectify Spirits of Wine, without putting Water in the Alembic. It is
is evident, that the Fire will consume Part of it, which is entirely loss, because the same Quantity of Spirit cannot be procured from it, which might, had there been any thing to moderate the Action of the Fire, which now preyed upon it.

Secondly, If Liquors are impregnated with strong Ingredients, especially Seeds, and the Quantity be sufficient to absorb all the Phlegm, a great Quantity of Spirit must be left in the Still, or the Ingredients will burn, and the Spirits contract an empyreumatic Taste, which is the more detrimental to the Spirit, as it is increased by Age.

Thirdly, If no Water be put into the Alembic with the Ingredients, the Spirit will be rendered finer by them, and the Fire, if ever so little too strong, will cause the Ingredients to burn, and the Spirits to contract an Empyreuma; a Misfortune easily prevented by this Precaution.

Thus it is a Safe-guard against Accidents: But besides, Water being mixed with the Ingredients, they are at once prevented from burning, and the Spirit not weakened; for no sooner are the Ingredients put in Motion by the Fire, than the Spirits immediately ascend, and the Liquor loses nothing of its Quality, provided the Receiver be removed as soon as the Phlegm begins to ascend.
The Water therefore prevents the Waste of the Spirits, and thus the Distiller loses nothing of his Goods; whereas, without Water, the Spirits by impregnating the Materials, their Quantity must be less. With regard to the Phlegm, there is no Difficulty in finding when it begins to ascend, the first Drop being cloudy, and when it has continued dropping for some time, it is perceived by a milky Cast at the Bottom of the Receiver.

Lastly, the Distiller is no Loser with regard to the Quality of his Liquor, which is not at all weakened thereby. Thus it is attended with the two capital Advantages, the Profit of the Distiller, and the Perfection of the Liquor. Let us now proceed to the different Manners of Distillation.

**CHAP. XI.**

Of the particular Advantages attending every kind of Distillation.

In the third Chapter we mentioned the several kinds of Distillation, we shall here enlarge on the particular Advantages of each, and in what Circumstances each is to be used.
In order for Distillation, the Alembic must be charged with Materials, and placed on a Fire, or Substances capable of producing the same Effect.

The Method of Distilling with the common refrigerant Alembic.

This Method of Distilling is the most generally used, being one of the most speedy and profitable, as it requires fewer Preparatives, and less Time.

To distil with the common Alembic, the Body of it must be thoroughly cleansed, that no Taste or Smell of any preceding Materials may remain. The Materials are then to be put into the Alembic; but care must be taken that the Alembic be not above half full, in order that the Materials may have sufficient Room to move, without choking the Neck of the Alembic. The same Care must be taken with regard to the Head, it must be thoroughly cleansed and dried; for it often happens that some small Quantity of Water is left in the Rim, which renders the first Spirits foul, and, by endeavouring to separate it from the other, some, and that the most volatile Part of the Spirit, will be lost.
After this the two Parts of the Alembic are to be carefully luted with strong brown Paper, well pasted on, and the Nose of the Alembic luted to the Worm; after which the Fire should be immediately made under the Still, left too long an Infusion should prejudice the Liquor.

This Alembic being worked on an open Fire, the Operation is quicker than any other; but the Degree of Fire requires a very close Attention; as a different Management is necessary to different Materials. The Water of the Refrigeratory must be changed from time to time, and if the Case requires it, the whole Head, but especially the Bec, must be kept cold.

Of Distillation in Sand, and in what Cases it should be used.

This Species of Distillation is performed in two different Manners. First, by covering the Fire with Sand or Ashes, and placing the Alembic upon it. This Method is very necessary in Digestion, and for the perfect Rectification of Spirits. Sand is absolutely necessary for moderating the Action of the Fire, when there is Reason to fear the Matter contained in the Bottom of the Alembic will burn.
The second Method of Sand Distillation, is to take the finest River Sand, and after thoroughly washing it, put into the Alembic a Quantity sufficient to cover it three Fingers deep; after which the Still is to be charged with the Ingredients to be distilled. This serves instead of Water in certain Cases, where the Use of it would prejudice the Ingredients; as in the fine spirituous Waters impregnated with the aromatic Parts of Flowers; the Sand preventing the Ingredients from burning. It is also necessary in distilling rectified Spirits from Seeds.

This Operation being finished, the Alembic must be thoroughly cleansed from the Sand, that the Taste or Smell contained therein, be not communicated to any other Charge of different Ingredients.

Of Distilling in Balneum Mariae, and its Advantages.

This Method of Distillation is of great Use in several Cases. Its Operation is more perfect, and is subject to few, if any of those Accidents attending Distillations on an open Fire.

In distilling sweet-scented Waters from Flowers, aromatic Plants, and others of that
that kind, where neither Water, nor Spirit ought to be mixed with them, there is an absolute Necessity for using the Balneum Mariae; as by every other Distillation, on an open Fire, the Ingredients would infallibly burn.

If Sand should be made use of, the Fire would melt the Tin from the Alembic, and the Contents be in the utmost Danger of being burnt.

In distilling in Balneum Mariae, a glass Alembic is generally used. This Alembic is to be placed in a Copper Vessel filled with Water. This Vessel ought at least to be of half the Height of the Alembic: at the Bottom of the Copper Vessel must be a Trivet on which the Alembic is to be placed, that it may not touch the Bottom of the Copper, because when the Water begins to boil, it disperses itself towards the Sides, and leaving the Bottom dry, the Ingredients would be in danger of burning.

The Use of the Balneum Mariae is excellent for those Ingredients which require little Spirit; but if a Copper Alembic be used, be sure to place Sand at the Bottom, that the distilled Liquor may not contract any ill Taste or Smell. This Method is also adviseable in the Rectification of Spirits.
on Account of the Danger attending this Operation when performed on a naked Fire.

Were this Method of Distillation as expeditious as that performed on a naked Fire, no other ought to be used; because it is subject to no Accidents, and at the same Time the Spirit, &c. distilled is much more fragrant and grateful.

In what Cases glass, or earthen Alembics are to be used; their Advantages and Disadvantages.

In the Chapter relating to Accidents, we have mentioned the earthen Alembic; we must now add, that it ought never to be used, except the Matter to be distilled have a strong and bad Smell, and then seldom above once, unless it be for Ingredients of the same or similar Qualities.

This Alembic being very difficult to be managed, we can only recommend it in the Case above-mentioned.

As a naked Fire is generally applied to this Alembic, it requires a Furnace where the Fire may be gradually increased, on account of the Accidents to which it is liable.

The
The glass Alembic is more easily managed, as it is generally placed in a Balneum Mariae; Its principal Use is for distilling Waters from Flowers, and making Quintessences; and were it not for the Length of the Operation, it would be preferable to any other Method.

This Alembic hardly admitting of a Refrigerant, a wet linen Cloth must be placed on the Head, and often changed.

The Receiver of this Alembic must not be very large, because of the Fragility of the Bec; but if it were ever so little bent into a Curve, the Largeness of the Receiver would be of no Prejudice; because then its whole Weight would be supported by its Stand.

Advantages of Distillation performed by the Vapour Bath.

This Method differs very little from the Balneum Mariae, and is used nearly in the same Circumstances; but has greatly the Advantage of the Balneum Mariae in the Quickness of the Operation. And Lemery, in the first Part of his Course of Chemistry, affirms its Operation to be more perfect.

However
However that be, its Use is equal to that of the Balneum Marie; but in distilling sweet-scented Waters, or Flowers, Sand must be placed at the Bottom, that the Liquor may not contract a Taste from the Copper.

Cases where Dung, Husks of Grapes, and Lime, are to be used.

These Substances are rarely used except in Digestions; and therefore of no great Use to Distillers, they using only hot Ashes, or a Fire well covered for that Purpose.

If Dung be used it must be of the hottest kind, viz. that of the Horse or Sheep, and the Quantity proportioned to the Heat intended. The Lime must be quick; and if the Heat required be moderate, Lime which has lain some time in the Air must be used. The same is to be observed with regard to the Husks of Grapes. But in whatever manner these are used, the Digestions must be performed in a close covered Vessel.
C H A P. XII.

Of Bodies proper for Distillation.

This Chapter alone might make a Volume, were we to make a particular Enumeration of all its Parts; but, as we have already observed, we shall confine ourselves to the Distillation of simple and compound Waters, &c.

If we acquit ourselves to the Satisfaction of the Public, we shall enjoy the Pleasure of having treated of one Part entirely new; and, indeed, the only one that has been overlooked.

The Bodies proper for Distillation, are Flowers, Fruits, Seeds, Spices and aromatic Plants.

By Distillation and Digestion, we extract the Colour and Smell of Flowers, in simple Waters and Essences.

We extract from Fruits, at least from some, Colour, Taste, &c.

From aromatic Plants, the Distiller draws Spirits, Essences, simple and compound Waters.
From Spices are procured Essences, or in the Language of the Chemists, Oils, and Perfumes, and also pure Spirits.

From Seeds or Berries are drawn simple Waters, pure Spirits; and from some, as those of Anise, Fennel, and Juniper, Oil.

The Colour of Flowers is extracted by Infusion, and likewise by Digestion in Brandy or Spirit of Wine: The Smell is extracted by Distillation; the simple Water with Brandy or Spirit of Wine.

What is extracted of the Colour of Flowers, by Infusion in Water by a gentle Heat, or by Digestion in Brandy or Spirits of Wine, is called, in the Distiller's Phrase, Tincture of Flowers.

The Colour of Fruits is extracted in the same manner, either by Infusion or Digestion: Their Taste is also procured by the same Processes. But let it be observed, that the Time of these Operations must be limited; for otherwise the Fruit, after Fermentation, would render it acid. The Taste is also extracted by Distillation in Spirit of Wine.

From aromatic Plants are extracted by the Alembic pure Spirits, Odours, and simple
ple. Waters. But these require different Methods of Distillation. The first by Water or Brandy only, the second by rectified Spirit, which will give them the greatest Excellency they are capable of.

The Plants themselves with their Flowers may also be distilled, which is still better.

From Spices are drawn Spirits, and oily or spirituous Quintessences. The Spirits are drawn by Brandy, or Spirit of Wine, with very little Water: The Oils are distilled per Descensum; and the spirituous Quintessences by pounding the Spices, and after infusing them in Spirit of Wine, decanting it gently by Inclination.

From Seeds are extracted simple Waters, Spirits and Oils. Very few of the first and last, Spirits being what is generally extracted from Seeds and Berries.

Some Distillers, through a Notion of Frugality, distil Seeds with Water; but their Liquors are not to be compared with those which are distilled with Spirits. When Oils are drawn from Seeds, the Operation is performed either by the Bainemum Mariae, or the Vapour Bath.

We