DISTILLATION OF ALCOHOL.

The cellars should be protected as much as possible from the jarring of passing vehicles, and the vicinity of forges where heavy hammers are used. Both excite in liquors as well as in wines oscillations, which cause them to deposit a residuum in casks or in bottles.

Perfect order and absolute neatness should prevail in all parts of the laboratory, the store-rooms, cellars, and in all the operations of the liquorist. Without order, the labor is confused and hindered at every turn; without cleanliness there can be no good products, for the very best materials will only yield the most inferior results; then in summer a swarm of flies will add to the annoyance. To avoid all inconveniences, it is necessary to assign to everything the place it should occupy habitually, and to wash and replace all utensils whenever they have been in use, and to scour all implements every evening that have been in use during the day; the stills should be examined frequently, to see if they require repairs or retinning; the whole laboratory should be washed every day, so as to remove all substances calculated to attract flies, or to engender filth, or to exhale unpleasant odors. The fuel, sugars, plants, and other ingredients, should be kept in very dry places, except mineral coal, which may be stored in the cellar.

Vessels and Utensils.

Having treated of the subject of stills, areometers and thermometers, in the preceding portion of this book, it remains for us to describe only the vessels and utensils which are required in fitting up the laboratory of a liquorist. There must be many pans or basins of copper of different sizes (Fig. 4), as well for melting and clarifying sugar as for the preparation of syrups and preserved fruits, and other purposes. These pans should be broad rather than deep, so as to afford a greater surface for evaporation; the bottom should be convex, in order to present the largest surface to the action of the heat, and prevent the sugar or other substance from becoming impacted and being burned. The pans, intended for blanching and preserving fruits should, on the other hand, be flat at the
bottom, so that the fruits may not be crushed or bruised. Then come filters (Fig. 5): these should be of tinned copper, of many sizes, furnished with covers and stopcocks, having small hooks within, arranged at different distances for attaching the strainers. These filters, which resemble large, closed funnels, should be mounted on a frame of oak, under which is placed a vat lined with tinned copper, in order to catch any liquid which, by the inattention of the workmen, runs over the top of the vessel intended to receive it.

A number of filters for decolorizing syrups. This very simple filter consists of a box having the form of an inverted, truncated pyramid. This box is made of wood, lined within with tinned copper soldered at the angles; at the bottom, is a stopcock \(A\), for drawing off the syrups; a little above the bottom is a hole to receive a tube \(B\), applied to the exterior of the filter to afford a means of escape for the air contained in the apparatus. Within these are two perforated diaphragms, also of tinned copper, one of which is larger than the other to adapt them to the form of the case, one being placed near the bottom, and the other fitting near the top. It is completed by the cover \(E\), intended to prevent the contents from cooling too rapidly. We shall describe the manner of using the filter in the article on the Clarification of Sugar.

Cans (conges), of different sizes, for mixing liqueurs.

* This is also known as a "Rectifier" by the liquor dealers of the United States.—Trans.
DISTILLATION OF ALCOHOL.

The can (Fig. 7) of the liquorist is made of copper, tinned within, having a graduated scale to indicate the quantity of liquid it contains, a stopcock B and cover C.

FIG. 7.

Graduated can of the liquorist.

VESSELS AND UTENSILS.

A large bowl lined and bound with iron, having two handles and supported at a height of about one metre from the floor by cords A, attached to a strong hook in the ceiling.

This bowl is set in motion by twisting the cords first in one direction and then in another, and by means of the iron ball B, which weighs 10 or 12 kilogrammes, serves for bruising almonds for orgeat syrup. There are many machines in Paris for the same purpose, but we are assured by our own experience that they are all inferior to this simple apparatus. We ought to say, however, that we have seen at Orleans a machine for crushing almonds, similar to a mustard mill, which produces excellent results. We shall describe it in speaking of syrup of orgeat.

FIG. 9.

A cylinder or roaster for roasting coffee and cocoa, a coffee mill, a stone or marble mortar with a wooden pestle, and a small brass mortar.
306 DISTILLATION OF ALCOHOL.

A large iron mortar for bruising hard substances having a loose pocket-like cover of leather, which is attached to the top of the mortar by a hoop with a hole at the top, for the passage of the handle of the pestle.

Strainers of silk and hair for straining liquids, a syphon with a stopcock and a liquor pump of tin for transferring brandies and liqueurs into barrels, a small syphon of glass or tin for smaller operations, a florentine receiver of glass, funnels of tinned copper, glass and tin of various sizes; a dipper and its dish, both of which should be tinned, for pouring liquids on the filters and filling the brooks (metal jugs). The dipper should have a capacity of three litres and have a scale marked on its interior.

A press (Fig. 10) with its frame for expressing the juice from fruits and the marc of currants; an extra

The liquorist should have, according to the importance of his establishment, a certain number of hogsheads and barrels of oak well bound with iron, having brass stopcocks, painted with oil-color, as much to protect from moisture and the boring of insects as to prevent evaporation through the pores of the wood. The paint is not a useless ornament. These vessels should stand on end upon trestles so as to occupy the least space.

The laboratory should be abundantly provided with flat spatulas of oak for stirring the mixtures, sauce-pans with a lip, and others, skimmers, pipkins and crocks of stone of different sizes, brocks of tin, copper and wood, demijohns covered with osier; flasks, jars, long and short necked bottles of glass, glazed earthen pans, tubes for examining and testing liqueurs and syrups, a tin box having many divisions, in which are kept the instrument for testing the specific gravity of liquids, steel-yards, scales and weights, and tin measures for liquids.

A large assortment of strainers and filtering cloths of different sizes is necessary. The filtering cloth (chaussete) is a sort of pocket of cloth or other woollen stuff, of conical form, used for filtering liqueurs. It is hooked inside of the copper filter. The strainer is a square piece of woollen cloth having a row of eyelets along its edge through which a cord is run. This is hung by means of small hooks in a square wooden frame for straining syrups.

The use of steam for heating conserves cannot be too highly recommended to the liquorist, whatever may be the extent of his business. The apparatus he should employ should consist of an upright oaken chest lined with zinc or copper (the latter is preferable), having a number of shelves of iron. These shelves are open, being composed of thin iron bars placed two fingers in width apart, and are for supporting the bottles and jars. The door is closed by means of two buttons or bolts, and has in the middle a glazed opening behind which a thermometer is hung in order to indicate the degree of heat within. At the bottom of the chest is a stopcock for drawing off the water condensed from the steam.
The steam is admitted from below by means of a pipe and stopcock, communicating with a small portable boiler, having a water and steam gauge and a safety valve like boilers of larger size.

**Furnace.**

After stills, the furnaces should attract the attention of the liquorist. On their proper construction depends very much the success of his operations. Every possible care should be given to their arrangement, for, independently of the matter of economizing fuel, they exercise great influence on the quality of the products.

A furnace consists, first, of the fireplace; second, the grate; third, the ash pit; fourth, the chimney.

The **Fireplace.**—The fireplace is the space between the bottom of the still or boiler and the grate, or the place in which the fuel is burned. The walls of the fireplace should be so arranged as to reflect the greatest possible quantity of heat. It is requisite, for attaining this end, that they should be comparatively restricted in their dimensions so that the bottom of the still may receive the full action of the fire, and that the flame and heated air may circulate freely beneath, before passing off by the sides. The dimensions of the fireplace should, therefore, be strictly proportioned to the size of the still and the character of the fuel to be employed. It should be so constructed that the flames, after having licked the bottom of the apparatus, may circulate freely around by means of a flue of special form, making several turns before reaching the chimney. By this arrangement the heat, which would otherwise escape, and be lost in the chimney, is utilized, the liquid is equally heated, and the smoke only escapes after having been deprived of a greater portion of its heat. The door of the fireplace should fit as perfectly as possible, in order to prevent all access of atmospheric air, except through the openings into the ash pit. A complete closure of this opening is obtained by substituting for the door a round hole, stopped by a conical sheet-iron plug filled with sand or cinders.

The **Grate.**—The grate is the support for the fuel, and on which it is burned, by maintaining it in a suspended position, so that the air may have free access to it, thereby facilitating the regulation of the fire.

The bars of the grate should be movable, of cast iron, very strong, and straight; they should be supported firmly on bars of iron; because grates in a single piece, or fixed in a frame, are liable to be disarranged by warping, and are difficult to clean. The bars for burning wood should be placed horizontally, the cross section being a quarter circle, so that the coals may always fall to the middle of the grate, while for coal, the bars should be arranged horizontally, and on a level. The space between the bars, as well as their size and number, will depend on the dimensions of the furnace, and the character of the fuel.

Finally, the grate should be fixed in the fireplace under the anterior part of the still, so that this portion of it may receive the direct action of the fire, and, as the draught tends to send the flame and heat towards the chimney, the greatest possible effect is produced.

The **Ash Pit.**—The ash pit, besides the use which its name indicates, is principally intended to afford access for the air which serves to keep up the fire. Its dimensions are a matter of indifference, especially for wood; yet, it is necessary that it should have sufficient height and depth to contain all the ashes resulting from a day’s work, without being crowded. The ash pit should be closed accurately by a sliding damper, by which the draught of the chimney may be regulated, and the fire increased or lessened, as occasion may require. The use of coal renders the employment of this sliding damper indispensable.

The **Chimney.**—The chimney conveys the smoke and vapors arising from the combustion out of the laboratory; it causes, too, an upward draught, which constantly renews the air which finds admission through the ash pit; and this is the reason of the saying, that the taller the chimney, the better the draught. On this principle, the rapidity of the combustion, and the intensity of the
heat, will be in direct proportion to the height of the chimney.

The furnace should be constructed of smooth brick of good quality—those called refractory (fire brick) should have the preference; they are laid in a mortar made of clay and sand. This method of construction presents the advantages of acquiring greater solidity under the action of the fire, and of preserving a greater quantity of heat. The furnace should be faced on the exterior with pressed brick, and bound with iron. The height should not exceed 85 or 90 centimeters, in order that the stills may be luted without the necessity of getting on the brickwork, and that the pans of syrups and fruits may be handled with more facility.

On account of their importance, furnaces ought to be built by skilful and experienced men, who are perfectly acquainted with the subject of heat and its applications.

CHAPTER XIII.

FUEL.

For purposes of distillation and the other operations of the liquorist, heat is produced by the combustion of different articles of fuel, as wood, coal, and sometimes coke. As for charcoal and turf, they are employed only in those localities where it is difficult to procure the three first named, either on account of their scarcity or high price. The selection and use of these different kinds of fuel involve important questions of economy. That should be adopted, the price being the same, which will produce the most intense and lasting heat.

Heating by means of wood is not to be preferred, nor is it the least expensive. The heat produced by this fuel is far inferior to that from coal. The former unquestionably takes fire more readily, and produces a greater amount of flame, but the fire is not so easy of control as that made with coal; nevertheless, there are some countries where wood is sold at a very low price, while, on the contrary, coal is very dear. We indicate the woods to which we would give the preference:

1. Oak.
2. Beech.
3. Hornbeam.*
4. Elm.

Fire wood is found in the market of two sorts, cord wood and raft wood.

Cord wood is that which has been transported on wagons or boats from the forest to the place of consumption. This is the best. Raft wood is floated in rafts on navigable streams, from which circumstance it has its name. It is inferior to the former.

It is to be observed that hard wood which has been protected from the prolonged action of water is the best for heating purposes; round sticks are better than split pieces, which are only used for kindling.† This results in economy of fuel and regularity of heating.

Coal, or mineral coal, is of all fuels the most valuable, and most abundant; it presents the greatest advantages on account of its low price when compared with the amount of heat it produces. All industrial pursuits depend on this primary substance, as railroads, navigation, illumination, the manufacturing of iron, woollens, cotton, &c., for their very existence. Blot out her coal fields and England would become a wilderness.

Coke is charred mineral coal, as the residuum of the gas-works; it produces a very intense heat and leaves very little ash; it may replace wood-charcoal advantageously.

Charcoal is the residuum of all kinds of wood which have been deprived of all their volatile principles by the action of fire. It is black, brittle, sonorous, and of little solidity; it burns readily and produces a very great

* Hickory and ash, which are among the best of American fire-woods, appear to be unknown for such uses in France.—Translator.
† The reader must remember that this is in France, where timber is converted to all manner of uses, and none but such as is fit for nothing else goes into the fire.—Translator.
quantity of heat; that which is compact and heavy
should be preferred to that which is light.

*Turf* is the result of a partial decomposition of cer-
tain plants under water; it is brown or almost black;
it burns with difficulty at first, but when once on fire,
the combustion progresses very well; it produces little
flame and yields a gentle heat, but emits a very un-
pleasant odor.

**Application of Heat.**

Heat is the principal agent of distillation; it is an
interesting subject to examine and ascertain the laws
according to which caloric is transmitted to and through
bodies.

The name *caloric* is given to the fluid which consti-
tutes the principle of heat; in other words, heat is the
effect, and caloric the cause.

Caloric is an imponderable fluid, like light, distributed
throughout nature; we become conscious of its presence
through the sensation of heat which is impressed on our
organs of sense; invisible, eminently elastic, it tends to
a state of equilibrium in all bodies, penetrating them
more or less easily, expanding them, decomposing, causing
them to pass from the solid state to that of a liquid, and
from a liquid to a gas, and on abstracting it from these
substances they are reduced from a gas to a liquid, and
from that to a solid; and finally, it has the power of
combining with each in a different proportion, to bring
them to the same temperature.

Those substances which heat penetrates easily are
called *good conductors*; they are arranged in the order
of their conductivity; silver, gold, copper, platina, iron,
zinc, steel, tin, and lead.

Substances which heat penetrates with difficulty are
called *bad conductors*; gases, liquids, porcelain, pottery,
are not as good conductors as the metals named above;
charcoal, dried wood, and glass are almost without capa-
city for conduction.

To explain more clearly the effects of caloric, we cite

---

**APPLICATION OF HEAT.**

Some examples: mercury in its natural state is a fluid;
if it is heated in a retort, the caloric accumulates in it,
and the mercury is evaporated in the form of a gas;
if it is deprived of a sufficient amount of its caloric by
artificial cold, it becomes a solid. It is by these means
that water assumes its three forms—liquid, solid, and gase-
ous. Nevertheless, the effects of caloric are not always
as marked, all substances not having the same affinity
for it. Thus, a piece of charcoal burning at one end
may be held by the other end without inflicting any pain,
while it would be impossible to hold in the hand a piece
of copper or iron of the same dimensions, if heated to
redness at the other extremity. It is, then, on this prin-
ciple that alcohol boils and is converted into vapor at a
lower temperature than that required for water.

The following table indicates the boiling points Cent.
of different liquids, and although given in another part
of this book is repeated here on account of its peculiar
value to the liquorist:

<table>
<thead>
<tr>
<th>Substance</th>
<th>Boiling Point</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulphuric ether</td>
<td>350.5</td>
</tr>
<tr>
<td>Liquid ammonia</td>
<td>600.2</td>
</tr>
<tr>
<td>Pure alcohol</td>
<td>750.4</td>
</tr>
<tr>
<td>Alcohol (90°)</td>
<td>800.1</td>
</tr>
<tr>
<td>Alcohol (85°)</td>
<td>815.1</td>
</tr>
<tr>
<td>Alcohol (59°)</td>
<td>850.8</td>
</tr>
<tr>
<td>Alcohol (45°)</td>
<td>880.9</td>
</tr>
<tr>
<td>Pure water</td>
<td>100°</td>
</tr>
<tr>
<td>Syrup of sugar</td>
<td>100°</td>
</tr>
<tr>
<td>Saturated solution of common salt</td>
<td>106°</td>
</tr>
<tr>
<td>Saturated solution of nitre</td>
<td>114°</td>
</tr>
<tr>
<td>Saturated solution of carbonate of potash</td>
<td>135°</td>
</tr>
<tr>
<td>Spirits of turpentine</td>
<td>155°</td>
</tr>
<tr>
<td>Sulphuric acid</td>
<td>305°</td>
</tr>
<tr>
<td>Linseed oil</td>
<td>315°</td>
</tr>
<tr>
<td>Mercury</td>
<td>500°</td>
</tr>
</tbody>
</table>

Caloric by its accumulation in, or interposition be-
tween the molecules of different substances, causes them to
undergo a very variable degree of expansion. Its effects
may be observed by the changes which take place in the
thermometer. We have said, too, that substances tend
to assume a state of equilibrium in regard to heat, hence
the sensations of heat and cold. According to this principle, we may understand that heat passes from one body to another by points of contact; this is the reason that well polished marble always feels cold; for the points of contact being greatly multiplied, a quantity of caloric is abstracted from the hand in proportion to the surface touched.

It may be conceived for the same reason, that in subjecting a liquid in a boiler to the action of caloric, it will be heated more rapidly when the boiler presents a greater number of points of attack to the heat arising from the fuel, and that the boiler should be constructed of some material that is a good conductor of heat. This is the reason why a boiler should be broad and shallow, if a prompt vaporization of the liquid it contains is desired.

Of the many means of producing heat, combustion is the most common and most useful. It is produced by one or other of the fuels to which we have alluded. It is by the assistance of the various parts which constitute the furnace that this combustion is effected, and the heat is applied to the different substances which it is desired to heat.

Having come to the amount of heat which is requisite for the operations of the liquorist, we may again remark, that water requires a greater quantity of heat than alcohol to boil and vaporize it; the heating and vaporization of liquids are always in proportion to the heating surface; a mixture of alcohol and water will require for heating it the average of the amount of heat required for the two taken separately, that is to say, the boiling point of alcohol being 78°, and that of water 100°, that of the mixture consisting of equal parts of each will be 89°.

One of the essential conditions of the application of heat is to produce it in the greatest quantity and at the least possible expense. It is manifest that distillation

---

* Two liquids of different boiling points, and which do not combine in solution, as water and benzole, water and oil of cloves, &c., will boil at a lower temperature than either alone. This explains why a liquid having a higher boiling point than water is converted into vapor by the injection of steam.—Kundt in Poggendorf's 'Annalen.'
DISTILLATION OF ALCOHOL.

Fig. 13.—Copper filters with covers for filtering liqueurs, syrups, &c.
A. Brocks or metal jugs of tin or copper, of a capacity of 15 litres.
B. Table or trestle of oak to support the filters, with a trough beneath lined with copper to catch any liquid that may flow over the top of the vessels during the filtration.

Figs. 14 and 15.—Copper cans tinned inside for containing the liqueurs intended for feeding the filters.

Fig. 16.—Wooden shelf or dresser for different implements.
A. Copper bottles tinned inside, and of different sizes.
B. Copper pans for various purposes.

Fig. 17.—Another dresser also intended for various articles.
A. Pourers or pans with a spout or lip.
B. Brocks or jugs of copper tinned inside, and of different sizes.
C. Dipper and its dish; the two implements are of copper tinned inside and out; the former contains exactly three litres, and has a graduated scale inside, divided into three parts.

CHAPTER XIV.
DISTILLATION AND RECTIFICATION.

Distillation as Applied to Liqueurs.

The liquorist, after carefully cleansing all the parts of his still, assures himself that no flavor remains; it is all important that the coil should be well rinsed with hot water, as much to remove the odors of the preceding distillation as to be assured that the convolutions are all open, for it may happen by some unforeseen accident that the coils may be closed, in which event an explosion would be inevitable. It must be observed that if this cleansing is done without first emptying the tub which contains the coil, the operation will be of no avail, inasmuch as the hot water will be chilled in its course through the convolutions of the coil, and the flavor of the preceding distillation will not be removed as desired.

When the distillation is to be conducted over the naked fire the still is to be placed on the furnace with the open grating fixed in its place so as to prevent the materials from imparting a bad flavor by attaching themselves to the still and being burned. If the plants distilled are dried, care should be taken that they be not employed in too large a quantity; the heat and the liquid will cause them to swell, and it may happen that the luting will be disarranged, thereby causing an escape of liquid and perhaps a fire. To obviate this inconvenience, we should advise that the plants be cut in small pieces; this will cause them to occupy less space in the still, or water bath, and give better opportunity for them to absorb the liquid. It is important that the boiler of the still should be filled only to about two-thirds with liquid; the cap is then adjusted to its place and attached to the coil, the tub or vat containing the latter being previously filled with cold water. At the extremity of the coil must be placed a receiver to catch the liquid as it distills over during the course of the operation. The socket joint of the boiler and cap must be absolutely closed to prevent the escape of vapor; all the joints must be well paid over with a strong paste made of flour and water. The joints, after being covered with this paste, should have a layer of strong paper or of cloth bands applied to them; these bands are about the width of two fingers, and should be covered with paste on both sides, and should be bound over the already luted joints of the still, so that they shall cover them completely and closely.

When matters have been thus arranged the fire is kindled under the still, care being had that it is not pushed too much, especially at the beginning of the distillation; it is then gradually increased, and as occasion may require; when the first drops of liquid begin to flow, the fire should be moderated so that the vapors...
may have time to condense and the chance of an explosion be prevented.

The distillation should be conducted so that the liquid may flow uniformly and equally. This result is obtained by an intelligent management of the fire, the variations in the stream being regulated by increasing or diminishing the amount of heat applied to the still. The operation is properly conducted when an average stream is maintained, for if we distill only by drops, the water or spirit obtained will be but slightly charged with the aromatic principle; if the fire is pushed too rapidly, it will cause the feints to rise with the water or spirit and volatile oil so as to render the liquid objectionable and give it an empyreumatic flavor. It frequently happens, too, that by a sort of explosive start, the liquid in the still passes over unchanged, carrying with it the substances intended to aromatize it.

The still should never be left, especially when distilling spirits, because spirituous vapors are much more liable to escape than water, and it may happen that the liquid may find a means of exit at the joints and spread over the surface of the furnace, or by running down the boiler come in contact with the fire. In this case the fire must be promptly extinguished by throwing water into the fireplace as well as on top of the furnace; the joints must be covered with wet cloths; the operator taking care when he approaches for this purpose to have his mouth and nose covered also with a wet cloth, for it is highly dangerous to breathe these inflamed vapors.

If it should happen that one should be covered with inflamed spirits, he should be immediately covered with a wet cloth, which should be kept always ready and at hand; in default of this, he should throw himself flat on the floor, with his face to the ground, and call for help.

It frequently happens that persons covered with burning spirit run as they call for assistance. The flames are increased by the current of air caused by the running and occasion burns which are most generally fatal. La Villette, where there are a great many ignorant distillers, has been the scene of many accidents of this kind.

Distillation over the naked fire has the advantage of progressing with greater promptness, but it has in many cases the disadvantage of altering the product more or less decidedly; this results from the unequal distribution of the heat. It frequently happens that the liquid is dried and burned at the upper portions of the boiler, or rather that some of the solid particles of the materials subjected to the distillation may come in contact with the sides of the boiler and facilitate the accumulation of heat at this point by preventing the contact of the liquid which would keep it down.

Distillation in the water bath is conducted as follows: The boiler is placed on the furnace (the grating which was used when distilling with the naked fire having been removed) and half filled with water; the water bath is now fixed in its place, care being taken to observe that the water in the boiler does not rise higher than five centimeters below the neck. The water bath containing the liquid and other substances is then fixed in the boiler covered with the cap, which is to be attached to the coil; all the joints are to be luted and the fire kindled. The operation is conducted in all respects just as with the naked fire.

The distillation with the water bath does not require so much care as that with the naked fire, but it is necessary to take precautions to have the water in the cooler frequently renewed and to run off no more of the liquid than is proper.
By distillation in the water bath purer and lighter products are obtained; that is, the spirits are stronger in degree, while the perfume is more delicate and they have no empyreumatic flavor.

The water bath enables us also to avoid the destructive action of heat on the liquid and other substances distilled. It is always advantageous to the quality of the product, that the degree of heat at which the liquid to be distilled will boil, may be less than that of the auxiliary liquid contained in the boiler or outer vessel. For example, it is desired to obtain an aromatic water by means of the water bath; the transmission of the heat acting on liquids of the same degree will be slow and insufficient to cause a proper amount of ebullition in the still, and the operation will progress with so much difficulty that it will become extremely expensive to push it to the end. If, on the other hand, it is desired to distill essential oils in the water bath having only water in the boiler for the transmission of the heat, it will be impossible.

Under some circumstances oil and other liquids may be used in the water bath to produce a greater degree of heat than that of the liquid to be distilled. But it may happen that these substances by becoming more and more concentrated may change in character and in their boiling point, and that an imperfect result will be obtained. Yet there is advantage in most cases in the use of these agents; it is at least certain that they will not exceed a given degree of heat, and that the temperature will be uniform in all parts of the liquid.

Distillation by steam should be conducted as follows:—

Commence by filling the steam boiler three-fourths full of water; see that the safety valve, the water, and steam gauge work well; kindle the fire under the boiler so as to set the water boiling to produce the steam. As soon as the steam gauge indicates the proper pressure (one and a half or two atmospheres), the cock which admits the steam to the pipe connecting the still with the boiler is opened one-fourth so as to heat the liquid to be distilled very gradually, then it should be opened one-half, and then entirely when it becomes necessary.

As to the still, it is arranged and managed just as in the distillation by the 

rectification.
only are capable of volatilizing such aromatics; but, as in this case, the liquid is often acrid without being on that account empyreumatic, it is indispensable that it should be redistilled in a water bath in order that the more subtile and aromatic parts once separated may pass over with the spirit. Rectification consists in pouring into the water bath of a still the liquid already distilled, and adding to it a certain quantity of water, which under these circumstances causes the volatile oil which is in excess to collect in globules on the surface of the spirit from which it has been separated. It has also for its object the removal from the aromatized spirit of the acrid and empyreumatic flavors which it may have contracted, or rather the feints which may have come over during the course of a distillation pushed to excess. To conduct this operation properly, it is necessary, on the one hand, to watch the fire, and, on the other, to renew the water in the cooler frequently.

Rectification is frequently confounded with cohabation. To cohabate a liquid is to pour the already distilled liquid on the residuum of the distillation in order to continue the operation which this return of liquid has not interrupted. Now, it is certain that the practice of cohabation is more injurious than useful. The long sojourn of these substances, exposed to heat in the still, causes them to contract an acridity from which the distilled liquid is not exempt. This is not the case in rectification: whenever the distillation is conducted over the naked fire, the rectification of the distilled liqueur is essential to the production of a delicate aroma.

For some years a column of plates has been successfully used in the manufacture of liqueurs and perfumery, for the rectification and concentration of spirits. This column is applicable in the manufacture of liqueurs when it is necessary to distill the marc of currants, or the remains of brandied fruits, feints, or other products, from which it is profitable to extract alcohol. This piece of apparatus is mounted directly on the boiler or the water bath of a common still.

The following is a description of this column, which has been so well constructed by M. Egrot as to leave nothing to be desired. We indicate also the method of using it (Fig. 11).

Fig. 11.

\[\text{a, base of the column; at the bottom of this piece is a circular collar } \text{c c, which fits perfectly to that of the boiler or the water bath.} \]

\[\text{b, first basin soldered directly on the base } \text{a. There is within this basin a convex bottom, from the centre of which rises a pipe } \text{d, for communication with the vessels above. This pipe supports a second basin, but distinct from that below; this also has a convex bottom. On one side there is a level pipe which, passing out at the edge of the basin, connects by means of the conical pipe } \text{f with that below (b), and dips to the bottom of it. The column is completed by a number of basins exactly like the last, except that the level pipes are placed alternately on opposite sides.}\]