**DISTILLATION OF ALCOHOL.**

**AROMATIC WATERS WITHOUT DISTILLATION.**

349..

Raspberry Water (Eau de Framboises).

Fresh raspberries (capped) . . . 12 kilogrammes.
Water . . . . 40 litres.

Without previous maceration, distill with such precautions as to prevent the fruit from attaching itself to the still. Draw twenty litres.

Pursue the same method for the following: Apricots, prunes, quinces, and other fruits.

Maraschino Water (Eau de Marasquin).

Black cherries (very ripe) [prunus avium] . . . 20 kilog.
Raspberries (very ripe and capped) . . . 4 "
Black cherry leaves . . . 1 kilog. and 500 grammes.
Peach kernels . . . 250 "
Florentine orris root in powder . . . 1 kilogr.
Water . . . . 40 litres.

Macerate the whole together for twenty-four hours (the fruits having been crushed), then distill off carefully twenty litres.

This receipt is excellent, and the maraschino water, thus prepared, may well rival that which is sold as coming from Dalmatia, but which is really produced in the south of France.

Water of Green Walnuts (Eau de Noiz Vertes).

Green walnuts . . . 11 kilogrammes.
Water . . . . 40 litres.

Take the green nuts, when the kernels have scarcely formed, crush them properly by stamping with a pestle, then distill without a previous maceration, so as to obtain twenty litres, observing the same precautions as for raspberry water.

Aromatic Waters without Distillation.

The non-distilled aromatic waters are imitations of those produced by distillation; they are always put on the market without their origin being made known, and with the intention of creating the impression that they have passed through the still. As it may happen that the liquorist may be under the necessity of purchasing aromatic waters in consequence of his own supply being exhausted, in order to protect him from this fraud, we shall indicate the processes employed by the counterfeiters and the method of detecting the trick.

These waters are prepared in two ways:

1. Pour the volatile oil on pulverized sugar, then triturate the mass, adding the water to be aromatized in small quantities at a time, shake the mixture well, and, after a rest of thirty or forty minutes, filter.

2. Pour the volatile oil on carbonate of magnesia, and conduct the operation as above. This method is greatly to be preferred, as the carbonate of magnesia has the property of greatly facilitating the suspension of volatile oils in water.

Aromatic waters, thus manufactured, have a less agreeable perfume than those which are distilled. On account of the difficulty of procuring good volatile oil, they are also defective in not having so fresh a flavor. They may, however, be preserved quite a long time, except those prepared with the aid of sugar, which are very susceptible of fermentation.

The factitious aromatic waters are easily recognized. They develop less perfume when poured into pure water; they are not mucilaginous nor greasy to the touch, and always exhale a somewhat herbaceous odor. Orange-flower water, prepared from the essence of neroli, is nothing like so pleasant as that which is distilled from the flowers.

Apart from the characteristics above mentioned, factitious aromatic waters are infallibly recognized by the means which we are about to indicate.

When examining an aromatic water suspected of having been manufactured by the aid of sugar, the liquid should be evaporated to dryness, and if, instead of obtaining mucilage and extractive matter, we find a saccharine substance which, when thrown on burning coals, puffs up and diffuses the odor of caramel, the suspicion is well founded.

If, on the other hand, the aromatic water is prepared
with carbonate of magnesia, we prepare a test, by making nearly saturated solutions of carbonate of ammonia and phosphate of soda, and filtering them. Having prepared the two reagents as indicated, an ordinary wine-glass is half-filled with the water under examination; into this is poured a small quantity of the solution of ammonia; then, if, on adding an excess of the solution of phosphate of soda, the water becomes turbid, and a white precipitate falls to the bottom of the glass (ammonio-phosphate of magnesia), the problem is solved.

The presence of carbonate of magnesia in any aromatic water may be detected by boiling it, and then adding a small quantity of a saturated solution of hydrochlorate of alumina, a precipitate is thrown down, which consists of carbonate of alumina.

CHAPTER XVII.

VOLATILE OILS OR ESSENCES.

The volatile oils, commonly called essences, are proximate principles of vegetables; in their characteristics, they differ entirely from the fixed or fat oils, in respect both to their physical and chemical properties.

The greater number of volatile oils are generally liquid at the ordinary temperature; some are solid, or partially crystallized; none of them are greasy or unctuous to the touch like the fixed oils, nor have they the appearance of being what is commonly called oily. All of them have a very persistent and penetrating odor, which generally recalls the substances from which they have been obtained, but they are never as fragrant. Generally poisonous, their taste is acrid, irritating, and caustic.

Light changes the color of volatile oils in a remarkable manner; it changes to yellow those that are colorless, darkens or decolorizes those that are colored; the volatile oil of chamomile, for example, which is blue, becomes yellow. Exposed to the air they change color, lose their odor, thicken, and finally become solid. They take fire suddenly on the approach of a flame, and burn with a very brilliant and dense flame. Highly soluble in alcohol, but little so in water, they boil only at 150 degrees Centigrade, and are distilled without alteration. When heated along with water, they volatilize at a heat not exceeding 100 degrees, and frequently much below that. It is remarked that their volatility is usually in inverse proportion to their density, the most dense being the least volatile.

Cold produces notable effects on them; it congeals them, but at different degrees; many become solid at some degrees above zero, others remain liquid many degrees below.

By age, they undergo changes in color and consistency which are very unfavorable to them; they become turbid, deposit a precipitate, and become so acrid that they reddens the ends of the corks in the vessels which contain them. When these accidents occur, it is important to rectify the oils at once.

They have the property of uniting with the fixed oils, and dissolving resins, wax, and caoutchouc; they are generally lighter than water, but there are some which are heavier than that liquid; the lighter are also more volatile.

They are found in all the organs of plants, but they abound especially in the leaves and flowers. According to the opinion of a goodly number of distinguished chemists, they do not constitute the perfume or odor exhaled by these organs; they serve simply as the vehicle for the transmission of the odorous substance, or aroma, the nature of which is yet unknown. Boerhaave has defined this odorous principle as follows:—

"This essence," says he, "acts upon our organs of taste and smell; it is active; it is the offspring of fire, and it produces various incredible effects. Imbued, confined, and, as it were, bound up in the oils, it communicates a singular and powerful odor which is found nowhere else; but when it has been altogether driven off,
it leaves them almost without strength, so that they can hardly be distinguished one from the other. Now, as a gentle heat is sufficient to drive off this essence of spirit from many oils and dissipate it in the air, the oils which have thus lost it are without strength, and are no longer capable of producing the effects they produced before.”

M. Roubiquet has published a remarkable article on the subject of aroma, which we reproduce from the *Annales de Chemie et de Physique*, 2d ser., vol. xv. p. 27.

“The ancient chemists thought that the odor of aromatic substances was due to a peculiar principle which Boerhaave called *spiritus rector*. Macquer contended that this peculiar principle or essence was not the same for all odorous substances, and he distinguished them as acid, alkaline, and oleaginous. When the French chemists were engaged in regulating chemical language, and establishing the modern nomenclature, they gave the name aroma to this unknown principle, which they regarded as the essential cause of odor; in the systematic collection of substances, it was arranged among the proximate products of vegetables. Fourcroy, more recently, ascertained that the existence of this substance, which had been admitted on the faith of the ancients, could not be demonstrated in a positive manner; he contended that odors were the results of the solution in ammonia of a portion of the odorous body itself, and that the intensity of the odor depended on the greater or less volatility of this body. Unfortunately, this theory, so seducing in its simplicity, is not in accordance with well-known facts. In September, 1820, I published some opinions on the subject of aroma, and, without pretending to return to the ideas of the ancients, I think I have demonstrated that in many various circumstances the odor which emanates from a substance is not due merely to a volatilization of a portion of this substance in space, but rather to an actual combination of a substance, often inodorous in itself, with a very volatile product which serves it for a vehicle. It is thus that tobacco, musk, ambergris, and so many other substances, manifest their odor only by the assistance of ammonia. Musk, well dried in a water-bath, is no longer odorous while the water, which is discharged from it, is ammoniacal. When it is impregnated with ammonia anew, by allowing it to be exposed for some time in the fumes of olerine (as is sometimes done by the perfumers), where this ammonia results from a natural decomposition, the odor returns with all its original intensity. Ammonia is not the only vehicle for odors. I cited, in the remarks above alluded to, the example of the essential oils of certain crucifers, particularly that of *black mustard* (*sinapis nigra*). In this case it is certainly not the volatile alkali which causes the diffusion of the odor, since it is known that acids give more strength and penetrance to mustard. It is by no means the oil which of itself communicates this enduring and penetrating odor, for, on allowing it to stand for some days on a well-cleaned metallic surface, it tarnishes it deeply, and frequently the oil almost entirely loses its odor. I presume that these phenomena are due to the presence of sulphur; but it is combined in a manner which is still unknown to us. If, as Fourcroy thought, plants owe their odor to the diffusion of the volatile oil which they contain, how is it, that certain highly odorous plants, such as the heliotrope, tuberose, jasmin, &c., do not yield an essential oil? and how can it be explained that certain essences have, so to say, no analogy with the odor of the plants, or parts of plants, from which they are obtained? It is certain, whatever may be said to the contrary, that neroli does not represent the entire odor of the orange flower, which, on the contrary, is found in the water distilled from this flower.

“All that has just been said demonstrates, it appears to me, that if it is right, on one hand, to include aroma among imaginary substances, we cannot, on the other, be satisfied with a theory which leaves so many gaps. It is necessary, then, to wait until experience shall enlighten us.

“It appears, in my opinion, from all the facts stated, that the odor, which diffuses itself in the air, should not, as a general rule, be attributed to a simple volatilization,
or emanation produced by the odorous substance itself, but rather, in many cases, to a gas or vapor resulting from its combination with a proper vehicle capable of diffusing itself in space according to certain laws. In regard to distilled odorous waters, this would be for many of them a pure solution of this combination; and I can readily suppose, on recurring to the opinion of M. Macquer, that the volatile oils frequently owe their odor to the combination of a variable vehicle with an inodorous oil. This would be solving a problem which has for a long time occupied certain distillers, who regret their inability to deceive at their ease, and who would discover an inodorous volatile oil with which to dilute the rarer and more expensive essences. I will finish this note with one last remark: it is, that the analysis of essence of turpentine, published by M. Houton-Labillardiére (Journal de Pharmacie, vol. iv.), and that of the essence of lemon, which we owe to M. De Sausser (Annales de Chemo et de Physique, 2d ser., vol. xiii.), exhibit an identity of result which indicates a similar composition, and which proves that the different odors which distinguish them arise from causes which exercise very little influence on their entire nature."

As is seen, the state of our knowledge is very imperfect in what concerns the true nature of the perfume of flowers and aromatic substances, and this subject, so full of attraction, has been little studied up to the present time. Nevertheless, one of our eminent chemists, M. Millon, Director of the Central Military Dispensary at Algiers, prepared, in 1857, a very interesting work, which Marshal Vaillant, the Minister of War, presented to the Academy of Sciences. In this memoir, M. Millon makes known a new method of extracting the odorous principle of flowers and plants, from which it appears that the author substitutes a double operation for distillation, expressing or maceration in oil: 1st, solution; 2d, evaporation. He dissolves the odorous principle in sulphuret of carbon, or in ether, on the one hand, and, on the other, he evaporates the solution over a slow fire. By this means, a butter-like substance is obtained, quite similar to the essence of roses from the East, and this substance reproduces in all its purity, its intensity, and fragrance, the original odor of the flower or plant.

This last product presents the peculiar chemical characteristic of being absolutely inalterable in the air. The perfumes, prepared by M. Millon, were preserved in open vases in open tubes, without losing any of their peculiar properties. This inalterability of the perfume of flowers and plants, when exposed to the air, constitutes a most interesting discovery. Let us hope that these perfumes, which render so much service to the perfumer, may ere long be successfully employed by the liquorist.

The volatile oils are contained in small glands, which are disseminated throughout the cellular tissue of vegetables. To extract these oils from the organs which contain them, the most common means is distillation; yet many are contained in such great abundance in the rinds of certain fruits, that they may be extracted by simple expression, while others can be obtained only by maceration in a fat or fixed oil.

As we have already said, volatile oils are very easily altered; it is therefore necessary that they should be preserved with great care to keep them in good condition. They ought to be placed, when fresh, in vessels that are well filled, and closely stopped, and kept in the dark. It is equally necessary to be careful to keep them clear; for mucilage acts as in the aromatic waters, although more slowly; that is, it decomposes the small quantity of water which is found in the oil, from which it follows that the essence resinifies itself, and the mucilage spoils itself, while the oil becomes rancid.

The manufacture of volatile oils by distillation requires the use of water at the boiling temperature, as in the case of aromatic waters. This liquid being converted into vapor serves as a vehicle for the oil, which is lighter though less volatile than it is.
The following rules are to be observed for the distillation of volatile oils:

1. Distill promptly.
2. Divide the material as much as possible to facilitate the escape of the oil contained therein.
3. Operate on large quantities in order to obtain strong products, and to have them of a better quality.
4. Charge the still with water already distilled from the substance, and which consequently contains a certain proportion of volatile oil.
5. Only use a sufficient quantity of water to prevent the materials from being burned, and use the first water that is distilled several times on fresh materials.
6. Saturate the water of the still with common salt, especially for exotic substances, whose oil is heavier than water. By this means, the density of the liquid is increased, and it is compelled to attain a higher temperature before boiling. Ordinary water boils at 100°, salt water requires 106°.

As in the case of aromatic waters, the florentine receiver should be used, and care should be taken that, in the case of the fluid oils, the water on the coil should be frequently renewed; and for those which concretize easily that the temperature is maintained at 30 or 40 degrees.

The distillation of volatile oils is effected better in the turk's-head still than in that with the goose-neck. Besides the temperature is easily regulated, and it is less difficult to cleanse a straight pipe than a crooked one, from the oil that may adhere to it and communicate its odor. Soubirian's still may be used with advantage.

For the extraction of volatile oils, flowers and plants are generally used when fresh, yet there are some plants which, when dried, produce more oil than when they are fresh; sometimes the latter furnish none at all. Milfoil* and garden balm, for instance, present a remarkable example of this singular phenomenon. This is attributed to the fact that in the fresh plant the oil exists in a peculiar state of combination, which is destroyed by the drying.

* Milfoil. (Achillea Millefolium) Common Yarrow.—Trans.

Volatile Oils or Essences by Expression.

Volatile oils are extracted by pressure from those substances which contain them in great quantity, and where these oils are almost on the very surface of the substance. The lemon, orange, cedrat, bergamot, and all similar fruits, contain the essence in the outer rind, or zest, which incloses their acid pulp. To obtain the oil, all of the yellow or green portion of the surface of these fruits is rased off, and the mass is inclosed in a small hair sack, and subjected to the action of a press between sheets or plates of fine tin; it is allowed to clarify, and is then decanted.

The volatile oil obtained by this process is more fragrant than that extracted by distillation, but it will not keep so long; besides it is impure, and is always clouded, because it is charged with mucilage, and a small proportion of water which is expressed from the rind.

The oils obtained by pressure are yellow, highly odorous, thicken quickly, in time acquire a disagreeable odor, leave a grease spot on cloth, are not entirely soluble in alcohol; while those that are distilled are more fluid, have a less agreeable odor, are more soluble in alcohol, and keep for a long time.

Rectification of Volatile Oils or Essences.

We have already said that volatile oils are altered, and become damaged under certain circumstances. On becoming old, some become entirely thick, while others are so only in part; they become rancid, or lose their odor, and sometimes throw down a deposit which contains a resinous substance; have a consistence and odor similar to turpentine, while the supernatant volatile oil has lost none of its fluidity. This resin is dissolved in the volatile oil when shaken; it does not separate from it again, and greatly hastens its destruction. When the oils of certain seeds have reached this condition of change, they are no longer susceptible of crystallizing by a slight degree of cold as before.

The light volatile oils, like those of lavender, sage,
lemon, &c., experience the changes, of which we have just spoken, more promptly than the heavy volatile oils of cinnamon, cloves, sassafras, &c. It is easy to observe the beginning of the change in volatile oils, by the action of their acids on the corks, which they corrode and stain yellow, as is done by nitric acid.

Volatile oils, which have become rancid, and although very much deteriorated, entirely deprived of their odor and color, and almost without fluidity, are not lost beyond remedy. They may be restored in all their purity, but the ordinary rectification is insufficient, because they are then deprived of all their perfume. We shall now proceed to describe the different methods adopted for their rectification, in order to restore to them all their original properties.

The volatile oil which is to be rectified is placed in a still, along with a large quantity of the recent plant, and a sufficient quantity of water; the distillation is proceeded with. When the volatile oil which has been spoiled by age is rectified, it is saturated anew with the perfume, and passes over with the volatile oil arising from the fresh plant. In this manner the volatile oil is completely renewed.

When a volatile oil is not altogether changed, but has commenced to lose its color and limpidity, it is sufficient, in order to restore it, that it be poured into a small glass retort placed in a sand-bath over a furnace, the receiver attached, and the distillation proceeded with at a moderate heat, about the temperature of boiling water. The volatile oil which passes over is limpid and almost without color. The distillation is suspended as soon as the drops begin to be colored; that which remains in the retort is thick, and has very much the appearance of a resin.

All volatile oils lose considerably by rectification; some about one-third, and others more, according to the state of deterioration in which they are when rectified.

Sophistication of Volatile Oils, and the Means of Detecting the Fraud.

Most of the volatile oils met with in commerce are adulterated. Want of good faith and honesty in certain dealers, who, to increase their profits, make no scruple in cheating the public so long as it requires goods at a low price, are the causes which multiply these adulterations. It is therefore important for the liquorist, if he cannot prepare his own oils, at least to know how to detect the fraud.

Almost all the high-priced volatile oils, and those which are sent to foreign countries, are mixed; some with volatile oils of lower price, others with volatile oils of other substances, and which have lost their color by exposure to the air or age; some with fixed oils, as that of the olive, the almond, &c., and, finally, with alcohol. The following are the means of detecting these frauds:—

Sophistication by fat or fixed Oils.—A volatile oil, which contains a fixed oil, is as much less liquid as the proportion of fat oil is increased; then, when vigorously shaken together, bubbles of air will be observed to collect on the surface of the liquid.

Unsize paper is used to discover the mixture made with a fat oil; one or two drops of the oil examined are let fall on the surface of the paper, and then exposed to the air, or to a gentle heat. If the oil is pure, it is completely volatilized; if it is mixed with a fat oil, it leaves on the paper a permanent spot which renders it transparent.

The adulteration by a fixed oil may also be readily ascertained by distilling the sophisticated oil in a retort over a water-bath. The volatile oil passes over during the distillation, while the fixed oil remains in the retort, because it cannot be converted into vapor at the temperature of boiling water. There is no reason to fear the adulteration of volatile oils by fixed oils, which are put in the still with the plants at the time of their distillation for extracting the essence, because volatile oils begin to boil and are distilled at a temperature much below that which is required for the fixed oils.
Alcohol is also an excellent means for detecting this sophistication. It is sufficient, in applying this test, to place any quantity of the suspected oil in a graduated tube, and to pour on it eight times its bulk of pure alcohol and shake it. The alcohol dissolves the volatile oil, leaving the fixed oil, which falls to the bottom of the tube, where the quantity is indicated to within some hundredths by the graduation.

It quite often happens that a portion of the undissolved fat oil adheres to the sides of the tube, and by so much diminishes the quantity collected at the bottom; in this case it is essential to promote the precipitation by slight blows upon the tube in different directions.

Sophistication by Alcohol.—This fraud alters volatile oils much less than the preceding; it has not, like the fixed oils, the objection of rendering them viscid; it renders them, on the contrary, more fluid, and does not change the color.

The adulteration with alcohol is rendered certain when, on mixing the volatile oil with water, the mixture immediately becomes white and milky, as the alcohol unites with the water and the oil floats on its surface.

The following method determines exactly the quantity of alcohol contained in a volatile oil: A graduated glass tube is filled with water to any height desired, and the same quantity of volatile oil is then added, a portion of the tube, at the top, being left empty. The two liquids are then frequently shaken, and after a moment’s rest, if the oil contains alcohol, it will be observed that the volume of the water has increased, while that of the oil has diminished; the graduation on the tube will indicate the proportions of the mixture.

Potassium has the property of promptly demonstrating the presence of alcohol in volatile oils. The following is the process by which the liquorist may apply this reagent successfully. It consists in putting a bit of potassium, as large as a pin-head, into a small quantity of the suspected volatile oil. If the oil contains so much as one-fourth of alcohol at 90 or 96 degrees, the potassium at once assumes a round form, with a brilliant and shining aspect like a globule of mercury; it moves about, oxidizes very promptly, and disappears in at least one or two minutes; a slight noise always accompanies these phenomena. When the alcohol is only mixed in the proportion of a sixth, an eighth, a twelfth, and even a twentieth, the same phenomena take place; it is only to be observed that the potassium disappears more slowly, and the noise is much less sensible when the proportion of alcohol is less considerable.

Sophistication by Common Volatile Oils.—This fraud, which is more difficult of detection, consists in mixing with certain volatile oils the more common and cheaper oils, such as the rectified oil of turpentine, lavender, rosemary, &c. This adulteration, before which all the tests of chemistry have failed, can be detected only by comparison with an oil of unquestionable purity. It is to be observed, however, that, by saturating a piece of cloth or paper with this sort of mixed oils, the more volatile oil is first dissipated, and that whose odor is most enduring is evaporated last, and may thus be distinguished, that of turpentine easiest of all.

Receipts for the Volatile Oils or Essences.

As for the aromatic waters, the quantity of volatile oils or essences is dependent on the season in which the plants, flowers, seeds, fruits, &c., have been gathered. As to the result, the causes are so various, which may increase or diminish it, that it is impossible to establish any very positive basis; the nature of the soil, exposure, good or bad weather, cause the result to vary in considerable proportions.

The details given, at the beginning of this chapter, render it unnecessary to repeat our observations in reference to the extraction of volatile oils. We shall content ourselves with giving the receipts for the volatile oils of roses and cinnamon, which will serve as types, one for the light, and the other for the heavy oils. We shall also give the receipt for the volatile oil of bitter
almonds, because of the peculiar characteristics presented in its manufacture.

Volatile Oil or Essence of Roses.

- Petals of fresh roses: 25 kilogrammes.
- Water: 10 litres.
- Common salt: 500 grammes.

After firing the grate in the still, put in the flowers, add the water and salt, adjust the cap, lute the joints of the apparatus, and distill, until the volatile oil ceases to pass over; collect the product as it comes off in a florentine receiver; remove the oil which floats on the aromatic water, with a pipette, filter it if necessary, and preserve it in well-stopped flasks.

There is a particular adulteration of volatile oil of roses, of which I designedly omitted to speak above. Sometimes the oil of roses imported from the East is nothing more than spermaceti dissolved in some fixed oil, to which a small quantity of the pure volatile oil has been added. In this condition the fraudulent mixture presents the appearance of the true oil, and, like it, remains congealed at a temperature of ten degrees above zero.

This fraud is readily detected. When the oil is rendered liquid by a slight increase of temperature, it has neither the fluidity nor mobility of the pure oil of roses; alcohol dissolves only a small portion of it, and it leaves a spot on paper which is not entirely dissipated by heat.

We take the liberty of reproducing an extract from a pamphlet on the subject, published in 1804, by M. Langlès, because it contains some information in regard to the essence of roses which is but little known:

"Can it be imagined," says this learned Orientalist, "that a process, which is so simple and so wide-spread in the East, and in fact throughout the western coasts of Africa, which is the result of another known from time immemorial (rose water), does not date back more than two hundred years? This opinion differs very much from that of many of the learned."
DISTILLATION OF ALCOHOL.

imitate what had been produced by chance and by nature."

[N. B.—The following article, from Ure's Dictionary, may not be uninteresting to the reader, and is therefore inserted here without apology.—Trans.

"The oil of roses, called also the attar or ottu, is extracted by distillation from the petals of the Rosa centifolia and semper virens. Our native roses furnish such small quantities of the oil, that they are not worth distilling for the purpose. The best way of operating is to return the water repeatedly on fresh petals, and eventually to cool the saturated water with ice, whereby a little butyricaceous oil is deposited. But the oil thus obtained has not a very agreeable odor, being injured by the action of the air in the repeated distillations. In the East Indies the attar is obtained by straining the roses in earthen pans, in alternate layers, with the oleiferous seeds of a species of digitalis, called genelot, for several days, in a cool situation. The fat oil of the seeds absorbs the essential oil of the rose. By repeating this process with fresh leaves and the same seed, they become eventually swollen, and, being then expressed, furnish the oil. The turbid liquid thus obtained is lifted off, in well closed vessels, where it gets clarified. The layer of oil which floats on top is then drawn off by a capillary cotton wick, and subjected to distillation, whereby the volatile oil is separated from the fat seed oil."

Volatile Oil or Essence of Cinnamon.

Ceylon cinnamon, bruised . . . 5 kilogrammes.
Water . . . . . . 20 litres.
Common salt . . . 1 kilogramme.

Macerate for twenty-four hours, add the salt, and distill until the water passes over clear. The product will be milky, very aromatic, and by rest will yield a volatile oil at the bottom of the receiver; after twenty-four hours, decant the product, return it upon the materials remaining in the still, and distill as at first; repeat this operation until there is no longer any perceptible

increase of the oily product, allow it to rest twenty-four hours, and decant to separate the volatile oil.

Volatile Oil, or Essence of Bitter Almonds.

Bitter almonds . . . . . . 10 kilogrammes.
Water . . . a sufficient quantity.
Common salt . . . 1 kilogramme.

Reduce the almonds to a powder by a peculiar mill, and extract the fixed oil by pressure in the usual way; that is to say, by a stamping press; mix the almond cake with water so as to form a thin broth, introduce the mixture into a still, and allow it to macerate for twenty-four hours; then distill by the aid of steam, which is injected through a tube into the still, or by means of Soubeiran's apparatus; in this last case the diluted almond cake should be placed in the water-bath. Continue the distillation so long as the product is odorous. Then separate the volatile oil from the aromatic water, pour this into a small still and distill anew; a new quantity of essence, which passes over at the beginning of the operation, will be separated; this essence must then be mixed with the first product.

For a long time the formation of the volatile oil of bitter almonds was an enigma to chemists, which they had almost despaired of solving; they asked themselves whence this essence could have originated, since the bitter almond contains only a fat oil, and other principles that are completely inodorous. MM. Robiquet, Liebig, Bussy, and Fremy have taught us that it is the product of a metamorphosis, of a chemical reaction which is established, under the influence of water, between the vegetable albumen of the almonds and one of the inodorous principles which accompany it. This principle, which is called amygdaline, is white, crystalline, sweetish, and soluble.

If, in fact, amygdaline is brought in contact with a solution of the albumen of almonds, or, more simply, with an emulsion of sweet almonds, the mixture almost immediately acquires a strongly aromatic odor.
DISTILLATION OF ALCOHOL.

of amygdaline will thus furnish by distillation as much as 42 parts of essence, accompanied by five or six parts of prussic acid. And what is more remarkable, is, that this conversion of an inodorous into a highly odorous principle is effected only by the albumen of the bitter almonds, and never by that of other vegetables, nor by the albumen of animals. Moreover, what thoroughly proves that the essential oil in this case is formed at the expense of the amygdaline, is, that sweet almonds, which do not contain amygdaline, do not yield the slightest trace of essential oil by distillation.

Because of this peculiar property of the albumen of the bitter almond, which is very similar to diastase, or a ferment, it is distinguished by the name, synaptase.

When exposed to the air, the essential oil of bitter almonds absorbs oxygen, and deposits crystals of benzoic acid. It contains from 8 to 14 per cent. of prussic acid, which adheres to it obstinately, but from which it may be separated by distilling it upon potassa. When entirely freed of this acid, it is no more poisonous than other volatile oils, and is classed with them.

Generally, the essence of bitter almonds found in the market, whether for liqueurs or perfumery, is composed of one part of the pure volatile oil of bitter almonds and seven parts of rectified alcohol.

For some years, there has been employed, in perfumery for scenting soaps, a chemical product having a perfume almost identical with that of the essence of bitter almonds; it is called essence of mirbane. The following is the method of preparing it:

- Benzine: 2 kilogrammes.
- Nitric acid, at 40°: 2 "
- Sulphuric acid, at 66°: 2 "

Pour the benzine into a large matras; add gently, and in small doses, the acids, which are mixed at the moment of being used (a sunny day should be selected for this operation), shake the mixture carefully every fifteen minutes for four hours; it results in an elevation of temperature and the abundant evolution of nitrous acid gas, which continues throughout the operation.

After a rest of ten or twelve hours, decant the oil which floats on the acids, and wash it in many waters. Thus prepared, the essence of mirbane is of a yellow color and very liquid, and has a powerful and highly aromatic odor. It cannot be used in the manufacture of liqueurs.
Volatile oils are obtained from certain flowers by macerating them in a fixed oil (enfleurage), and then bringing this in contact with alcohol; the product of this operation is called an extract.

Flowers, whose odor is very fugitive, do not yield a volatile oil by expression or distillation, such as white hawthorn (Cratoneura oxyacantha), cassie (Acacia farnesiana), honeysuckle (Lonicera periclymenum), geranium, jasmine, fagon, heliotrope, hyacinth, lilac, lily, muguet, narcissus, patchouli, reseda (mignonette), syringa, tuberose, violet, &c. &c. The aroma can be extracted only by the use of a fat or fixed oil (as that of olive, ben, or sweet almonds) as a solvent.

The flowers are separated from the stalks, and placed in layers or strata, with cotton wool, or white woollen cloths saturated with oil between each layer; after three or four days, the flowers are renewed, and this operation is repeated until the oil, absorbed by the cotton or cloth, has imbibed a sufficient quantity of the odor. The cotton wool, or woollen cloths are then digested in alcohol at 85 or 90 degrees, and distilled in a water-bath. The alcohol takes up the odor, and thus forms the volatile oil or extract.

Some manufacturers prefer not to use the still. In order to obtain the volatile oil of a flower, they only place the oil expressed from the cotton wool, or cloth, in contact with alcohol for some days; the latter dissolves the volatile oil without disturbing the fixed oil. After decantation, the spirit is filtered.

In order to accomplish the decanting more effectually, the mixture may be exposed to frost, or to the action of an artificial freezing mixture. The oil solidifies, and falls to the bottom of the vessel, while the alcohol floats above charged with the odorous principle of the flower. It is decanted without distillation.

There is a fourth process proposed by a skilful perfumer of Paris, M. Teissier-Prevost, which consists in replacing the oil by mucilage of gum arabic, with which a number