Arrangement of the machine, we offer the accompanying illustration and description.

Fig. 3.

L. Copper boiler surrounded by a sheet iron furnace.
M, X. Distilling plates.
H. Rectifying column.
I. Goose-neck for conducting the alcoholic vapor from the rectifying column to the wine-heater G.
G. Cooler and wine-heater combined.

PORTABLE APPARATUS FOR CONTINUOUS DISTILLING.

J. Pipe and cocks for the return of the spirits to the rectifier.
E, F. Funnel and pipe to receive the wine and convey it to the bottom of the cooler.
A, B. Suction and force pumps to feed the reservoir D.
C. Pipe to convey the wine from the pump to the reservoir D.
D. Reservoir or tank surmounting the apparatus and to receive the wine.
F. Supporters for the reservoir.
d. Level pipe to the reservoir.

The distilling is conducted as follows:—
The liquor to be distilled, let it be wine, is raised to the upper tank D by means of the pump B attached to the frame of the carriage; the regulating cock of the pipe E is opened, and all the parts of the apparatus are filled except the boiler L, which has been previously filled with water.

The regulating cock is then closed, and the fire lit under the boiler. The steam which rises, passes first over the first plate M, where it takes up a certain quantity of the vapor of alcohol; by traversing the second plate K it is enriched by a second dose of alcohol; finally, it is saturated in the third compartment. This vapor, highly charged with alcohol, reaches the rectifying column H, where it is freed from a greater portion of its water and its essential oils; thence it is conveyed by the goose-neck I into the coil of the cooler G, the upper portion of which acts as a rectifier. The alcoholic vapors which have found their way mixed with the steam into the cooler, return to the rectifying column by the pipe J. The vapors which are not condensed in the upper part of the cooler are condensed as they descend and escape in the form of brandy or alcohol as the return cocks may be closed or open.

At this moment the regulating cock is opened. The liquor contained in the reservoir entering at the bottom of the cooler, raises the wine already heated by contact with the worm, and causes it to flow into the pipe which leads to the upper section of the still; there it is subjected
DISTILLATION OF ALCOHOL.

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to the action of the steam rising from the boiler, which deprives it of a portion of its alcohol; it loses the balance of its alcohol in traversing the two other sections; it finally falls into the boiler as spent liquor, and by its ebulition furnishes more steam for continuing the distillation, and so on. The exhausted liquor escapes from the boiler in a continuous stream through a waste pipe in form of a siphon.

To terminate the operation, water is pumped into the upper reservoir. This water forces before it all the wine which the apparatus contains, and when the proof bottle no longer indicates the presence of alcohol all the stopcocks are closed, the fire is extinguished, and the machine left in this condition until the work is resumed, or if this is to be postponed for a long time, or the machine has to be removed to some other place, it will be necessary to empty it entirely of water.*

Pear Brandy.

Perry is a drink prepared from pears just as cider is from apples, and between which, too, there is much analogy. The action of perry on the nervous system is thought to be injurious. It is less nutritious and more irritating than cider. It is very heady when old, and promptly intoxicates those who are addicted to its habitual use.

Pears yield nearly fifty per cent. more juice than apples, and the juice is far more saccharine; perry, also, contains more alcohol than cider. Perry of the best quality is very like the white wines of Anjou, Sologne, and Gatinais. When bottled, after being well prepared, it becomes entirely wine-like. When it is effervescent, it often resembles the light wines of Champagne. It is well suited for mixing with white wines of inferior quality, which it renders stronger and better, as is well understood by wine dealers; frequently, small retailers even sell pure perry as white wine.

Pear brandy is obtained in the same way as cider brandy, and possesses the same characteristics. The alcoholic results, as in all other drinks, cannot be positively estimated, this depends on the good or bad quality of the pears, whether they are carefully handled or not, the temperature, &c. Nevertheless, we may say that it is quite common to obtain 15 or 18 per cent. of brandy at 50 degrees from perry.

Brandy from Beer.

Beer is produced by the fermentation of barley and a decoction of hops; like all other fermented liquors, it contains more or less alcohol, and will yield a brandy of pretty fair quality when it is itself of a good quality, and when the distillation is effected by steam, but which still preserves a peculiar odor and taste due to the hops. Generally the quality is bad, as only spoiled beer is distilled; good potable beer will always command a higher price than the brandy it will yield. The distillation too is always conducted over the naked fire, and proper precautions are not taken to prevent the slimy and mucilaginous elements of the beer from being burned to the still, which, by adding a detestable empyreumatic flavor to the acid taste of the spoiled beer, must cause the product to be bad.

When beer is distilled the operation should be conducted in the same manner as for wine.

There are many other fermented liquors which will yield alcohol by distillation, as hydromel, &c., but the inferior quality of the spirit produced, and the expense attending the use of many of these substances have induced distillers to pass them by for those in more general use, and the profit from which is less problematical.

Rum.

The names rum and tafia are applied to a spirit obtained from the distillation of a fermented liquor prepared from
the molasses of sugar cane. This spirit is of excellent quality, and is very much sought after when it is old. Rum comes to us from America, principally from the Antilles; Martinique and Guadaloupe furnish it in large quantities of very good quality.

True Jamaica rum was formerly made from the juice of the violet cane, which gave it a peculiar aroma, and tafia was the product of the distillation of molasses; now both of these liquors are obtained from the distillation of molasses, only the article sold as rum is the spirit of molasses carefully prepared, while that sold as tafia has less perfume and is of inferior quality.

Rum is shipped from the colonies in iron-bound oak barrels containing 225 or 425 litres; its alcoholic strength is commonly from 51 to 55 degrees Centigrade. It is much used in France and England, where it is considered as a preservative against cholera.

This distillation of rum like all the operations accompanying it, is conducted in the same way as that for the distillation of alcohol from molasses, only by preference a special apparatus (see page 76) is used in order to retain in the rum the characteristic taste which causes it to be so highly prized by gourmets. The first product is never of sufficient degree; it is necessary, then, to redistil it.

Like all other spirits, rum when it is first distilled is white and transparent; in order to give it the yellowish amber tint by which it is known in the trade and to increase the peculiar taste usually met with in it, variable proportions of prunes, shavings of leather, cloves, tar, etc., are infused in a part of the liquor: the desired color is generally completed by the addition of the necessary quantity of caramel. The proportions of the ingredients just named constitute what are called in the rum factories sauces. They differ in different factories, and from this results the various kinds of rum, which connoisseurs esteem more or less for their peculiar bouquet. The following is the recipe for one of these sauces:

CHERRY BRANDY.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>New leather tanned and rasped</td>
<td>2 kilogrammes</td>
</tr>
<tr>
<td>Oak bark crushed</td>
<td>500 grammes</td>
</tr>
<tr>
<td>Cloves</td>
<td>15</td>
</tr>
<tr>
<td>New tar</td>
<td></td>
</tr>
<tr>
<td>Molasses spirit</td>
<td>100 litres</td>
</tr>
<tr>
<td>Alcohol from molasses at 85°</td>
<td>10 litres</td>
</tr>
</tbody>
</table>

Infuse the whole for fifteen days, then draw off the clear liquid and complete the color with caramel.

Another method consists in infusing the other ingredients in a small quantity of the spirits, and using the tar in a different manner. It is as follows:

- Shavings of tanned leather 4 kilogrammes
- Black truffles 1
- Orange peel 20 grammes
- Alcohol from molasses at 85° 10 litres

Digest at least fifteen days before using this preparation, and only add enough of it to the rum to perfume it properly, then introduce into the cask destined to contain the rum the smoke from a wisp of straw impregnated with tar; now close the bung in order to allow the vapor time to condense on the surface of the cask, then fill it with the prepared rum. This, when old, acquires a flavor very analogous to that of Jamaica. It is well to add a small quantity of caramel to give the usual amber tint.

Prunes are used even during the fermentation; they are steeped in hot water, and after being crushed, are thrown into the fermenting vat. The proportions are very variable, but generally 10 kilogrammes of prunes are added for every 100 kilogrammes of molasses: that of the hot water is also indefinite.

By reason of the facility with which rum may be mixed with spirit of wine, it is rarely met with unless so mixed, especially in the hands of a dealer. This fraud is difficult of detection; there are a few dealers in spirits who can detect it, and they are frequently deceived.

Kirschenwasser or Kirsch. (Cherry Brandy.)

In Germany, the spirit distilled from the fermented juice of a variety of wild cherry, is called Kirschenwas-
ser (cherry water), which is contracted into Kirsch. A great quantity is produced in the Black Forest, from which the best kirsch of Germany and Switzerland comes.

In France, the distillation of kirsch is confined almost exclusively to Franche-Comté, that is, to a small portion of the departments of Haute-Saone, Vosges, and Doubs. The centre of this trade is at Fougerolles (Haute-Saone), where there are many commission agencies of importation, both French and foreign.

The cherries generally employed for making kirsch are a species of wild cherry, the fruit of which is very black when thoroughly ripe, and with a long red stem, and a very large seed in proportion to the fruit. They are collected in July and August. If possible, a fair day is selected; because it is well understood that kirsch from cherries gathered in bright weather is far better than that obtained from fruit gathered during a damp spell.

Generally, the method of manufacturing kirsch is very objectionable. When the cherries are ripe enough to be readily plucked by hand, one by one, as is indispensable to avoid unripe fruit, the peasants thrash the trees with long poles, while the children gather the fruit as it falls and throw it into open hogsheads. One may well see that in this mass there will be some cherries insufficiently ripe, and some that are rotten; yet there is no separation, and the whole are mashed together, either with the hands or a small wooden block on a wicker strainer, resting on two pieces of timber, placed on the top of the fermenting vats, which receive the expressed juice; they then pound the marc with a view to crushing the seeds, and throw it into the expressed juice, in order that, during the vinous fermentation, it may impart the agreeable taste which is characteristic of kirsch, and which causes it to be so much sought after.

When the fermentation is finished, which requires from fifteen to thirty days, according to the capacity of the vats and the temperature of the weather, they throw the whole, marc and liquid, into the Turk's-head still, and distil over a naked fire. This process, as we see, is very defective, and can only result in a product of very bad taste, and is highly injurious to the animal economy; because, on one hand, the cherries, being left to ferment in vats, or hogsheads usually on end, open at the top, and but seldom, or imperfectly covered, become acid, and often mouldy on the top. On the other hand, the distillation of a semi-fluid substance over a naked fire, produces an empyreumatic flavor, which the crushed seeds are intended to conceal, however, without entire success.

The best process for obtaining kirsch of good quality is the following:

The cherries, when ripe, are plucked singly by hand, only the ripest being gathered; in this state they only are taken that will separate easily from the stems, which are left attached to the tree. Those that are rotten or damaged should be rejected. As soon as a sufficient quantity of fruit is gathered to justify operations to be commenced, it is crushed by the hands, or a wooden rubber, on a wicker basket or trough, supported by a frame resting on a tub. The juice falls into the vessel, while the skins and seeds remain in the basket. The seeds, being separated from the skins, are thrown into the liquid, and the whole transferred to a fermenting vat; it is carefully covered, and permitted to ferment in some place having the proper temperature. The must commonly marks six or seven degrees Baumé, and the fermentation, which lasts about four or five days, is effected without artificial ferment. When the fermentation is finished, the clear liquid is drawn off and distilled, with all the necessary precautions, by the aid of steam.

All spirits from nut fruits, may be prepared in the same manner, especially that from prunes, which possesses much analogy to kirsch, and is often confounded with it. Well prepared kirsch has a peculiar flavor, which is not empyreumatic, but which is derived from the seeds;
it is not acrid; the odor is due to the presence of a small quantity of hydrocyanic (prussic) acid, contained in the cherry stones. For a long time, it was thought that the stones ought to be broken, to produce in kirsch its characteristic odor and taste; but it has been ascertained that this is altogether superfluous, and that the seeds communicate to kirsch identically the same perfume, whether broken or not.

The alcoholic product from 100 kilogrammes of cherries is usually seven or eight litres of kirsch at 51° or 55°, or about from three and six-tenths litres to four and four-tenths litres of pure alcohol.

The larger proportion of kirsch made in Franche-Comté, is sent to market very soon after its distillation; it is then at 53° C. When intended to be kept, it is put up in glass vessels, demijohns, bottles, or flasks, etc. During the first year, the vessels are closed with some substance that will permit a slight evaporation, by which the acrid principles are volatilized, and a very pleasant liquor is left in the vessel, which is now closely corked to be kept.

When glass vessels are lacking, it is put up in small casks or kegs made of ash, which have the advantage of not imparting any color to their liquid contents. In the country they are in the habit of placing kirsch, during the first year, in rooms where a gentle temperature favors evaporation. We may remark, in passing, that colored kirsch is seldom made, it being more highly prized when limpid and transparent. Age, as for all other spirits, greatly improves its quality.

Frequently, kirsch is met with in the market mixed with pure brandy, or alcohol from apricot seeds, reduced to 51°; sometimes alcohol, reduced and perfumed with the essence of bitter almonds, is added to it; but all these frauds, produce a kirsch of inferior quality, which is easily recognized by the taste.

There is, however, a preparation which imitates kirsch so perfectly, that when mixed with the latter, it is very difficult of recognition. It is as follows:—

| Seeds of apricots | 3 kilogrammes. |
| Seeds of cherries | 9 |
| Dried peach leaves | 625 grammes. |
| Myrrh | 150 |
| Good flavored alcohol at 85° | 62 litres. |

Bruise the seeds and digest the whole together in a water bath in a simple still for 24 hours; at the moment of beginning the distillation, add 30 litres of water, lute on the top, light the fire, and draw off 60 litres of a good product, to which should be added 40 litres of water to reduce it to 50°, and thus form 100 litres of fictitious kirsch. By adding 15 grammes of sugar to the litre, the taste will be softened and the sharpness of the liquor destroyed. The peach leaves may be replaced by 315 grammes of the dried flowers.

Since the advance in the price of spirits, a great many kirsch distillers mix alcohol from the beet or grain with the cherry wine. The mixture being perfect, the alcohol takes up the excess of perfume, which would have remained in the liquor, and, in consequence of its addition, the quantity of kirsch is greatly increased.

Gin, Geneva.

Gin is nothing but grain spirit aromatized with juniper berries. It is not the result of the distillation of these berries crushed and fermented with water. This spirit, then, is prepared in the same manner as whiskey, and the only object of adding the juniper is to cover the unpleasant taste which usually characterizes this liquor. The proportion of berries used is extremely variable; it depends on the nature of the spirits and the wishes of the distiller; but, as a general rule, one kilogramme of berries is sufficient for the proper aromatization of one hecatolitre of whiskey.

The juniper berries, coarsely ground or simply crushed, are added to the product which is about to be distilled, or placed in a sack and suspended in the still, or, what is better yet, on a receiver arranged for the purpose, through which all the alcoholic vapors rising from the still are compelled to pass.
Holland enjoys a large trade in the exportation of its gin. Its home consumption, which is considerable, consists of a gin at 45 to 49 centesimal degrees. The large factories of this product are at Scheidam (Schnaps). This town contains more than two hundred gin distilleries.

In Sweden and Norway, a sort of gin is prepared by simply digesting the juniper berries for some days in spirits at 50 or 55 degrees. This process is very objectionable, because it communicates to the liquor a very disagreeable sharpness. It is preferable to employ the process described hereafter, which consists in distilling the berries after sufficient maceration with alcohol at 85 or 90 degrees, and to reduce the product of the operation to 49 degrees.

The gin, which is consumed in the North of France and Belgium, is often nothing more than whiskey from rye and barley, or rather from potatoes and barley, and the taste which characterizes it is that of grain. This gin has an odor which is by no means agreeable, and far from being delicate, yet it is very much preferred by those who like this kind of spirits.

**CHAPTER IX.**

**THE MANUFACTURE OF SWISS ABSINTHE.**

Swiss absinthe at the present time constitutes the object of considerable trade and a special manufacture. Portarlier, Montpellier, and Lyons, are cities in which it is manufactured in very great quantities. We shall describe the article as produced in each locality, assuming that the quantity of Swiss absinthe to be made is one hectolitre.

### Absinthe of Portarlier.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Larger absinthe, dried and ground</td>
<td>2 kilogr., 500 grms.</td>
</tr>
<tr>
<td>Green anise</td>
<td>6</td>
</tr>
<tr>
<td>Fennel</td>
<td>5</td>
</tr>
<tr>
<td>Alcohol at 85°</td>
<td>95 litres</td>
</tr>
</tbody>
</table>

### Absinthe of Montpellier.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large absinthe dried</td>
<td>2½ kilogr.</td>
</tr>
<tr>
<td>Green anise</td>
<td>6</td>
</tr>
<tr>
<td>Fiorentine fennel</td>
<td>4</td>
</tr>
<tr>
<td>Coriander</td>
<td>1</td>
</tr>
<tr>
<td>Angelica seed</td>
<td>500 grammes</td>
</tr>
<tr>
<td>Alcohol at 85°</td>
<td>95 litres</td>
</tr>
</tbody>
</table>

Distil as in the preceding case. The color is made also in the same way with the following ingredients:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dried hyssop, (herb and flowers)</td>
<td>750 grammes</td>
</tr>
<tr>
<td>Dried balm of Moldavia</td>
<td>750</td>
</tr>
<tr>
<td>Small absinthe</td>
<td>1 kilogr.</td>
</tr>
</tbody>
</table>
Absinthe of Lyons.

Large absinthe, dried 3 kilogrammes.
Green anise 8 "
Fennel 4 "
Angelica seed 500 grammes.
Alcohol at 85° 96 litres.

Absinthe of Fongerolle. (For 600 Litres.)

Great absinthe, Green anise 24 kilogrammes.
Fennel 8 "
Coriander 2 "
Roots of the black alder 3 "
Angelica root 4 "
Alcohol at 85° 570 litres.
Water 300 "

Treatment as above.

Digest for at least twelve hours with the alcohol in a proper apparatus, add the water at the time of distilling, draw off 570 litres of perfumed spirits. When this quantity has been obtained continue the distillation until all the phlegm has been distilled off and set aside for another operation.

Absinthe of Bourges. (For 600 Litres.)

Great absinthe, Green anise 24 kilogrammes.
Fennel 8 "
Coriander 4 "
Alcohol at 85° 570 litres.
Water 300 "

Treat as before.

It is always optional to diminish or increase the quantities of the ingredients in the foregoing recipes according to the taste of the manufacturer, or the price of the article he wishes to produce; but this fact must be borne in mind, that it is only age that will give to absinthe that softness so much prized by consumers.

Remarks.—The greatest pains should be taken in the selection of the materials, especially the plants intended for the coloring; these should be very green and dry, and free from black and mouldy leaves. The seeds should be powdered in a mortar, and the great absinthe picked over and ground.

The distillation of absinthe should be effected in a Turk's-head still, in a water-bath, or, what is better, by steam, in order that the essential oils may rise with more facility, especially towards the close of the operation; because the phlegm is employed in another opera.
tion, in which it is most useful, by adding to the perfume through the large proportions of essential oils it contains.

The coloring is of the highest importance. The plants are finely divided, or reduced to powder, and covered with perfumed spirits; then heated gently, in order to extract the chlorophyll or coloring principle. After cooling, the colored spirit is drawn off clear, and the plants are drained. They may still, after this operation, serve for coloring a smaller quantity of absinthe. They are then subjected to distillation, to collect and save the small quantity of alcohol still adhering to them.

In the large factories, the extract of absinthe is colored in tinned copper vessels, containing about ten hectolitres—they are called colorers. These vessels, hermetically closed, are heated to 60 degrees by means of steam.

The coloring may be made in the cold way, but the operation requires many days, and a large quantity of plants, which considerably increase the acridity of absinthe.

When the coloring and perfumed spirit, held in reserve, have been mixed, the alcoholic strength is tested and reduced to 74°, although absinthe is never sold above 72°; but, by rest and time, there is always some loss which must be provided against.

The green color of absinthe becomes yellowish by age, and then has a dead-leaf tinge. The green tint may be preserved by adding, after the mixture, fifteen grammes of anise, at the same time adding something to the flavor; the hyssop fulfills the same end, while it yields a beautiful green color, which the balm increases still more. Finally, the lesser absinthe, by its slightly yellowish tinge, modifies the excessive brilliancy of the green color, while its slight bitterness and aroma, added to those of the great absinthe, impart to this liquor the characteristics peculiar to a well-made product.

Absinthe is considered as being of good quality when, on being diluted with water, it becomes white, and exhibits the colors of the opal, which is due to the essential oils from the seeds, and the resinous and coloring matters of the plants, which, under these circumstances, are set at liberty, and form, with water, the milky compound so highly prized. In this state, it should be pleasant, agreeable, odorous, and sweetish. Sharpness and tastelessness are always signs of a recent manufacture.

Absinthes of inferior quality are often met with in the market. Some are manufactured without distillation, essences being used to replace the seeds and plants; some are distilled with trois-six from beets, &c., which leaves much to be desired in flavor; some are prepared with old or damaged materials, while, finally, there are others which, after the distillation have had added to them aromatic resins, such as benzoin, guaiacum, &c., in order to increase the opalescence.

White Absinthe.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greater absinthe, selected</td>
<td>2 kilogr., 750 grms.</td>
</tr>
<tr>
<td>Lesser absinthe</td>
<td>1 kilogr., 125 grms.</td>
</tr>
<tr>
<td>Hyssop flowers</td>
<td>1</td>
</tr>
<tr>
<td>Veronica</td>
<td>550 grms.</td>
</tr>
<tr>
<td>Genepi</td>
<td>550 grms.</td>
</tr>
<tr>
<td>Roman chamomile</td>
<td>225 grms.</td>
</tr>
<tr>
<td>Green anise</td>
<td>5 kilogr., 250 grms.</td>
</tr>
<tr>
<td>Fennel</td>
<td>5</td>
</tr>
<tr>
<td>Coriander</td>
<td>1 kilogr.</td>
</tr>
<tr>
<td>Angelica seeds</td>
<td>550 grms.</td>
</tr>
<tr>
<td>Alcohol at 85°</td>
<td>96 litres</td>
</tr>
</tbody>
</table>

White Absinthe. 241
Conduit the maceration and distilling in the same way as for green absinthe; then rectify the product, and reduce to 74°.

The abuse of absinthe, even diluted with water, is most deleterious to the animal economy. Taken pure, it occasions serious disorders of the stomach and brain. It is not to the alcohol alone that these injurious effects are to be attributed, but more especially to the large quantity of essential oils of anise and fennel which it contains.

Apparatus for Manufacturing Absinthe and Perfumed Spirits.

This apparatus, Pl. VIII., consists of the following parts:

A. Kettle inclosed in a wooden jacket, acting as a water bath inclosing another kettle, which contains the alcohol and herbs to be distilled.
B. Top or cover of the boiler (still).
C. Opening closed by a plug for charging the still.
C1. Opening like the above for discharging the plants after distillation.
D. Cap of the still fastened on by a circular collar, and terminating in a neck which conducts the alcoholic vapors to the cooling coil.
E. Cooler with its coil.
E1. Discharge pipe of the condensing coil.
F. Colorer, furnished like the still, with plugs through which to fill and empty it.
G. Pump firmly fastened to the wall by the collars G1.
H. Piston rod.
I. Eccentric for driving the pump.
J. Pulley on which a band runs to connect with the power.
K. Bearings for pulley shaft.
L. Tank, or well of metal, sunk in the floor.
M. Suction pipe.
M1. Suction pipe connected with colorer.
N. Three-way cock, attached to the suction pipe to draw any liquid from the tank to deliver it in the still, in

the colorer, or to the store-room, or to draw the finished liquor from the colorer, and deliver it in the store-room.
N1. Pipe for drawing off the colored product.
O. Force or delivery pipe.
P. Three-way cock, which directs liquids at pleasure into the still or the colorer.
P1. Pipe delivering the liquid into the colorer.
P2. Pipe to convey the liquid into the still.
R. Cock and pipe for delivering the manufactured product into the store-room.
S. Funnel and pipe to convey the distilled product to the tank.
T. Main steam-pipe connected with steam boiler.
U. Steam-cock for the kettle of the still.
V. Steam-cock for the colorer.

Management of the Apparatus.—The principal advantages of this apparatus are its great simplicity and the small number of pieces constituting it. One pump, by its multiplicity of uses, is sufficient for three different transfers of liquid.

1. It fills the boiler of the still A with alcohol and water.
2. It fills the colorer F with the distilled product which flows into the tank by the funnel and pipe S.
3. It draws the liquid from the colorer F1 to send it to the store cisterns by the pipe R.

The apparatus is set in operation as follows:

Having filled the tank L with water and alcohol in the proper proportions, and having placed in the boiler of the still through the upper opening the plants necessary to the manufacture of the absinthe, the cock P1 is opened, and the pump set to work; the boiler A is immediately filled from the contents of the tank L. When the tank is empty, the motion of the pump is stopped and the cock P is closed. The steam is then turned on by opening the cock U1 and the product soon begins to flow from the lower extremity of the condensing coil, falls into S and again fills the tank L; but now it is spirits perfumed by the plants that were placed in the still. The liquid is white, and possesses already a great
DISTILLATION OF ALCOHOL.

part of the properties peculiar to the liquor. It must now be colored. For this operation the pump performs its second office, by drawing up the liquid and sending it to the colorer, which has been previously packed with the coloring plants in quantity proportioned to the perfumed spirit to be poured over them. The perfumed spirit is drawn from the tank by the pump, and is transferred through the cock and the pipe into the colorer. Finally, after this operation which finishes the manufacture of absinthe, the pump fulfills its third office by drawing the colored product contained in through the pipe and transfers it through cock and pipe into the tanks or barrels intended for its reception.

CAUSES OF THE PERNICIOUS EFFECTS OF ABSINTHE.

1. To require that all liquor distillers who manufacture absinthe, or any other spirituous liquors, should have some knowledge of chemistry and botany, should be of good character, and be possessed of organs of taste and smell accurate enough to be of use in estimating the quality of the materials passing through their hands.

2. That a certificate or diploma as a distiller should be conferred on him only after his having proved, by a satisfactory official examination, that he is possessed of a competent knowledge of the theoretical principles of the trade he wishes to pursue.

3. Finally, that he should serve for at least one year as an apprentice, in order that he may, on entering into the business, add also practical knowledge to the theoretical which he should possess. By following this plan, we would have good and true distillers. While at the present time a large proportion of the young men, who set up in this business, have very little knowledge, they very often leave trades having little or no connection with distilling, and at the end of a few months' apprenticeship, sometimes under a man more ignorant than themselves, they present themselves as master workmen at the distillery or the brewery. Why, then, should it be cause for astonishment if badly manufactured products of distillation enter into our daily consumption?

We cannot close this article without giving some advice on the distillation of absinthe.

The plants should be picked over, as only the tops are distilled absinthes that are free from all adulterations.

We have no intention, by what has just been said, to advise the use of this liquor, however well it may be made, but to set forth the fact that, in many localities, sufficient care is not taken in the selection of the plants, and in conducting the distillation. This results from the fact that most persons who undertake this work are ignorant of the first principles of distillation. So much is this the case, that, if allowed to express an opinion on so serious a question, we should advise the authorities—
But why are absinthes so bad in Paris? It is because the greater proportion of absinthes sold are not distilled, but made from essences, which, as is well known are highly charged with empyreumatic essential oils. Now, if the proportion of these essences is too great, as is almost always the case, they are not completely dissolved, and the absinthe so manufactured, after being swallowed, leaves an acrid taste, and a lasting and painful sense of heat and discomfort in the mouth, throat, stomach, and even in the urinary organs in persons who use it habitually.

In conclusion, absinthe, as a medicine, like most other plants, has some useful properties; but as a favorite and daily drink it has its dangers and becomes very often fatal. But it is certain that if this liquor was always of good quality and properly prepared, it would not play such sad havoc, and would spare many useful men to the country.

CHAPTER X.
ALCOHOLOMETRY.

Spirituous liquors, known in commerce as brandy, whiskey, spirits, etc., as we have already said, are mixtures of alcohol and water in variable proportions. Their marketable value generally depends on the actual quantity of alcohol which each of them contains.

Alcoholometry is the determination of the alcoholic strength of spirituous liquors, that is to say, the valuation of the proportions of water and pure alcohol that a mixture of these two liquids may contain. This is effected by the combined use of a thermometer and an areometer. As for the valuation of the proportion of pure alcohol contained in a wine, or any liquid whatever, it is made by the assistance of small test stills. Before examining the latter, we shall first explain the method of determining the proportion of alcohol contained in a mixture of pure water and spirit, and describe some of the instruments necessary to the solution of this problem.

THERMOMETERS.

Thermometers are philosophical instruments made use of to determine the temperature of the atmosphere and of different substances with which they may be brought in contact. These instruments are graduated glass tubes hermetically closed, which contain a certain quantity of mercury or alcohol. The construction of the thermometer depends on the property common to all substances by which they expand under the influence of heat, and contract under the influence of cold.

The thermometers used in France are Reaumur's and the Centigrade. The latter is the official thermometer, and is coming more and more into use. In Germany, England, and the United States Fahrenheit's thermometer is used.

In order to compare two thermometers one with the other, it is necessary to have two fixed and invariable points of reference; the temperature of melting ice has been chosen for one, that of water in a state of ebullition at the level of the sea for the other; because these two terms are the same everywhere, and are easily found.

The three thermometers named have not the same divisions, but are as follows:

Reaumur, the freezing of water 0°, boiling water 80°
Centigrade, “ 0°, “ 100°
Fahrenheit, “ 32°, “ 212°

In Russia, the thermometer of Delisle is used; the scale is the reverse of the above; the boiling point of water is zero, and the freezing point is marked 150°.

Mercurial thermometers cannot be constructed to indicate a temperature, above 350°, because that liquid boils at this temperature, nor below 34° below zero, because when so near its freezing point its rates of expansion and contraction are irregular.
The distiller has frequent use for the thermometer in the various operations we have described. When the instrument is to be used, it is sufficient to suspend it for a while in the air or the liquid the temperature of which is to be tested. The fluid in the instrument will soon stand at a fixed point, thus indicating on the scale attached the temperature sought for. It is proper to remark that mercury acquires the temperature of a liquid much more readily than that of air, so that it is necessary to wait a longer time when testing the temperature of the atmosphere than is required for liquids. Mercurial thermometers are to be preferred to those filled with alcohol on account of their greater accuracy and the promptness with which they react under changes of temperature.

As each may have his own fancy as to the thermometer he may prefer to use, we have thought it advisable to subjoin the following tables, showing the relations between those in use among different people in various countries.

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Distillation of Alcohol. Centigrade and Reaumur Thermometers.