The upper horizontal column contains the per cent. of the stronger alcohol; and the vertical columns below, the volumes of water which are to be added to 100 volumes of it, in order to produce a spirit of the strength indicated in the left-hand column. For example:—if we wish to procure a spirit of 20 per cent. from alcohol of 85 per cent., we take the number from the left-hand column, and find opposite, under the vertical column, 329.84, which are the number of volumes of water required to produce a spirit of 20 per cent. out of a spirit containing 85 per cent. of alcohol.

The general rules for mixing spirituous liquors are, if you wish to reduce spirits of a given number of degrees above proof (P), to a required number of degrees below proof, to multiply the number of gallons by 100, less the required number of degrees below proof; divide this product by 100, more the number of degrees which the given liquor is above P, and the quotient deducted from the original number of high proof gallons, will give the result.

For instance, to reduce a cask of 40 gallons of spirits at 36 degrees above P, to 5 degrees below proof:

\[
\begin{align*}
&\text{100} \\
&\text{5} \\
&\text{To 100} \\
&\text{Multiply 95} \\
&\text{add 36} \\
&\text{by 40} \\
&\text{136} \\
&\text{3800 = 28}
\end{align*}
\]

Deduct the 28 from the original cask containing 40 gallons:

\[
\begin{align*}
&\text{40} \\
&\text{28} \\
&\text{12}
\end{align*}
\]

Therefore 12 gallons of spirits are to be taken from the cask and supplied by water, and the mixture will then be equal to 5 degrees below proof.
FERMENTED LIQUORS.

The 28 gallons of spirits at 36 degrees above proof, are equal to 38 gallons at proof; and this is done by reversing the operation:

Multiply 28 gallons by 00.36

\[ \frac{10.08}{38} \]

Or, by multiplying 40 by 5 you obtain 2.00, and deducting these 2 from 40 will produce 38 gallons at proof; or, in other words, to 28 gallons of spirits add 12 gallons of water, so as to make 40 gallons, which, at 5 degrees below proof, will be equal to 38 gallons at proof.

For reducing high-proof (any high proof) spirits to proof spirits (proof spirits always mean a mixture of equal volumes of standard alcohol, of specific gravity 0.825, and distilled water): for coming to a result, multiply the given quantity by 100, divide that product by the number of degrees which the high-proof spirits are above proof, with the addition of 100, and the quotient thereof deducted from the original quantity will give the answer. For instance,—to reduce 36 gallons of spirits at 20 degrees above proof to proof:

\[
\begin{array}{ccc}
20 & 36 & 36 \text{ gallons.} \\
100 & 100 & 30 \\
120 & 3600 = 30 & 6 \\
\end{array}
\]

Therefore 6 gallons are to be removed and replaced with water; and 30 gallons at 20 degrees above proof are equal to 36 gallons proof. The operation is the multiplication of the 20 percentage with the given 30 gallons, such as:

\[
\frac{30}{20 \text{ percentage.} \quad \text{add 6 the percentage.}} \quad \frac{6}{36 \text{ gallons proof.}}
\]

The simple formula of reducing the spirits, is to multiply the quantity of spirits at a given per cent., and to divide by the derived per cent. less the quantity of the employed spirit.
100 gallons of alcohol at 80 per cent., to be reduced to 30 per cent.; how much water is required?

\[
\left(\frac{100.80}{30}\right) - 100 = 166\frac{2}{3} \text{ gallons of water.}
\]

For raising low-proof spirits to proof spirits with high proof spirits, multiply the number of gallons by the number of degrees which the high-proof spirits are above proof; divide the product by the number of degrees above proof, added to those below proof, and the result will give the number of gallons below proof, which, deducted from the original number of gallons, will give the quantity to be removed and replaced with high-proof spirits.

To raise 40 gallons at 15 degrees below proof to proof, with spirits 36 degrees above proof:

\[
\begin{align*}
15 \text{ degrees below proof} & \quad 40 \\
36 \quad \text{" high "} & \quad 36 \\
51 & : \\
\text{From 40 gallons} & \quad 40,000 \\
\text{deduct} & \quad 28.235 \\
& \quad 11.765 \text{ or } 11\frac{3}{4} \text{ gallons.}
\end{align*}
\]

Therefore 11\frac{3}{4} gallons are to be removed, and replaced with spirits 36 degrees above proof.

By multiplying the 11\frac{3}{4} or 11.775 by 36

\[
\begin{align*}
4.235 & \quad \text{the percentage.}
\end{align*}
\]

\[
\begin{align*}
\text{add 11.765 gallons, or} & \quad 16,000 \text{ gallons at proof,} \\
16.000 & \quad 16 \\
\text{Multiply 28.235} & \quad \text{From 28.235} \\
\text{by} & \quad \text{take 4.235} \\
4.235.25 & \quad \text{To} \quad 24,000 = 28\frac{1}{4} \\
& \quad \text{add} \quad 16,000 = 11\frac{3}{4} \\
& \quad 40 \quad 40
\end{align*}
\]
FERMENTED LIQUORS.

The 28½ gallons at 15 degrees below proof, require 11½ gallons at 36 degree above proof.

To raise low-proof spirits to above proof, multiply the number of gallons by the difference in degrees between the spirits to be added and those to which they are to be raised. This product divide by the sum of the degrees above proof and below proof, and the quotient will give the number of gallons below proof, which, deducted from the original quantity, will give the number of gallons to be removed, and replaced with high-proof spirits; and if the given spirits is at proof instead of 15 degrees below proof, the mode of operation is the same in this instance.

For example:—To raise 40 gallons at 15 degrees below proof to 5 degrees above proof, with spirits 36 degrees above proof:

\[
\begin{array}{cccc}
36 & 15 \text{ above proof} & 40 & \text{ From 40.0} \\
5 & 36 \text{ below } " & 31 & \text{ take 24.3} \\
\hline
\text{Diff. 31} & 51 & 1240 = 24.3 & 15.7
\end{array}
\]

Hence 15\frac{7}{10} gallons are to be removed, and replaced with spirits of 36 degrees above proof.

By taking 24.3 at 15 deg. below proof = 20.7 gallons proof.

\[
15.7 " 36 " \text{ above } " = 21.3 "
\]

40.0 at 5 deg. above proof = 42.0 gallons proof.

Thus showing that the mixture of 24\frac{3}{4} gallons at 15 degrees below proof, with 15\frac{7}{10} gallons at 36 above proof, are equal to 40 gallons at 5 above proof, and both are equal to 42 net or proof gallons.

To raise spirits above proof to higher proof with high proof spirits, multiply the number of gallons by the difference in degrees between both proofs, and divide the product by the difference of the given proofs.

Raise 36 gallons at 20 degrees above proof to 25 above proof with spirits 40 degrees above proof.
BREWING, DISTILLING, AND RECTIFYING.

From 40  36  25 required proof.
Take 20  5  20 given  "
Diff. 20 : 180 = 9  5 difference.

36

9 gallons at 40 degrees above proof = 12.60
27 " 20 "  " = 32.40 proof.  "

Thus, 45.00 gal. = 36 gal.

at 25 degrees above proof.

To reduce spirits above proof to spirits of less degrees above proof, with water, multiply the number of gallons by the difference between both proofs, and divide the product by the given proof added to 100.

For example:—Reduce 36 gallons at 30 degrees above proof to 20 degrees above proof:

30 given
20 required

10
100 add 10
30 by 36

130 : 360 = 2.77 or 2 \( \frac{3}{4} \) gallons water.

From 36

Take 2 \( \frac{3}{4} \)

33 \( \frac{1}{4} \) or 33.25 gal. at 30 above proof = 43.22 at proof
36 " 20 "  " = 43.22.  "

To raise low-proof spirits to a higher degree of low-proof spirits with high-proof spirits, multiply the number of gallons by the difference between the given and required proofs, and divide the product by the sum of the proofs of the given and added spirits.

For example:—Change 36 gallons at 10 degrees below proof to 5 degrees below proof with spirits 20 degrees above proof:
FERMENTED LIQUORS.

\[
\begin{array}{ccc}
20 & 36 & 10 \text{ given} \\
10 & 5 & 5 \text{ required} \\
30 & : 180 = 6 & 5 \text{ difference.}
\end{array}
\]

From 36 gal. at 10 below proof
Take out \( \frac{6}{6} \) at “
36 at 10 below proof = 27.00 gallons proof
Put in \( \frac{6}{6} \) “ 20 above “ = \( \frac{7.20}{7.20} \) “
36 at 5 below proof = 34.20

To reduce low-proof spirits to lower proof with water, multiply the number of gallons by the difference of degrees between both proofs, and divide the product by 100 less the given proof, and the quotient will be the result.

For example:—Reduce 36 gallons 5 degrees below proof to 10 below proof with water:

\[
\begin{array}{ccc}
\text{Required} & 10 & 100 \\
\text{Given} & 5 & 5 \\
\text{Difference} & 5 & 95 \\
& & 180 = 1.90 \\
& & 6
\end{array}
\]

From 36.00
Take 1.90
34.10 from 34.10
5 take 1.70 = 5 per cent below proof
1.70.50 32.40 at proof = 36 gallons.
Or from 36 gallons
Draw off 1.90
In cask 34.10 at 5 degrees below proof
Add water 1.90
36.00 at 10 below proof.

To reduce high-proof spirits to a required lower proof, which will still be above proof, multiply the given number of gallons by the difference between the given and required...
proofs, and divide the product by 100, adding the required proof.

For example:—How many gallons of water will be required to reduce 80 gallons of spirits 60 degrees above proof to 20 degrees above proof?

\[
\begin{align*}
60 & \quad 100 & \quad 80 \text{ gallons} \\
30 & \quad 20 & \quad 40 \text{ difference} \\
40 & \quad 120 & \quad 3200 \div 26.67
\end{align*}
\]

To reduce high-proof spirits to proof spirits. In this case the number of gallons to be added will equal the percentage.

For example:—To 80 gallons at 40 degrees above proof, how much water is required to reduce it to proof?

\[
\begin{align*}
80 & \\
40 & \\
32.00 \div 32 \text{ gallons of water to be added.}
\end{align*}
\]

To reduce spirits above proof to spirits below proof, multiply the given quantity by the sum of the given and required proof, and divide the product by 100 less the required proof.

For example:—To 80 gallons 40 degrees above proof, how many gallons of water to reduce it to 10 below proof?

\[
\begin{align*}
40 & \quad 100 & \quad 80 \\
10 & \quad 10 & \quad 50 \\
50 & \quad 90 & \quad 40.00 \div 44.44 \text{ gallons of water.}
\end{align*}
\]
CHAPTER X.

The Hydrometer.

This is a simple instrument, used for determining the specific gravities or densities of liquids, and sometimes of solids; it is based upon the hydrostatic law, that a floating body displaces its own weight of the liquid in which it swims; hence, the more dense the liquid, the smaller will be the quantity displaced, or the depth to which an hydrometer will sink in it. By varying the weight required to sink a body of given bulk, we may determine the specific gravities of liquids, as well as by measuring the relative volume displaced by one of immovable weight; and upon these principles hydrometers are constructed. The hydrometers of constant weight are all made either of metal or glass of well-known form. The hydrometer which is principally in use in this country is of silver-metal, and consists in form of a cylindrical stem, to which is appended a hollow ballast bulb, so as to cause it to float. That part of the stem above the bulb is graduated on each side; that below is not graduated, terminates in a loaded or solid bulb, and is accompanied by a movable regulating weight. The side marked \( P \) (proof) is sometimes graduated as high above \( P \) as \( 50^\circ \), and as low below \( P \) as \( 45^\circ \), and is used for weighing low or high-proof spirits; or, in other words, those which seldom exceed \( 45^\circ \) above or below \( P \), and in which instances the regulating weight is always retained during the operation. The opposite side, generally graduated as high as \( 100^\circ \), is used for weighing high-proof spirits or alcohol, in all which instances the regulating weight must be removed. This is done (if a screwed bulb) by unscrewing the loaded or solid bulb at the end of the ungraduated part of the stem, after which the
loaded bulb is to be replaced; but if a permanent or fixed bulb, by taking off the weight.

The hydrometer is necessarily accompanied by a thermometer, and a card, so as to regulate the degrees of heat or cold at which the liquor arrives, at the time of examination, of a standard temperature, which is 60° Fah. The several qualities of proof, as they respect the various differences in strength, are indicated on the different scales of the thermometer card by the letters O P, meaning over proof, and U P, for under proof.

§ XXXVII.

The hydrometer requires a thermometer for ascertaining the temperature of the spirits. When heated, it expands or becomes more rarified, while when cold, more intense and contracts; therefore, when at a high temperature, the hydrometer immerses to a greater depth in the spirits, while, when at a low temperature, it shows the reverse. The same spirits, when tested by the hydrometer in warm weather, or in a warm temperature, shows a sensible difference in the number of their degrees, from what it indicates when cold, or at a low temperature; and this difference has to be regulated by a standard, which is done in the following manner. When the tin or copper cylinder which accompanies the thermometer is filled with the spirits to be tested, and having immersed the hydrometer—1, note the number of degrees above or below P, where the liquor apparently cuts the graduated stem; 2, add or deduct the temperature of your liquor from the graduated column which agrees nearest with the degree cut by the hydrometer; 3, then from the number of degrees thus cut, reduce the number of the stem by as many degrees as the mercury stands above 60° Fah., and thus will the true proof be ascertained; but, 4, should the mercury stand below 60°, as in winter, then
FERMENTED LIQUORS.

raise or increase the number cut on the stem, at the time of observation, by as many degrees as the mercury is below 60°. Illustrations for ascertaining the true proof of spirits, according to variable degrees of temperature, are as follows:

1. If the stem of the hydrometer is cut by the liquor 42° above P., and the mercury stands at 70°, or 10 above the standard (60°) in the thermometer, what is the net proof?—Ans. 39° above P.

2. If the stem is cut at 5° above P., and the mercury stands at 68°, or 8° above 60°, the standard, what is the net proof?—Ans. 2° above P.

3. If the stem is cut at 68° above P., and the mercury is at 68° above 60°, what is the proof?—Ans. 5° above P.

4. If the stem is cut at 12° above P., and the mercury is at 5° below 60°, what is the proof?—Ans. 14° above P.

5. If the stem is cut at 15° below P., and the mercury is at 68° above 60°, what is the proof?—Ans. 18° below P.

6. If the stem is cut at 10° below P., and the mercury is at 7° below 60°, what is the proof?—Ans. 7° below P.

7. If the stem is cut at 10° below P., and the mercury is at 90°, or 10 below 60°, what is the proof?—Ans. 6° below P.

8. If the stem is cut at 14° below P., and the mercury is at 60°, what is the proof?—Ans. 14° below P.

9. If the stem is cut at P., and the mercury is at 60°, what is the proof?—Ans. P. net proof.

10. If the stem is cut at P., and the mercury is at 8° above 60°, what is the proof?—Ans. 3° below P.

11. If the stem is cut at P., and the mercury is at 8° below 60°, what is the proof?—Ans. 3° above P.

12. If the stem is cut at 5° below P., and the mercury is at 50°, or 10° below 60°, what is the proof?—Ans. P.

These examples have all been copied from Wright's Cordialanica.
CHAPTER XI.

§ XXXVII.—GENERAL TREATMENT OF SPIRITS.

In using the solution of the ethereal oils in spirits, for the purpose of preparing the oils suitable for aromatizing the spirit and producing a clear liquor, it is required to rub the essential oils in the following mixture: 1 ounce of burnt alum and half an ounce of calcined magnesia—these must be powdered fine—and 2 ounces of any essential oil well tinctured with it; 1 quart of 90 per cent. alcohol is then added, which is afterwards put upon a filtering-bag: an addition of alcohol is then put on the filtering-bag for the purpose of depriving the mixture of any oil it may contain.

§ XXXVIII.—CLEARING OF LIQUORS.

Various substances are employed for clearing liquors which have become turbid or cloudy. The best preparation is the following:

In 1 quart of wine vinegar and 1 quart of water stir the white of 8 eggs; heat the mixture to 100°, let it cool, and fill the same in bottles for use if required. A very small quantity is sufficient, say 1 quart of the mixture to 1 barrel of any liquor which may have become turbid, to clarify any liquor.

Another preparation for clearing is:

Rub up half an ounce of burnt alum, half an ounce of prepared chalk, and the whites of two eggs in a pint of water.

The neutralization of the sharp taste of alcohol and all spirituous liquors is of the highest importance, as it contaminates the taste of every liquor, and it will always predominate when prepared with alcohol or spirits which was not
quite free from the fusel oil. I can safely recommend my preparation, which is called the age and body preparation, as it neutralizes entirely the bad taste of the spirits. It gives, likewise, the new spirit a taste which remains on the tongue like a liquor which has the age of several years. It may be employed on a large scale by the distillers and rectifiers for common whisky or corn spirit, Bourbon, Irish, and Scotch whiskies.

§ XXXIX.—Preparation of the White Sugar Syrup with or without the Addition of Gum-arabic.

To 5 pounds of white sugar add half a gallon of soft water, which, when dissolved, put over a slow fire and keep it stirring, so as to prevent its burning; take off the rising scum, and add about one-quarter of a pound of starch sugar, as described under the head of sugars. The liquor prepared with such a syrup has an oily consistency and is well suited for all liquors. For gum syrup, add a solution of gum-arabic mucilage, made by dissolving 4 ounces of white gum-arabic in 1 pound of boiling water. The syrup is prepared at a slow fire, and will then not crystallize.

All the fruit syrups, such as raspberry, currant, blackberry, and others, are prepared by dissolving white sugar in the expressed juice of the berries, and boiling the syrup once.

Lemon syrup is prepared by dissolving 10 pounds of sugar in 3 quarts of boiling water for five minutes, and adding half a pound of tartaric acid and a quarter of a pound of the essence of lemon to it when cold.
CHAPTER XII.

§ XL.—Division of the Liquors.

The manufacturers of liquors prepare—I. The simple liquors.

II. The compound liquors or double spirits.

III. Cordials.

I.—As belonging to the simple liquors, I will mention—

1. The common rum, prepared by the distillation of all fermented saccharine solutions. The New England rum and Jamaica rum, distilled from molasses.

2. The areca, similar to rum, but prepared by fermentation of rice and cocoa-nut juice; also from the fruit of the areca and other palm trees in the West and East Indies.

3. The cognac, which is prepared in France from the low grades of wine by distillation. Originally the cognac brandy was obtained from the quinces growing in that country. The name of the quince in French is "le coing," and the same name has been retained for the cognac brandy made in that region.

4. Rochelle brandy, obtained by distillation of the grape leaves and common wines, after having undergone fermentation, in the south of France.

5. Whisky, or spirit, from corn, rye, wheat, and barley, and therefore, also, the high wine rectified from them.

II.—The double or compound liquors are all those liquors which are prepared from essences and flavorings, or essential oils, &c.,—gin, apple or cider brandy, peach brandy, cherry, plumb, raspberry, and similar liquors.

III.—The cordials are mixtures of the best spirits, satura-
ted with essences or essential oils, with a large proportion of sugar, so as to be of an oily consistency. Curaçao, Maraschino, absinthe, anisette, Kirschwasser, &c., belong to this class.

1. The manufacture of rum has already been explained.

2. For the manufacture of Arac.

100 gallons of fine spirits of 50 per cent.,
2 pounds of the essence of arac, or St. Croix rum,
10 pounds of roasted and ground rice;
and, when well mixed, left for one week, stirring it several times a day; and then add 4 pounds of rock-candy, dissolved in hot water, and the whole left in a temperate place; after which, when clear, it will be suitable for use.

Another mode of making arac, is to put into a barrel containing 40 gallons—

10 gallons pure arac,
30 " pure spirit,
in which some rice has been digested some weeks previously: say 5 pounds of the same to 30 gallons of proof spirits, 1 ounce of cocoa-nut oil, \( \frac{1}{4} \) pound of the essence of arac, and about 1 ounce of the tincture of saffron.

3. For Cognac Brandy.—There are a great many methods proposed to imitate a good cognac brandy. It may be produced from the best cognac or grape-oil, the \( \text{œ} \)nanthic ether, the extract of the grape-juice, or the essence of cognac.

(1.) From Cognac Oil or the \( \text{œ} \)nanthic Ether.—Dissolve 1 ounce of the best cognac oil in 1 quart of the highest-proof alcohol, and let it stand over-night; the following morning add 1 ounce of acetic ether, 1 ounce oil of apple, 1 ounce of essence of Jamaica rum, and 10 drops of the oil of bitter almonds to the alcohol; and in the cask containing 160 gallons of good proof spirits, rectified by the above prescribed method, add 1 gallon of syrup of gum-arabic, and—according to the color desired, either dark or pale brandy—1 gallon of sugar coloring and 1 quart of the tincture of white-oak bark.
(2.) From the Essence of Cognac.—For 60 gallons of pure spirits, take—

1 pound of the essence of cognac,
1 gallon of syrup of gum-arabic,
1 " of sugar coloring,
1 quart of oak-bark tincture,
1 ounce of acetic ether.

(3.) From the Extract of the Grape-juice.

1 pound of the extract of cognac,
1 gallon of syrup of gum-arabic,
2 " of sugar coloring,
200 " of pure spirits.

(4.) From the Brandy flavoring.—Each gallon of the brandy flavoring is put into 1 barrel (of 40 to 45 gallons capacity) of pure spirits (French purified spirits), and, according to the color desired, from $\frac{1}{4}$ to 1 gallon of sugar coloring is added.

To add, if it is desired, about 5 gallons of pure imported brandy for each barrel containing the mixture, a more expensive, and perhaps also a more improved brandy may be thereby obtained.

The Rochelle brandy is imitated by the extract of cognac: say 1 pound to 5 barrels of pure spirits, as above described, and adding sufficient coloring; $\frac{1}{4}$ pound of essence of violet, 1 gallon of syrup of gum-arabic, 1 quart of tincture of oak-bark, and 2 gallons of Rochelle brandy for each barrel.

Preparation of Monongahela, Bourbon, Irish, and Scotch Whisky, or Rye, Corn, Wheat, and Barley Whisky.—In different countries, various grains are employed for the production of whisky. The rye is much used in Holland, the potato in Germany, the barley and oats in Ireland and Scotland, and corn in the United States.

(1.) The Monongahela whisky is mostly distilled in the western country from rye. In order to convert a corn whisky into a rye whisky, add to 4 barrels of the corn whisky—
1 pound of the essence of Monongahela,
1 ounce of sweet spirits of nitre,
1 gallon of syrup of gum-arabic.

(2.) The Bourbon whisky is best imitated by—
1 pound of the essence of Bourbon,
1 ounce of sweet spirits of nitre,
1 gallon of syrup,
4 barrels of common rectified corn whisky.

(3.) The Irish whisky, which is characterized by its smoky flavor and taste, on account of its being prepared from barley peculiarly treated with the peat while malting, is best imitated by
1 pound of the essence of Irish whisky,
1 ounce of sweet spirits of nitre,
\( \frac{1}{4} \) gallon of syrup of gum-arabic,
4 barrels of good whisky, from either rye or corn.

(4.) The Scotch whisky, which has a marked and different taste from the Irish whisky, probably owing to a different mixture of the grain, such as the barley and oats and wheat in various proportions, but, from a similar mode of preparation of the malt, having the same smoky taste, is prepared likewise by—
1 pound of the essence of Scotch whisky,
1 ounce of sweet spirits of nitre,
\( \frac{1}{4} \) gallon of syrup of gum-arabic,
4 barrels of common whisky.

All the whiskies ought to be laid aside for four to six weeks before being put into the market for sale.

§ XLI.

II. Compound Liquors.—A great many liquors belong to this class, and the best spirit is necessary to produce a good imitation. The first, and most important liquor, is *gin*, which is a favorite drink in Holland, and is imported to this country in very large quantities. In Holland, the process of
manufacturing gin is to mash the malt barley and rye meal together; it is then fermented and distilled; afterwards this spirit is rectified by adding some juniper-berries and a small quantity of hops, and the product of the rectification is a high-flavored gin. In order to imitate Holland gin, as well as English or London gin, and also Tom gin, it is the best juniper oil which must be employed—that from the berry, and not from the wood. The essences of gin, and the gin-flavorings, are the materials used for producing this pleasant and wholesome beverage.

1. To prepare Holland gin from the oil, take
   \[ 2\frac{1}{2} \text{ ounces of the best juniper oil}, \]
   \[ 20 \text{ drops of oil of lemon}, \]
   \[ 15 \text{ " of oil of coriander}. \]
Dissolve the oils in 2 quarts of high-proof alcohol, and let it stand over-night; then put them in a forty-gallon barrel containing pure spirits, and 1 gallon of syrup of gum arabic.

2. London cordial gin, from the oil, is prepared likewise from
   \[ 2\frac{1}{2} \text{ ounces of oil of juniper-berry}, \]
   \[ 20 \text{ drops of oil of calamus}, \]
   \[ 10 \text{ " of oil of angelica}, \]
   \[ 5 \text{ " of oil of coriander}, \]
dissolved in 2 quarts of 95 per cent. alcohol, 40 gallons of pure spirits, and 2 gallons of syrup of gum arabic.

Should the liquor be milky, it is necessary to filter it, which is done by letting it run through a woollen filtering bag, in which is contained a mixture of
   \[ 4 \text{ ounces of burnt alum}, \]
   \[ 6 \text{ " of white pipeclay}, \]
   \[ 4 \text{ " of carbonate of magnesia}, \]
   \[ \frac{1}{2} \text{ " of dry pearl-ashes}. \]
This compound is suitable for all those liquors which have become milky by the addition of any essential oil to weak spirits. It is always necessary to pour the filtered alcohol.
FERMENTED LIQUORS.

in small quantities, into the barrel containing the pure spirits, and to shake the barrel every time a fresh portion of the same is added; then the gin will remain clear—otherwise it will become milky again, and occasion much trouble and difficulty to filter forty gallons of gin through the bag.

In order, however, to avoid the trouble of filtering, the gin-flavorings may be employed for the purpose; and one gallon of the flavorings, thrown into a barrel containing from forty to forty-five gallons of pure spirits, will produce a clear gin, and answer all the requirements of Holland, or English gin.

§ XLII.

The following liquors belong to this class, viz.: peach, cherry, apple or cider brandies; blackberry, raspberry, plum, orange, cinnamon, ginger, clove, peppermint, pear, banana, pineapple, vanilla, kimmel or caraway, and anise liquors; stomach bitters, wormwood, Blake’s, Hoofland’s, Stoughton’s, a new aqua vitae or tonic bitters, and Boerhaave bitters. Particularly, however, Jamaica and New England rum, extract of punch, and extract Bishop.

1. Jamaica Rum.—This may be produced from the rectified spirits, by employing

1 pound of the essence of rum,
1 ounce of oil of pimento,
1 " of tincture of orris root,
½ " of Peruvian balsam.

Dissolve the oils separately, and then mix them with the essence, and throw them in a cask containing 160 gallons of pure spirits. Or by the Jamaica rum flavorings; of which 1 gallon, added to a barrel of pure spirits, will produce an excellent rum.

2. New England Rum.—This is generally prepared in the Eastern States by the distillation of molasses; but frequently this material is not so plentiful, and resort is had to the com-
mon corn whisky, which is once more rectified, and by adding 1 pound of strong essence of Jamaica rum, and 1 pound of nitrous ether, to 10 barrels of such purified corn spirits, a good New England rum is obtained.

3. Peach Brandy.—This beverage is prepared from the essence of peach, by taking

1 pound of the essence,
1 gallon of syrup of gum arabic,
1 ounce of acetic ether,
1 " of pineapple ether,
4 barrels of pure spirits.

4. Apple or Cider Brandy.—It is prepared by using

1 pound of the oil of apple,
½ " of the oil of pear,
1 gallon of syrup of gum arabic,
5 barrels of good rectified spirits.

5. Cherry Brandy.

1 pound of the essence of cherry,
¼ " of the essence of pineapple,
¼ ounce of the oil of cinnamon,
¼ " of the oil of cloves,
4 barrels of pure rectified spirits,
2 gallons of cherry juice.

6. Blackberry Brandy.—This liquor is prepared from

1 pound of the essence of blackberry,
1 gallon of blackberry juice,
1 " of syrup of gum arabic,
4 barrels of pure spirits.


1 pound of the essence of raspberry,
1 " of acetic acid,
1 gallon of syrup of gum arabic,
1 " of raspberry juice,
4 barrels of pure spirits.
FERMENTED LIQUORS.

8. Plum or Zwetschen Brandy.—This favorite German liquor, also called Slibowitz liquor, is prepared from

1 pound of plum essence,
\(\frac{1}{2}\) " of acetic ether,
\(\frac{1}{2}\) " of banana,
1 gallon of syrup of gum arabic,
4 " of pure spirits.

Another mode of preparing the slibowitz or plum brandy is from prunes, which are mashed together with the kernels, and exposed to fermentation, when it is again distilled, and produces a fine spirit, having the flavor and taste of prussic acid.


2 ounces of oil of orange,
10 drops of oil of neroli,
1 pound of essence of orange,
1 gallon of syrup of gum arabic,
4 barrels of pure spirits.

10. Cinnamon Brandy.

1 pound of the essence of cinnamon,
\(\frac{1}{2}\) " of the essence of cherry,
1 gallon of syrup of gum arabic,
4 barrels of pure spirits.


1 pound of essence of ginger,
20 drops of oil of bergamot,
\(\frac{1}{2}\) pound of tartaric acid,
1 gallon of elderberry juice,
1 " of syrup of gum arabic,
4 barrels of pure spirits.

12. Clove Brandy.

1 pound of the essence of cloves,
\(\frac{1}{2}\) " " cherry,
\(\frac{1}{2}\) " " ginger,
BREWING, DISTILLING, AND RECTIFYING.

1 gallon of syrup of gum-arabic,
4 barrels of pure spirit.


1 pound of the essence of peppermint,
$\frac{1}{4}$ " sulphuric ether,
1 gallon of syrup of gum-arabic,
2 barrels of pure spirit.


15. *Banana Brandy.*


17. *Vanilla Brandy.*

All these liquors are used in the mixtures for highly flavored and pleasant brandies by the addition of some syrup.

18. *Kimmel.*

1 pound of the essence of caraway,
$\frac{1}{4}$ of an ounce of oil of anise,
$\frac{1}{4}$ " " fennel,
20 drops " neroli,
1 gallon of syrup of gum-arabic,
2 barrels of pure spirits.

19. *Annis Liquor* is prepared from

1 pound of the essence of anise,
$\frac{1}{4}$ " tincture of orris,
20 drops of the oil of coriander,
2 barrels of pure spirits.


1 pound of the essence of wormwood,
1 ounce of the oil of tansy,
1 " " calamus,
2 " " orris,
1 gallon of the syrup of gum arabic,
3 barrels of pure spirits.


All the bitter liquors, so called, stomachic, tonic, aromatic,
FERMENTED LIQUEURS.

Phoenix, Stoughton's, Blake's, Boerhaave's, and other bitters, are mostly composed of gentian-root, orange-peel, centaury-flowers, chamomile flowers, calamus-root, and coriander-seed, with more or less variation of the ingredients, and an addition of more spices, such as cloves and mace; some also add hops and quassia-wood, in order to make a very strong bitters. The bitters of Blake and Boerhaave contain a small portion of aloes, and that of Hostetter more centaury flowers. The best materials for preparing a wholesome bitters, which will excite an appetite and act upon the liver and digestive organs, is to put in a barrel containing 40 gallons of pure spirits,

\[
\begin{align*}
\frac{1}{4} & \text{ pound of gentian-root,} \\
\frac{1}{4} & \text{ " orange-peel,} \\
\frac{1}{4} & \text{ " buds,} \\
\frac{1}{4} & \text{ " agaric,} \\
\frac{1}{4} & \text{ " chamomile-flowers,} \\
\frac{1}{4} & \text{ " centaury,} \\
\frac{1}{4} & \text{ " coriander-seed.}
\end{align*}
\]

These ingredients are all bruised together and left in maceration for a fortnight, in a warm temperature; after the lapse of that time the clear bitter liquor is drawn off and mixed with an equal quantity of water, so as to make the bitters palatable. One gallon of such a stomachic or tonic bitters will not cost more than 25 cents.

23. Extract Punch.

\[
\begin{align*}
\frac{1}{4} & \text{ ounce of the essence of Jamaica rum,} \\
1 & \text{ " tartaric acid,} \\
1 \text{ gallon of sugar syrup,} \\
2 & \text{ " pure spirits,} \\
10 & \text{ drops of the oil of lemon.}
\end{align*}
\]

Dissolve the oil of lemon and essence of rum in the spirits, and the tartaric acid in a little water, before adding all together.
25. Extract Bishop or Glow-wine.

Take of the tincture of Curacao-peel 1 pound, orange-buds \( \frac{1}{4} \) "

Dissolve in the same 5 drops of the oil of nutmegs,

10 " " cloves,

20 " " cinnamon.

Mix them together, and add about half a gallon of the sugar syrup.

§ XLIII.—Cordials.

These liquors are compounds of the best spirits, in which the various flavors or essences are dissolved, with more or less of the syrup made from white sugar. The following are the principal cordials in general consumption, viz.: the absinthe, Curacao, Maraschino, anisette, perfect love, cherry-bounce, raspberry, and the railroad liqueur, a new cordial composed by myself; also the elixir vitae or long-life cordial, orange elixir, Roman punch, and kirschwasser.

1. The Absinthe.—This liqueur is prepared in various ways. Originally prepared in Switzerland, it has acquired great celebrity, and is therefore frequently called Swiss absinthe; but at present in France it is likewise made of a superior quality. The genuine Swiss absinthe is prepared in the following manner: by macerating

4 ounces of the wormwood herb,

2 " star anise-seed,

2 " green cherry-leaves,

2 " sage herb,

in 5 gallons of proof spirits; and after one week's maceration add

\( \frac{1}{4} \) ounce of the oil of anise,

\( \frac{1}{4} \) " " bergamot,

\( \frac{1}{4} \) " " fennel.

Another receipt for making the absinthe is, to dissolve the
FERMENTED LIQUORS.

best oil of wormwood, say 2 ounces, in 5 gallons of pure spirits, and add

\[ \frac{1}{4} \text{ ounce of the oil of anise,} \]
\[ \frac{1}{4} \text{ " " calamus,} \]
\[ \frac{1}{4} \text{ " " orange,} \]

1 gallon of white syrup,

and prepare the color from the neutral extract of indigo, made green with the tincture of Turmeric.

2. *The Curaçao.*—This liqueur derives its name from the Curaçao-peel, as it is nothing else but a tincture of the Curaçao orange-peel, sweetened and flavored with more essential oils. The following receipt is the most reliable: to macerate 5 pounds of green Curaçao orange-peel in 6 gallons of pure spirits, adding about \( \frac{1}{4} \) of a pound of red saunders wood for obtaining at the same time the reddish brown color; and after a week's digestion strain off, and dissolve \( \frac{1}{4} \) of an ounce of oil of bitter-almonds, \( \frac{1}{4} \) of an ounce of oil of cinnamon in the above tincture, and then add 1 gallon of white sugar syrup: when all ingredients are mixed, filter and fill in bottles, and after standing a few weeks it will produce a delightful cordial.

3. *Maraschino.*—This is an Italian cordial, while the Curaçao is a favorite in Holland. Maraschino derives its aroma from the oil of bitter almonds, blended with the oils of cinnamon and rosewater, &c.

10 gallons of pure spirits,

1 ounce of oil of bitter almonds,

\[ \frac{1}{4} \text{ " " cinnamon,} \]
\[ \frac{1}{4} \text{ " " cloves,} \]
\[ \frac{1}{4} \text{ " " vanilla,} \]

5 drops of oil of rose,

5 " " neroli,

5 " " bergamot.

To this solution add 2 gallons of white-sugar syrup, \( \frac{1}{4} \) gallon
of rosewater, and \( \frac{1}{4} \) gallon of orange-flower water; mix together, and filter, and fill in bottles.

4. *Anisette.*—Dissolve 2 ounces of oil of anise and \( \frac{1}{4} \) an ounce of oil of star anise in 10 gallons of pure spirit, and add 2 gallons of white-sugar syrup to it.

5. *Parfait d'amour, or Perfect-love Cordial.*—Macerate in 10 gallons of pure spirit,

\[
\begin{align*}
&2 \text{ ounces of orris-root,} \\
&4 \text{ " of raisins,} \\
&2 \text{ " of figs,}
\end{align*}
\]

For one week. Then dissolve

\[
\begin{align*}
&\frac{1}{2} \text{ ounce of oil of lemon,} \\
&1 \text{ drachm of oil of cinnamon.} \\
&1 \text{ " " juniper,} \\
&1 \text{ " " calamus,} \\
&1 \text{ " " cloves,} \\
&1 \text{ ounce " vanilla.}
\end{align*}
\]

Color by sugar-coloring, and add 4 gallons of white-sugar syrup: it is then filtered through a woollen filtering-bag, and filled in bottles.

6. *Cherry-bounce.*—This is a very wholesome cordial, and may, with great benefit, be taken by persons affected with cough of long standing, or those suffering with lung complaint. Take

\[
\begin{align*}
&5 \text{ gallons of cherry-juice,} \\
&2 \text{ " of syrup of white sugar.}
\end{align*}
\]

And dissolve in 1 gallon of pure spirit—

\[
\begin{align*}
&\frac{1}{4} \text{ ounce of oil of bitter almonds,} \\
&\frac{1}{4} \text{ " " cloves,} \\
&\frac{1}{4} \text{ " " cinnamon.}
\end{align*}
\]

Mix all together.

7. *Raspberry Cordial.*—Take 5 gallons of raspberry-juice, 2 gallons of white-sugar syrup, and 1 gallon of pure spirits.

The quince, gooseberry, strawberry, black and red cur-
Fermented Liquors.

Raisin, peach, nut, and apple cordials, are all prepared in the same manner from their respective juices.

8. The Railroad Liquor.—To 5 gallons of pure spirits, add:
   \[ \frac{1}{4} \text{ ounce of oil of peppermint,} \]
   \[ \frac{1}{4} \text{ " " absinthe,} \]
   \[ 10 \text{ drops " rose.} \]

Add to the solution 1 gallon of white syrup, and color the liquor with blue orchil.

9. Elixir Vitæ, or Long-life Cordial.—Macerate for ten days, in 5 gallons of pure spirits,
   \[ 1 \text{ ounce of zedoary-root,} \]
   \[ 1 \text{ " of ginger-root,} \]
   \[ \frac{1}{2} \text{ " of gentian-root,} \]
   \[ \frac{1}{2} \text{ " of agaric,} \]
   \[ \frac{1}{2} \text{ " of rhubarb-root.} \]

Strain off the clear tincture, and add 2\frac{1}{2} gallons of water and \frac{1}{2} gallon of syrup.

10. Orange Elixir.—To 5 gallons of pure spirits, add
   \[ \frac{1}{2} \text{ pound of orange-peel,} \]
   \[ \frac{1}{2} \text{ " of calamus-root,} \]
   \[ \frac{1}{2} \text{ " of hops.} \]

After macerating for one week, strain, and add 1 gallon of sugar-syrup, and color with sugar-coloring.

Also another receipt for the above; which is, to dissolve in 3 gallons of pure spirits
   \[ 1 \text{ ounce of oil of orange,} \]
   \[ \frac{1}{4} \text{ " " calamus,} \]

and add 1 gallon of white-sugar syrup, and color the whole with sugar-coloring.

11. The Roman Punch.—This very refreshing beverage is prepared by 1 ounce of lemon-juice or citric acid, \frac{1}{4} ounce of essence of rum, dissolved in 1 gallon of pure spirit, adding \frac{1}{4} gallon of syrup of sugar. Mix all together, and filter.

12. Kirschwasser.—Dissolve 1 ounce of the oil of bitter
almonds in 3 gallons of pure spirits, and add 1 gallon of white-sugar syrup.

13. Noyeau.—This cordial is generally drank by ladies, and requires to be very sweet. Take

- 1 ounce of oil of bitter almonds,
- \( \frac{1}{2} \) “ orange,
- \( \frac{1}{2} \) “ cinnamon.

Dissolve in 2 gallons of pure spirits, and add 1 gallon of syrup of white sugar.

14. Orgeat.—To milk of blanched sweet almonds, 2 pounds, add

- 2 drachms of oil of bitter almonds,
- 1 “ orange,
- 1 gallon of white-sugar syrup,
- \( \frac{1}{2} \) of spirits.

15. Peppermint Cordial.—To 1 ounce of oil of peppermint dissolved in 1 gallon of pure spirit, add 1 gallon of syrup of white sugar.

16. Ginger Cordial.—To 1 quart of essence of ginger add 1 gallon of pure spirit and 1 gallon of white-sugar syrup.

17. Angelica Cordial.—To 1 ounce of oil of angelica add \( \frac{1}{2} \) ounce of calamus, and dissolve them in 1 gallon of pure spirit, and add 1 gallon of white-sugar syrup.

18. Celery Cordial.—To 1 pound of the essence of celery, add 1 gallon of pure spirit and 1 gallon of syrup of white sugar.

19. Rose Cordial.—To \( \frac{1}{2} \) ounce of otto of rose add \( \frac{1}{2} \) ounce of oil of bitter almonds. Dissolve in 1 gallon of highest-proof alcohol, and add 1 gallon of syrup of white sugar, and color by cochineal rose color.


- 1 ounce of oil of bitter almonds,
- \( \frac{1}{2} \) “ orange,
- \( \frac{1}{2} \) “ cloves.
Dissolve them in 1 gallon of pure spirits, and add 1 gallon of white-sugar syrup and 2 gallons of Teneriffe wine.

21. Aromatic Wine-bitters.—Macerate

1 pound of orange-peel,
2 " of orange-buds,
$\frac{1}{4} "$ of agaric,
$\frac{1}{4} "$ of Peruvian bark,
1 " of gentian-root,
5 gallons of Teneriffe wine,
20 " of spirits of wine.
CHAPTER XIII.

XLV.—On Acetic Acid, Vinegar, Quick-vinegar, &c.

1. It has been stated in the beginning of this Treatise, that, besides the alcoholic or vinous fermentation, there is an acetic fermentation, which manifests itself in the same substances that have first undergone the vinous fermentation, and merely depending upon oxidation of the same substances by atmospheric air; and that the transition from the vinous to the acetic fermentation of many substances is so rapid, and in some instances instantaneous, that the theory of this sudden change has, for a long time, been a mystery to the inquiring chemist. It is, however, fully ascertained, that pure alcohol, whisky, all expressed juices of fruits and grains, after undergoing the first change, may, by prolonged fermentation, be again metamorphosed, and become sour, and the product is then called acetic acid or vinegar.

2. The change produced by the conversion of alcohol into acetic acid, has been ascribed by Berzelius to a force which he called Catalysis, meaning the absorption and condensation of air; and it is not improbable that the ferment absorbs oxygen, and resolves itself into a highly oxidized body, which, by giving up a portion of oxygen to the alcohol, evolves carbonic acid and water. It is also proved that, where the ferment has been decomposed and precipitated as insoluble matter after a long-continued vinous fermentation, as is the case in some wines and in the low fermentation of Bavarian beer, these liquids lose the tendency to acetification.

When vinous liquors are exposed to the free access of air...
mospheric air, at a temperature of 80°, they undergo this second fermentation, and terminate in the production of a sour liquid called Vinegar. Vinegar is obtained from a great many substances. In England, it is made from malt liquor; in France, where the grape is in abundance, it is produced from wine. Vinegar has a variable specific gravity, but is never higher than 1.0250. Vinegar may become mouldy, or advance farther into another fermentation, called the putrid fermentation, when exposed too long to the atmospheric air.

3. Distilled vinegar, or dilute acetic acid, is distilled over from common vinegar. It becomes higher in its specific gravity, for it rises from 0.997 to 1.020; and one fluidounce of the same will neutralize eight grains of precipitated chalk. Distilled vinegar is colorless, and has a flat acid taste, and consists essentially of the real acetic acid, which is sometimes called the radical vinegar, and water. Acetic acid is produced also from the distillation of a metallic salt, called Verdigris (acetate of copper), or by distilling acetate of soda, or acetate of lead (sugar of lead), with half its weight of sulphuric acid, or from a mixture of sulphate of copper and acetate of lead.

4. The principal quantity of acetic acid is at present obtained by the distillation of wood in the process of preparing charcoal for the manufacture of gunpowder, or for other technical purposes, and the liquor which first distils over is called Pyroligneous Acid. It is very empyreumatic and impure, and requires to be freed from tar and other substances.

The pyroligneous acid is saturated with chalk and then evaporated, by which an impure acetate of lime is obtained, which, mixed with sulphate of soda, furnishes, by double decomposition, sulphate of lime and acetate of soda. This latter, distilled with sulphuric acid, produces a sufficiently pure acetic acid, and is generally sold as acetic acid No. 8 in the
BREWING, DISTILLING, AND RECTIFYING. 103

-sater, and has a specific gravity of 1.060; when crystal-
dized, at a temperature of 40°, it is called glacial acetic acid.

§ XLVI.

5. As my object is to describe practically the vinegar made by the quick process, so that any person may be able to con-
struct an apparatus at a trifling cost, and can make his own table vinegar for about three cents per gallon, and be equal to the French wine vinegar; I will, therefore, detail minutely the process, which I have described, in the year 1837, in Sil-
liman's American Journal of Science, Vol. xxxi. p. 272, with a drawing. The apparatus described in Booth's Encyclopedia, p. 19, is, however, of simple construction, and it is now here copied.

The oaken vat or vats in which the oxydation of the alco-
hol takes place, are called vinegar generators, or graduators, and are 5 to 7 feet high, 3½ feet diameter below, 3 feet wide above, placed 1½ feet above the ground, and provided with a wooden cover, fitting rather closely, and having a funnel in-
serted in its centre, through which the alcoholic liquid is to
be poured. A broad wooden hoop is fastened closely around the inside, about six inches from the top, on which rests the false top, leaving a small square between it and the sides, to be stopped tightly with tow. This is perforated with 200 to 300 small holes, of one-sixth of an inch diameter and 2½ inches apart, through each of which pass strips of cotton or linen wick, with knots on the upper end to prevent their passing through; four larger holes, 1½ inches in diameter and 1½ feet apart, are each fitted air-tight with a glass-tube four to five inches long, which, opening a little below, and several inches above the false top, allows the air of the interior to pass out slowly. About one foot or fifteen inches from the bottom, eight holes are bored, sloping downwards, at equal distances, in a circle around the vat, through which the air enters, without suffering the liquid to flow out. The whole vat is then filled with beech-wood shavings to within an inch of the false top; they should be previously scalded with water and soaked in hot vinegar. The liquid is poured into the vat through the funnel, and trickles drop by drop through the cotton-wick. To prevent its running too fast, the wicks should fill the holes, and the false top fit closely to the sides; spreading among the shavings, it offers a very extended surface to the action of the air entering through the eight holes, and is more or less oxidized. The air, having performed its part, pushes out through the four glass-tubes, and finally through the funnel in the cover. To prevent the liquid from collecting in too great quantity at the bottom, a glass siphon is introduced an inch or two from the bottom, so that its upper head is an inch at least below the eight holes, and runs off the liquid into the receiving vessel or bucket. A thermometer is sometimes introduced a little below the false top, to observe the temperature of the oxidating compartment of the vat.

To charge the vats a standard liquid is employed: 50
gallons of 60 per cent. alcohol or whisky, and 37 gallons of beer or other fermented liquor. When the vats are first put in operation, acetification takes place slowly, until the shavings are well charged with mother of vinegar; to attain which, 5 gallons of the above are mixed with 40-50 gallons of weak vinegar, and poured through the funnel into the upper part of the vat, from which it passes gradually through the shavings, and the alcohol is partially oxydized; it is then poured repeatedly through the same vat, until it comes through completely acetified. A deposit of mother gradually takes place on the shavings and side of the vat, and the larger the amount of it formed, the more rapid the oxydation; so that the process goes on better after some weeks than at first.

The vats being thus prepared, 15-18 gallons of the above standard liquor is diluted with 60 gallons of soft water, and poured into the first vat, then into the second; every hour 2½ gallons are drawn off from the second: the product of one hour being kept as vinegar, that of the next hour being thrown back on the first vat: thus in 24 hours 30 gallons are ready for sale. With ten vats, which one hand can superintend, 150 gallons of acetic acid may be made in 17 working hours.

This acetic acid is as clear as water, and may be improved in appearance and taste by adding to every 52 gallons 1 pound of cream of tartar and 2 pounds of sugar. The temperature of the vinegar-room should be about 100°, and the preparatory mixture to be from 120° to 130° when poured through. When the vats are in full operation, the temperature in the vinegar-room should be maintained at 68° to 71°. If a stronger vinegar is required, the product of the second vat is mixed with a stronger alcoholic liquid and passed through a third vat; and for a still stronger, a fourth vat is employed, with the addition of proof spirit to the product of the third; but it should be noted, that the weaker
spirituous liquors are more easily and rapidly acetified than
the stronger.

The vinegar obtained by the above preparation is of such
strength, that an ounce will neutralize 30–36 grains of carbon-
ate of potassa, and the product of the fourth vat will neu-
tralize 50–60 grains of carbonate of potassa.

XLIV.—The latest improvement in quick vinegar
Process.

6. A still more simple apparatus for producing a good
vinegar in the space of 12–24 hours without the increased
temperature is now introduced, and is constructed in the fol-
lowing manner:

A large cask, about 12–15 feet high and 5–10 feet wide,
without air-holes, but cover closely fitting on the cask, is
filled with beech wood or with charcoal in large lumps, or
even with cotton, or any other porous substance: both these
substances, as well as the cask, are properly acetified by
strong acetic acid, and drawn off by means of a cock near
the bottom; and then the mixture of alcohol or strong
whisky, 1 part to 10 parts of water, filled into the cask,
and after a lapse of 12 hours poured off as good vinegar.

This vinegar is produced in a common temperature; but the
liquid which is the ready-prepared vinegar, must run slowly,
and the quantity of the mixture of 1 part of alcohol to 10
parts of water, must be poured in at proper intervals. The
product obtained by this process is much stronger and much
quicker, and, although requiring more attention to time of
filling, yet is very easily managed. This vinegar may be
made to keep longer by adding a few pounds of sugar to it.

7. This vinegar may be prepared in any house or hospital
at a cost not exceeding five cents per gallon, and of any
desired strength; and if the vinegar be made on a small
scale, a glass cylinder may be employed instead of an oak
vat, and the charcoal in lumps thoroughly impregnated with acetic acid, and the cover tightly fitted on the glass cylinder, and a stop-cock applied at the bottom so as to draw off the prepared vinegar.

8. The French Wine-vinegar is prepared in France on a large scale, where they employ three or four rows of vats, holding 45 gallons each, and lying horizontally, with two holes adjoining in the upper part of the front end, one of which, two inches in diameter, is for charging the cask with wine and removing the finished vinegar; the other, which is much smaller, is designed for the influx and efflux of the atmospheric air. When the casks are first employed, they are one-third filled with the best wine-vinegar, to which two and a half gallons of wine are added; in eight days a second charge of two and a half gallons is introduced, and thus a third and a fourth, after intervals of eight days each, until the proper quantity has been added, or the casks are two-thirds full. Eight days after the last charge, about nine gallons of vinegar are drawn off, provided the fermentation has been successful, and wine added in the same quantities and time as before. Under favorable circumstances, one of these stand-casks will last for twenty years.

9. Apple Vinegar, also the juice of grapes and other saccharine fruits, is obtained by expressing and subjecting to vinous fermentation in casks at a temperature of 77–82°C; if muddy, they have to be filtered through beech-wood shavings, &c., to clarify, and then suffered to acetify in vinegar-casks, adding a little vinegar to commence and hasten the operation.

Vinegar from starch and potatoes may be obtained in the usual way, by boiling either, and exposing them at first to vinous, and then to acetous fermentation.

10. Vinegar from Beer.—To 100 gallons add an equal quantity of water, 3 gallons of alcohol, and 6 gallons of
strong vinegar; put the whole in the vinegar-cask at a warm temperature.

Vinegar may also be made from rice, by first exposing it to the vinous fermentation, as stated in a former chapter of the conversion of starch into starch sugar, by means of oil of vitriol, and then subjecting the saccharine solution to the rotating fermentations.

11. *Raspberry Vinegar* and *Strawberry Vinegar.*—These are prepared by mixing 1 pound of the respective fresh juices with 4 gallons of good boiled vinegar, and setting aside for one or two days, and then filtering off the clear liquor; put then in bottles well corked, and bladder tied over them.

Both these vinegars may be used as salad, or mixed with sugar and water as a summer beverage, and are quite cooling and wholesome.

12. *Forty Thieves Vinegar* or *Aromatic Vinegar.*—Macerate cloves, sage, rosemary, rue, pimento, calamus, caraway, nutmegs, each 1 ounce, in 2 gallons of strong vinegar, and add one-half ounce of camphor.

This vinegar is usefully employed in infectious diseases, and has received the above name from the circumstance, that at Marseilles, where the pestilence once raged, the thieves, who used this vinegar, pillaged the city, and were not attacked by the disease.