

bottom fitted in, a hole for a faucet bored near the bottom, and the other fixtures added.

The casks for receiving the young wine from the vats should be large, holding from one to two thousand gallons each, or the whole vintage; they should be made from the very best seasoned white oak, having strong iron hoops, with screws attached, a common two-inch bung-hole, and in one head a door, eighteen by twenty-four inches wide. The door is fastened on hinges, opening inside, and has two stout bolts and a cross-bar of oak outside, with two holes, through which the bolts are passed when the door is closed, being further fastened by two notches with wings. Another small hole is made in the middle of the head, in which a wooden faucet is inserted, for drawing out samples. The door is intended to admit a man, for the purpose of washing and cleaning the cask.

As such large casks cannot be removed from the cellar, particular care is requisite to keep them clean and sweet, but they will last any length of time if made of good material. A cask for keeping wine should never be used for other purposes. As soon as it is empty it must be washed clean, inside and out, well sulphured, and the bung driven in again. It should be kept in an airy, shady place till wanted for use; the press-house would be the most suitable.

A couple of pails are necessary for exclusive use in the cellar; they are generally made of oak, and in the form of a vase, having a narrow neck, but widening again at the top, which is made of copper or iron, the hoops and handle being composed of the same metal, and should hold exactly five gallons, being gauged to show by a mark each single gallon.

Funnels of different sizes are also wanted, the largest to be made of oak wood, holding about six gallons, with a copper or iron tube on the bottom, to go into the bung-hole of the casks, and two staves projecting three inches at the bottom, for two feet, to make it stand firm, a little declining towards the tube-hole.

Lastly, for drawing wine in or out of the casks a good siphon is required. This may be made of tin or lead pipe, but, for convenience, should have a small faucet soldered on, as a mouth-piece. All these articles should be kept as clean as everything pertaining to the cellar and presses, and never used for any other purpose.

*The cellar, how it should be constructed.*—A good, well-ventilated and drained cellar is absolutely demanded for wine making. To secure an even temperature, it must be deep, and arched over with stone or brick, the stone-work smoothed off with plaster, and whitewashed; the floor either of flag-stones or brick; and to prevent the hot summer air getting in, and likewise the cold in winter, a separate entry for the steps is required, with a door at the top and another below. Several air-channels or flues must be arranged from the arch to a couple of feet above the ground outside. The arch is covered with from four to six feet of earth. And this is now the most practical spot to build a house large enough to contain the press, a fermenting room, with conveniences for heating, connection by conduits with the cellar, and perhaps a separate room for distillery apparatus.

## WINE-MAKING.

*Making white wine.*—To make a first class white wine, only white grapes are used; they are mashed in the apparatus, being fixed on the top of the fermenting vat, but not allowing the husks to fall into the vat, which, after being mashed, are put on the press, and when the whole mass is thus prepared, they are pressed out, and the juice, or must, put in the vat. As there are no husks in the vat, the false bottom is not required. The head, or cover, is now put on, and the temperature of the must ascertained by the thermometer. If it is lower than 50°, some must is taken out and heated, to warm up the whole mass till it comes up to 60°, which is the point it should be brought to when fermentation takes a proper course. This temperature must be maintained as evenly as possible, and therefore a proper room, as already described, with a stove or fire-place in it, will be the most serviceable. After the temperature of the must is regulated, the bung with the safety-valve and the tube are fixed on, and a small vessel with water is placed under the other end of the tube, or cylinder, so that it will reach into the water about three inches. The whole work of mashing, pressing, regulating the temperature, and closing up the vat, must be performed with the greatest possible speed, as the juice begins to ferment as soon as it is extracted from the berries, and by coming in contact with the atmosphere, the most essential part of the wine, its chief strength, the alcohol, escapes. In proportion as the grape contains sugar, the fermentation of the must will proceed; hence the fermentation of the must from highly improved grapes of best qualities, containing much sugar, and a vintage favored with a hot, dry summer, will take twice as much time as poor and watery juice. By fermentation, the sugar of the grape-juice is converted into alcohol, which, amalgamated with the other contents of the grape-juice, forms the wine, at once fiery, aromatic, and pleasant in every respect. The dissolution of the greater part of the sugar, and the union with the acids gluten, tannin, &c., will have been performed when the must begins to get a clear color, an aromatic, vinous taste, and quiet; it is then time to draw it from the fermenting vat into the casks, in which it will slowly finish its fermenting process. Rich must will ferment in from five to eight days in the vat, while that of inferior quality gets through in two or three days. It is very important to have large casks in which to keep the wine, as thus its properties and character are much better preserved.

When the casks have been filled, a similar tube is fixed, as on the fermenting vat, with one end in the bung-hole and the other in a small vessel of water.

*Making schiller wine.*—This name signifies a particular color of the wine, varying from one hue to another, and to be called neither white, yellow, nor red. Grapes of all colors are used in making this wine; they are mashed by putting the mill on the top of the vat, and the husks put in it, and fermented together with the must. When they are all mashed, or one vat is filled, the false or fermenting bottom is set in, to keep the husks under the must, and the head and other fix-

tures put on. The fermenting of schiller wine takes a longer time and is more stormy than white or claret wines; but this is stronger, more fiery, and aromatic, than either.

The same temperature is required as for other kinds. Much care, however, must be taken to watch its culminating point, when the carbonic acid gas escapes furiously, the water begins to roar in the little tub, and the safety valve works like a hammer, that nothing may interfere with the action and function of those agents, on which depends, in this critical period, the safety of the whole contents of the vat. The agitation may be observed still better in the glass tube connected with the vat; but after a short time, only a few hours, the must will calm; the fermentation proceed more quietly, and, in two or three days, begin to get clear and vinous, which is the time for drawing the young wine into the casks, there to complete its fermentation. The husks are pressed and the juice obtained added to the rest. As soon as one cask is filled, the tube is fixed into the bung-hole, and a small vessel of water put under the other end, to keep the air from contact with the young wine. The ventilation of the cellar is so regulated as to get an even temperature of about 50°.

*Making red wine, or claret.*—The blue and Traminer-colored varieties are used for this purpose; after the whole vintage, white, Traminer, and blue, or black, is made into claret. The color of the juice has to be examined, if it be not of the desired dark-red, some coloring matter must be used. There are several harmless substitutes, such as well-ripened elder berries, the berries of the hawthorn, &c. Whatever kind of berries may be used, they should, in all cases, be perfectly ripe; still better if they have been picked some time before they are wanted, and dried in the sun. The quantity of these must be ascertained by taking a sample of the must and adding berry juice till the desired color is obtained; but, as the red or claret wines become lighter by age, the color should at first be a few shades darker.

Claret wine takes more time to finish its fermenting process than any other. It is perfected when the color becomes clear, and the taste changed from sweet to strong vinous. According to the state of the weather and the season, which influence the quality of the grape, the fermentation will proceed, but the ordinary period requisite to complete it is from eight to ten days. When finally fit to draw into the casks, the management is the same as with other varieties; the husks are put under the press, and the extracted juice into the casks and mixed with the juice first drawn. The sediment or lees, from either variety, is saved in a cask for further use.

The husks, which still contain a considerable amount of wine-making properties, after the juice has been extracted from them by the press, are broken up fine, put into the fermenting vat, and water, in equal proportion to its bulk, is added—to each ten gallons of water one gallon of lees—to strengthen and facilitate its fermentation. A light but pleasant wine is obtained in this way, which is fit to drink the next summer, and will be found, in hot weather, a very agreeable cooling drink. All the seeds should be saved, well dried, and hung up in bags in an airy, dry place.

## TREATMENT OF THE YOUNG WINE.

*The second fermentation.*—The young wine, after it has been brought into the cellar, will go through another course of fermentation, and will be more or less agitated for a certain time. The casks have to be filled occasionally, and kept full to the bung; the dissolution of the sugar and of the different constituents of the wine will proceed slowly, and finally cease altogether; the undissolved matter settles on the bottom of the cask, and is called lees. When the wine gets to such a state, quiet and clean, it is time to draw it off into another cask. The casks, before using them, must be well cleaned and sulphured, which is done by dissolving sulphur in an iron pan over a fire, cutting strips of cotton cloth or linen two inches wide and nine long, and soaking them in the sulphur; then a piece of wire about a foot long is fastened to the bung, and the other end bent to a hook, on which is hung an ignited strip of the sulphured cotton, and introduced into the cask, the bung driven in, the cask rolled to and fro, and finally the sulphuric acid gas, which has not penetrated into the wood, let out by loosening the bung.

A siphon, reaching about two thirds to the bottom of the cask, is used for drawing. If the empty cask can be placed near enough, so that the other end of the siphon reaches to its bung-hole, it is so much better, as there is less escape of the gaseous and flavoring ingredients of the wine. The rest of the wine which the siphon does not draw is drawn off by a faucet, about six inches above the bottom. When a cask is thus filled to the bung-hole, the bung is driven in tight.

In order to preserve the fine, clear condition of the wine, all jerking and other rough treatment of the casks must be avoided. The lees from the emptied casks are collected into a cask by itself.

White wines will have attained the proper condition for drawing in a couple of months, wine of inferior quality still sooner, and should be drawn immediately after showing a clear, bright color, as the sediment injures its taste and character.

Schiller wine, according to its quality and intended use, may remain some time on the lees, especially if it is designed for preserving to an old age; but in most instances it will improve by drawing as soon as it is clear.

Claret wine, however, should remain from five to six months in the first cask and lees. When fermentation is no longer perceptible, the cask is filled, the bung driven in, and it is left undisturbed till the drawing is finished. The exact period is a matter of fashion, according to the taste and habit predominating in the country where it is sold. By letting it stand on the lees for several months it obtains more of those peculiar principles, astringency, &c., preferred in a good claret.

No wine should be drawn, and no good wine-cooper will open a cask in cloudy or sulky weather, as the wine, coming in contact with such an atmosphere, gets turbid and excited; therefore cool and bright days must be chosen for that purpose. All articles used in the draw-

ing, no matter how clean they may be kept, should be previously rinsed with wine.

*Remedies for flat and turbid wines.*—There are many instances when the wine loses its character, either turning flat, or getting excited and turbid, when it will be necessary to attend at once to its restoration by applying proper remedies, and prevent it from total destruction. By acting according to the principles set down here, such cases can occur only by accident; but, to avoid the calamity, constant care is required. The causes may be different, but generally it will be found that neglect, merely, or perhaps ignorance of proper management, created the trouble.

When wine becomes flat, it wants stimulating. This may be done by various means. The liquid from two pounds of raisins, cut fine, and soaked a few days in a gallon of good rectified alcohol, then pressed and strained, is mixed with a couple of gallons of the flat wine, heated to near boiling, and all put into the cask again. After it has been well stirred, the bung is replaced and left undisturbed for at least two months, when it may be drawn into another cask, previously well-sulphured. Every thirty gallons will require a gallon of alcohol and two pounds of raisins.

Another good remedy is, from each thirty gallons of flat wine two gallons are taken out, two pounds of well-dried grape-seed added, and brought over fire; while it is heating the seeds are stirred and rubbed with a beater, and after a while the liquid is strained and put hot into the cask again, which is bunged up immediately. Practical knowledge and experience are necessary to manage such wines; but the cause of the trouble may easily be prevented by adhering to the general principles of wine-making.

If the cask produced the flatness, the wine must be drawn first into another, before anything is done with it. When the wine becomes excited, turbid, and ferments again, which may occur often in poor cellars, if the weather should change from cold to warm, or if the casks have been opened in close, sulky, and cloudy weather, the difficulty will be found most likely in the cellar. Wine cannot be expected to keep and mature well in a poor cellar, which, perhaps, is also used for other purposes.

Sulphur is a good remedy. An empty, clean cask is provided, two gallons of the infected wine put in, a strip of sulphured cotton ignited, the bung driven in, and the cask rolled. After a while, two gallons more of wine are put in, sulphured, and rolled again, according to the quantity to be cured; eight or ten gallons may be impregnated with sulphur, or even more; and finally restored to its stand, and well-stirred, with the bung out.

*Further treatment of the wine, and its fining.*—After the wine has been drawn once, there is still more or less undissolved matter in it, which will soon settle to the bottom of the cask and therefore render necessary another drawing. This must be done, generally, three or four times before the wine gets clear, well-fined, and fit for the market. The proper time for drawing will be at intervals of from three to five months; but experience and judgment alone can point out the exact period. If it is desired to sell the wine before it has attained its finish,

it must be fined. This is done by taking out of the cask from four to five gallons, and adding to each thirty gallons the whites of ten eggs; these are beaten to foam with the wine, finally put into the cask, well stirred, and the cask bunged up.

Or powdered gum arabic may be used, in the proportion of one ounce to fifty gallons of wine, well stirred with the whole contents. Both articles are perfectly harmless to the character of the wine, and entirely answer the purpose. In the course of from four to six days the wine will be in the desired condition to draw and bottle for market. It will keep best and improve more in the casks; but there are several instances when, after it has been drawn, and the casks filled, portions remain, for which no casks small enough can be provided; it is better to draw such portions at once into bottles. Simple as the bottling seems to be, yet there are many things to be observed, in order to keep the wine well and prevent it from becoming flat and turbid. The first and chief requirements are clean, sweet bottles, and new, fresh corks; it must be a rule strictly adhered to, that as soon as a bottle is emptied it is to be rinsed out well with water and placed in the open air, on a shelf or frame erected for the purpose; before using, it is rinsed out once more, and then filled within two inches of the mouth. The cork, which should fit exactly, is dipped into wine, and driven well in. The bottles should always be placed in a horizontal position, so that the corks cannot get dry and admit air, which is generally the reason why the wine gets flat. They keep best if put in dry sand, one above the other. As further protection, the corks may be waxed.

#### USE OF THE HUSKS, LEES, AND SEEDS.

*Use of the husks.*—These may be differently used; a pleasant wine can be made of them, in the way already described, but a real good marketable wine is obtained by adding sugar in proportion to the vinous principles, found out by proper instruments, by which all wines have to be brought up to a certain standard point, most favorable to their development. But, as a description of this modern art of wine-making would require more room than has been allowed, it may only be mentioned that a vintage can be increased from a hundred to two hundred per cent. without the least detriment to its quality.

If the husks are not wanted for this purpose, a good vinegar may be obtained from them. As soon as they come from the press they are broken up fine, and put into a vinegar vat, twice their bulk of rain-water added, with two gallons of lees and a quart of beer-yeast to each barrel. The vat is set in a warm room, *but not in a fermenting room, cellar, or anywhere near wine*, and allowed to stand till the vinegar is formed, which is then drawn into barrels, the husks being brought to the compost heap, or directly to the vineyard.

*Use of the lees.*—The lees contain considerable undissolved sugar and other vinous substances, which, by distilling, make a highly flavored brandy. The quantity may be increased without affecting its good quality by adding to each barrel of lees half a barrel of well-rectified alcohol; that from potatoes is the best. Let it stand a couple of weeks, turning the cask once or twice a day, and finally it will be

fit for the still. The remainder in the still, too weak for brandy, makes a good vinegar. Lees are likewise a good stimulant for flat, insipid wine, and a portion should always be kept on hand to be thus applied.

*Use of the seeds.*—Grape seeds are very valuable for fining and strengthening the wine; they may be used either in the manner mentioned, or a few handfuls thrown into the cask just as they are. They must be well dried, and kept hung up in an airy place.

DRS. GALL AND PETIOL'S METHOD OF WINE-MAKING, ACCORDING TO THE MODERN PRINCIPLES ADOPTED IN GERMANY AND FRANCE.

In consequence of many failures in the ripening of the grapes, and diseases spreading rapidly over the continent, more or less destroying the crops of whole districts, grape culturists and chemists began to look for remedies and substitutes for those principles in which the vintages are deficient.

Much has been said against this method, and much suggested to neutralize predominating acids without resort to sugar and water, but all experiments have thus far failed, either the wine would get flat at once, or be unfit for use on account of its harshness. More than fifty years ago, Chaptal, Cadet de Vaux, and other eminent chemists, suggested that poor wines might be improved by adding sugar; later, Claudot-Dumont urged his countrymen to abstain from the bad practice of sweating and mixing their poor wines, and recommended sugar as the best agent to improve them. But neither of these chemists were able to point out in what proportion sugar should be used to obtain the desired result. This problem has finally been solved by Drs. Gall and Petiol, and approved by such men as Thénard, Döbereiner, Von Babo, Bronner, and others.

Drs. Gall and Petiol both discovered, after many analytical experiments and researches, that the surplus acids in the grape-juice can be turned to good account, by bringing its other ingredients (sugar and water) to a proper proportion. Every kind of grape-juice is nothing but clear water, in which are dissolved from six to thirty per cent. of sugar, two to four per cent. of free acids, and from three to five per cent. of other matter, or the essence of wine-making principles. Sugar converts itself into alcohol by fermenting, and two per cent. of sugar will produce, in the average, one per cent. of alcohol; the free acids, if they are in proportion to the other principles, give the wine its agreeable vinous character, its flavor, &c.; the last properties contain the principles necessary for fermenting, fining, and keeping. Dr. Gall has further proved the fact that these different acids in the grape do not require particular notice; it is sufficient to find out the whole sum, and then treat them alike. In order to ascertain what per centage of sugar and acids the must, or grape-juice, contains, two different instruments are required, a "must scale" and an "acidimeter;" for the first purpose *Oechsle's must scale* is generally used, and *Otto's acidimeter* for the second; on both are the following calculations based, illustrative of this method. None of these instruments have been yet

introduced into our country, but it may be presumed that, when a demand for them shall be manifested, some of the leading druggists will respond, and import them. They may, however, be procured at any time direct from the manufacturers, Dr. L. C. Marquart, of Bonn, on the Rhine, or J. Diehn, Frankfort-on-the-Main.

Experiments continued for eight years have proved that, in favorable seasons, grape-juice contains, in the average, in 1,000 pounds:

Sugar.....	240 pounds
Free acids.....	6 pounds
Water.....	754 pounds
	1,000

Which proportion may be set down as a normal; therefore, to obtain good wine from a vintage of inferior quality, these proportions must be secured by adding sugar and water. It will be seen that the contents of the acids are the indicating point as to what quantities of sugar and water would be required to bring the wine to such a normal state; further, as has been the case generally, the less sugar the more acids. The per cent. of acid in the grape-juice is the basis on which a calculation must be founded.

All practical grape-growers and wine-makers in Germany and France admit that a wine containing the proportion of sugar, acids, and water above-described, is in every respect preferable to heavier or lighter wines. It has lately been called a "normal wine," and will serve here as well as a standard.

When a must contains, instead of twenty-four per cent., only fifteen per cent., or instead of two hundred and forty pounds, only one hundred and fifty pounds of sugar, but, instead of only six per cent. or pounds, nine per cent. of acids in one thousand pounds, the question arises, how much sugar and water will have to be added, to bring such a must to the proportion of a normal wine? To solve it, we calculate thus: if, in six pounds of acid, in a normal wine, two hundred and forty pounds of sugar appear, how much sugar is wanted for nine pounds of acids? Answer: three hundred and sixty pounds. And again: If, in six pounds of acids, in a normal wine, seven hundred and fifty-four pounds of water appear, how much water is required for nine pounds of acids? Answer: one thousand one hundred and thirty-one pounds. As, therefore, the must which we intend to improve by neutralizing its acids should contain 360 pounds of sugar, 9 pounds of acids, and 1,131 pounds of water, but contains already 150 pounds of sugar, 9 pounds of acids, and 841 pounds of water, remain to be added 210 pounds of sugar, 0 pounds of acids, and 290 pounds of water.

By ameliorating a quantity of 1,000 pounds must  
by 210 pounds sugar  
and 290 pounds water,

we obtain 1,500 pounds of must, consisting of the same properties as the normal must, which makes a first-class wine. The increase of the quantity is five hundred pounds, or two hundred