cess, it may be checked or suspended. And thus it is, too, that dry wines, and fined wines, and wines in bottles, are durable, when they would perish in the cask.

The acid was shown to be also essential to the produce of wine. Mere extract, or leaven, and sugar, produce beer, not wine. Tartarous acid cannot well be in excess in that compound in which it exists, viz. the supertartrite of potash ; because it is a salt of difficult solution, and the superfluity is precipitated ; hence the tartar of wine-casks ; hence also the crystals which are seen, in cold weather, to float in Madeira wine. We noticed that it was decomposed in the fermentation, and was thought to contribute to the quantity of alcohol. The French chemists also assert that a part of it is converted into the malic ; hence the peculiar properties of some wines ; hence also the practice of liming the vats, or of sprinkling the grapes with lime in the manu­facture of Sherry wines, whence they acquire that peculiar dry and hard taste which distinguishes them from the wines of Madeira. As the tartarous salt adds to the fermenting power of the fluid, hence we explain the facility with which the juice of green grapes runs into fermentation when com­pared with ripe ones ; the immature fruit containing a much larger proportion of this salt than the mature. Thus also those wines continue to ferment longer, or to retain the power of fermenting ; and hence the vivacity of Champagne wines, the most effervescent kinds of which are made from half-ripened fruit.

The temperature of 54° Fahrenheit is considered the most favourable to this process. In extreme heat it fails, as in extreme cold. Hence the difficulty of making wine in India and the West Indian islands. Hence also, in the temperate climates, we have it in our power to regulate fermentation by the use of heat or of cold. Hence also it is that wines which had ceased to ferment, recommence in spring; and hence one of the processes essential to the manufactures of Champagne wines, namely, that of watching the spring fermentation, and bottling the wines in this stage.

Air is necessary to fermentation, rather than essential. The operation does not cease in closed vessels, but is re­tarded. Air is not absorbed in the vinous fermentation, although its oxygen is in the acetous. The wine is stronger in close vessels if the process is slower, because a portion of the alcohol escapes from the vats ; and this is now understood in our malt distilleries. That alcohol is held in solution in the carbonic acid which is generated, and thus it appears to intoxicate more rapidly ; as is well known in Champagne wines. Under pressure, this com­pound is united to the fluid; and being disengaged, pro­duces the well-known effervescence. The practice of fer­mentation is partly regulated by this consideration. The violent stage of that process in wine-making is allowed to take place in an open vat, the next is partially checked by an occasional bung, and in the last of all the vessel is com­pletely closed. In strong still wines, the whole process may be conducted in open vessels; but in light and brisk ones, it is absolutely necessary that the last part should take place in closed ones. Champagne wines are managed so as to ferment even in their bottles.

The volume of the fermenting fluid has a considerable effect on the process ; a few days are sufficient to complete it when the quantity is large. When small, it is difficult to establish, and tedious in the progress, and the results are also different; wines of different qualities being thus pro­duced from the very same materials. It is the same in the ultimate fermentation or ripening of wines. Champagne would be destroyed in a large cask : porter, an extreme case, is ripened in enormous quantities, as are many of the stronger wines. Bulk is peculiarly required for the strong and sweet wines ; Champagne may be made in a gallon measure.

The first appearance is the production of air-bubbles, terminating at length in a general ebullition. The liquor then becomes turbid, a variety of solid matters are disen­gaged, some falling to the bottom, and others rising to the top of the fluid. The leaven before mentioned is thus separated among other matters, while the bulk of the fluid is materially increased. It is in this stage that we have the power of regulating the extent of the fermentation, by separating the floating leaven, or allowing it to return into the liquor. Hence the process of fermenting in a full cask ejecting that substance by the bung-hole.

The disengaged gas is chiefly carbonic acid ; but hold­ing, as first remarked, some alcohol in solution. It appears by analysis that this is the produce of part of the carbon of the sugar and of its oxygen ; and this is the great change which leads to the production of the alcohol. But it also contains some obscure vegetable matter in suspension ; because, if passed through water, it not only converts it into vinegar, but deposits that mucilage which in vinegar is called the *mother.* It is possible, however, that this may itself be a new compound ; and it is one which, in certain cases, contains azote. That substance, which exists in yeast, has also been found in the disengaged gas, partly, it is said, in the form of ammonia ; and hence, possibly, a nauseous ammoniacal taste, well known in bad wines, and very remarkable in those of the Cape of Good Hope.

The generation of heat is one of the most remarkable phenomena in fermentation, and it bears a proportion to the bulk of the fluid. It is sometimes so great as to render it necessary to reduce it by art ; its cause is obscure. The colour of wines is also produced during the fermentation ; the red appears to be a substance analogous to resin, soluble in alcohol ; and thus its production is accounted for. Hence white wines may be made from red grapes, by ex­cluding the husks ; hence also red wines are often astrin­gent, because the tannin also lies in the husk. Thus also, in Champagne wines, the red are generally inferior, be­cause the species of fermentation required to extract the colour dissipates part of the flavour.

The formation of alcohol is the last and the essential phenomenon ; and it is now plain how this must depend on the quantity of sugar, on the goodness of the fruit, on the due apportioning of the leaven, and on the manage­ment of the process.

Thus, when all the necessary circumstances are present, the process goes on till the produce is pure wine, or a com­pound of alcohol, water, acid, colour, vegetable extract, and sugar. For although the two latter are said to be destroyed, there is almost always a minute portion of both remaining ; the former rendered very sensible, in some wines, by the skinny matter which it deposits on the sides of the bottles. In a similar manner it happens that a portion of sugar continues attached to the wine for a long time, though it is not always sensible except to a fine taste. Thus it is perceptible in Claret, and even in Madeira, which are among the driest of our wines. It is often very sensible in Fort, and when in excess is commonly the mark of a bad wine. In the first stages of the fermenta­tion the sugar is never thoroughly decomposed. If that were the case, indeed, the process would stop, or it would proceed to vinegar. Further fermentation, that slower species which takes place in the casks, tends further to diminish it; but still a portion remains, even when it has been bottled.

It is the gradual conversion of this sugar, the chief operation that goes on in bottled wines, which is the cause of the change which these undergo. This process often requires many years for its completion : that is the case in the Clarets of Chateau Margaux, and other Bordeaux wines ; and the same process indeed takes place to a greater or less degree in Madeira and the other strong wines. In these cases it is a cause of improvement, the wine becoming